MANDATORY DISCLOSURE

1. NAME OF THE INSTITUTION : PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY

ADDRESS : AT/P.O./P.S.-CHHENDIPADA, DIST.-ANGUL
PIN — 759124, ODISHA
TELEPHONE NO. : 06761-252307
MOBILE : 9438253319, 9438772261
E-Mail : pciet.cpd@gmail.com, pciet_cpd@rediffmail.com

2. NAME AND ADDRESS OF THE TRUST/SOCIETY/COMPANY AND THE TRUSTEES : PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY TRUST

ADDRESS : AT/P.O./P.S.-CHHENDIPADA, DIST.-ANGUL
PIN — 759124, ODISHA
TELEPHONE NO. : 06761-252307
MOBILE : 9438253319, 9438772261
E-Mail : pciet.cpd@gmail.com, pciet_cpd@rediffmail.com
:
TRUSTEES :

(1) ER. LAMBODAR PRADHAN – SECRETARY
AT/P.O./P.S.-CHHENDIPADA,
DIST.-ANGUL, ODISHA, PIN-759124
MOBILE : 9438253319, 9438772261
E-mail : lpradhan2009@gmail.com

(2) ER. HEMANTA KUMAR PRADHAN – CHAIRMAN
AT/P.O./P.S.-CHHENDIPADA,
DIST.-ANGUL, ODISHA, PIN-759124
MOBILE : 9438253318
E-mail : hpradhan1978@gmail.com

(3) MRS. MANJUBHASINI PRADHAN
AT/P.O./P.S.-CHHENDIPADA,
DIST.-ANGUL, ODISHA, PIN-759124
MOBILE : 9439537392
E-mail : manjubhasinipradhan@gmail.com

(4) MRS. KABITABHASINI PRADHAN
AT/P.O./P.S.-CHHENDIPADA,
DIST.-ANGUL, ODISHA, PIN-759124
MOBILE : 9861386263
E-mail : kabita.cpd@gmail.com

(5) JYOTIRMAYEE PRADHAN
AT/P.O./P.S.-CHHENDIPADA,
DIST.-ANGUL, ODISHA, PIN-759124
MOBILE : 8895231293
E-mail : jyotirmayee62@gmail.com

3. NAME AND ADDRESS OF THE VICE CHANCELLOR/ PRINCIPAL/DIRECTOR :

(1) DIRECTOR- DR. BASANTA KUMAR SAHOO
AT/P.O./P.S.-CHHENDIPADA
DIST.-ANGUL, ODISHA, PIN-759124
MOBILE : 9437493399
E-mail : drbksahoo008@gmail.com

(2) PRINCIPAL – ER. HEMANTA KUMAR PRADHAN
AT/P.O./P.S.-CHHENDIPADA
DIST.-ANGUL, ODISHA, PIN-759124
MOBILE : 9938052112
E-mail : hpradhan1978@gmail.com

4. NAME OF THE AFFILIATING UNIVERSITY : STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING (SCTE&VT), ODISHA, BHUBANESWAR.

5. GOVERNANCE :

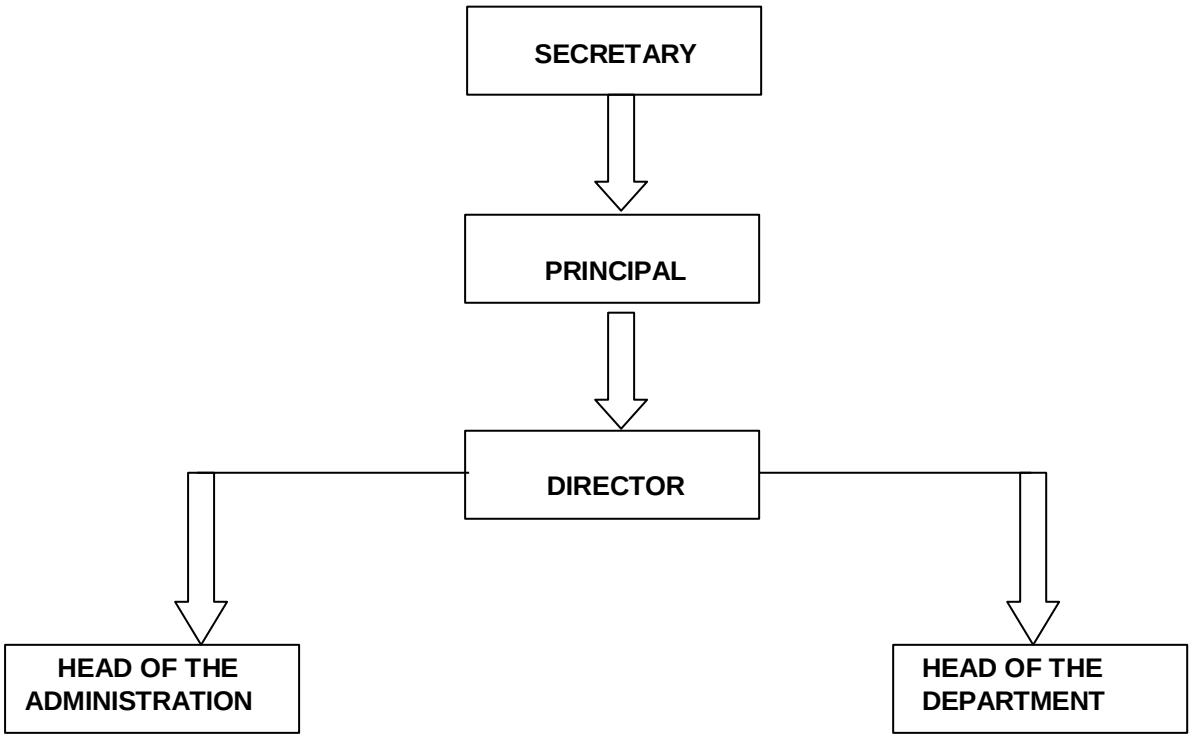
- Members of the Board and their brief background :
  (1) ER. LAMBODAR PRADHAN, SECRETARY
  (2) ER. HEMANTA KUMAR PRADHAN, CHAIRMAN
  (3) MRS. MANJUBHASINI PRADHAN, MEMBER
  (4) MRS. KABITABHASINI PRADHAN, MEMBER
  (5) ER. JYOTIRMAYEE PRADHAN, MEMBER

Most of the members of the Trust Board are qualified engineers having adequate experience in managing & promoting other technical & educational institutes with a mission to produce quality Diploma Engineers customize with changing scenario of our nation.

- Members of the Academic Advisory Body :
  (1) ER. HEMANTA KUMAR PRADHAN, PRINCIPAL
  (2) DR. BASANTA KUMAR SAHOO, DIRECTOR
  (3) ER. RASHMITA GADANAIK, HOD, ELECT.
  (4) ER. TARANISEN MOHANTY, HOD, MECH.
  (5) ER. BABITA SAHU, HOD, CIVIL
  (6) ER. DILLIP KUMAR DEHURY, HOD, MINING
  (7) MR. KSHIRA MOHAN BEHERA, HOD, MATH.& SCI.
  (8) MR. ASWINI KUMAR PRADHAN, LECT. IN COMP.

- Frequency of the Board Meeting and Academic Advisory Body : The regular meeting of the Trust Board & Academic Advisory Body has been held at least two times in each semesters & 04 times in a year.

- Organisational Chart & Processes :



- Nature and Extent of involvement : of Faculty and students in academic affairs/improvements

  The institute has been taking regular feedback relating to academic activity from the faculty & students in each semesters & taking corrective steps for its improvements of quality of teaching related activities through Departmental Academic Committee & monthly review & monitoring committee of the institute.

- Mechanism/Norms and Procedure : for democratic/good Governance

  Our institute constituted e-grievance redressal system for students, staffs & guardians as per A.I.C.T.E. norms & for redressal of grievances to provide good governance of the institute.

- Students Feedback on Institutional : Governance/Faculty performance

  The institute has been taking regular feedback on institutional governance & faculty performance & taking Corrective steps to eradicate the shortcomings on priority.

- Grievance Redressal Mechanism : for Faculty, staff and students

  The institute has been constituted a Grievance Redressal Committee since inception of the institute from the session 2009-10 as per A.I.C.T.E. norms for redressal of grievances & faculty staffs & students. The Grievance redressal committee for faculty, staff & students re-constituted for the session 2025-26 by vide Order No. PCIET/Estt/3075/25 dated 23.07.2025.

- Establishment of Anti Ragging : Committee:

  The institute has constituted Anti-Ragging Committee since the inception of the institute from the session 2009-10 as per A.I.C.T.E. norms to prohibits & prevent completely any type of ragging in our institute. The ragging is strictly prohibited in our institute. The anti-ragging committee of PCIET reconstituted for the session 2025-26 by vide Order No. PCIET/Estt/ 3061/25 dated 22.07.2025.

ANTI RAGGING COMMITTEE

Sl. No.	Name	Designation	Chairman/Member of the Committee	Contact No.
1.	Er. Hemanta Kumar Pradhan	Principal	Chairman	Ph : 06761-252307 Mob : 9938052112
2.	Dr. Basanta Kumar Sahoo	Director	Member	
3.	Er. Taranisen Mohanty	H.O.D., Mech. Engg.	Member	
4.	Mr. Aswini Kumar Pradhan	Lecturer in Comp.Sc.	Member	
5.	Mr. Subhendu Kumar Pani	Lecturer in English	Member	
6.	Mr. Kshira Mohan Behera	H.O.D. Math. & Sci.	Member	
7.	Er. Rashmita Gadanaik	H.O.D., Elect. Engg.	Member	
8.	Er. Gouri Sankar Pradhan	Lecturer, Mech. Engg.	Member	
9.	Er. Dewan Kumar Sahu	Lecturer, Mech. Engg.	Member	
10.	Er Swarnaprava Parida	Lecturer, Civil Engg.	Member	
11.	Er. Babita Sahu	H.O.D., Civil Engg.	Member	
12.	Mr.Tapan Kumar Sahu	Lecturer in Chemistry	Member	
13.	Er. Ramesh Chandra Pradhan	Lecturer in Elect. Engg.	Member	
14.	Er. Dillip Kumar Dehury	H.O.D., Mining Engg.	Member	
15.	Mr. Dolagobind Sahoo	Lecturer in Physics	Member	
16.	Ms. Nirupama Behera	Lect. in Chemistry	Member	
17.	Er. Diptimayee Pradhan	Lect in Computer Sci	Member	
18.	Mr. Saroj kumar sahu	Lect. in Mathematics	Member	
19	Mr. Suryakanta Behera	Instructor, W/S.	Member	
20	Mr. Satyajit pattanaik	Comp. Prog.	Member	
21	Mr. Prasanta Kumar Behera	Office Asst.	Member	
22	Mr. Santha Pradhan	Office Asst.	Member	
23	Mr. Susanta Kumar Sethy	Office Asst.	Member	

24	Representative of Tahasildar, Chhendipada		Member	
25	Representative of Local Police Station		Member	
26.	Representative of Local Media		Member	
27	Representative of Guardians/ Parents		Member	
28	Students Representatives		Member	

ANTI RAGGING SQUAD

Sl. No.	Name	Designation	Chairman/Member of the Committee	Contact No.
1.	Dr. Basanta Kumar Sahoo	Director	Chairman	06761-252692
2.	Mr. Aswini Kumar Pradhan	Lecturer, Comp.Sc.	Member	
3.	Er. Taranisen Mohanty	H.O.D., Mech. Engg.	Member	
4.	Mr. Subhendu Kumar Pani	Lecturer in English	Member	
5.	Mr. Kshira Mohan Behera	H.O.D., Math. & Sci.	Member	
6.	Er. Dewan Kumar Sahu	Lecturer, Mech. Engg.	Member	
7.	Er. Gouri Sankar Pradhan	Lecturer, Mech. Engg.	Member	
8.	Er. Rashmita Gadanayak	H.O.D., Elect. Engg.	Member	
9.	Mr. Suryakanta Behera	Instructor, W/S.	Member	
10.	Mr. Satyajit Pattanaik	Comp. Prog	Member	
11.	Er. Babita Sahu	H.O.D., Civil Engg.	Member	
12.	Er. Swarnaprava Parida	Lecturer in Civil Engg.	Member	
13.	Er. Dillip Kumar Dehury	H.O.D., Mining Engg.	Member	
14.	Er. Ramesh Chandra Pradhan	Lecturer in Elect. Engg.	Member	
15.	Er. Ipsita Nayak	T. A in Civil Engg.	Member	
16	Mr. Laltendu Sahu	Lect. in Physics	Member	
17	Mr. Saroj Kumar sahu	Lect. in Mathematics	Member	
18	Er. Diptimayee Pradhan	Lect. in Comp. Sci. & Engg	Member	
19	Er. Namita Dehury	Lect. in Electrical Engg	Member	
20.	Mr. Tapan Kumar Sahu	Lecturer in Chemistry	Member	
21.	Mr. Prasanta Kumar Behera	Office Asst.	Member	
22.	Mr. Santha Pradhan	Office Asst.	Member	
23.	Mr. Susanta Kumar Sethy	Office Asst.	Member	

- Establishment of Online Grievance Redressal Mechanism :

  In pursuance to A.I.C.T.E. Regulation, 2012, published vide Notification F. No. 37-3/Legal/2012 dated 25.05.2012 & A.I.C.T.E. Regulation F. No. 01-101/ DRG/ AICTE/ Regulation/2017 dated 20.02.2017, the e-grievance redressal mechanism system of P.C.I.E.T., Chhendipada, Dist.-Angul has been installed & implemented by Orell Software Solutions Pvt. Ltd. with effect from dt.13.08.2018 having its webportal : pciet.edugrievance.com for the session 2018-19 & has been renewed in subsequent years. The E-grievance redressal committee of PCIET for the session 2025-26 reconstituted by vide Order No. PCIET/Estt/3077/25 dated 23.07.2025.The objective of the e-grievance redressal mechanism is to ensure transparency by the institute, in admission & preventing unfair practices & to provide a mechanism to innocent students, faculties & staffs for redressal of their grievances.

- Establishment of Internal Complaint Committee (ICC) :

  In pursuance to the A.I.C.T.E. Regulations 2016 vide F. No. : AICTE/WH/2016/1 dated 10.06.2016 & A.I.C.T.E. F. No. 1-PC/AICTEG.P./2016 dated 08.07.2016, an Internal Complaint Committee (ICC) of PCIET, Chhendipada, Dist. — Angul has been constituted for the session 2018-19 vide Order No. PCIET/Estt/533/2018 dated 19.07.2018& has been reconstituted in subsequent years. The Internal Complaint Committee of PCIET Chhendipada reconstituted for the session 2025-26 by vide Order No. PCIET/Estt/3057/25 dated 21.07.2025. The objective of the above committeeis for

redressal of any grievances of the girls students studying in the institute & women employees working in the institution and preventing & prohibiting any type of gender sensitization, discrimination, corporal punishment & sexual harassment in the institute campus & hostel and create safe, conducive study atmosphere for all students especially girls students.

- Establishment of Committee for SC/ST :

  In pursuance to the A.I.C.T.E. Regulation 2012 vide F.No. 37-3/Legal/2012 dated 25.05.2012 & as per SC/ST Act 1989 vide No. 363 of 1989 dated 11.09.1989 a Grievance Redressal Committee for SC/ST students of PCIET, Chhendipada, Dist. — Angul is hereby re-constituted for the session 2025-26 by vide Order No. PCIET/Estt/3073/25 dated 23.07.2025. The objective of this committee is to work for preventing any type of intimidation, discrimination, atrocities and harassment of SC/ST students studying in the institute.

- Internal Quality Assurance Cell :

  In pursuance to the National Quality Assurance Policy & A.I.C.T.E. Regulation (Appendix-06) for the session 2019-20, an Internal Quality Assurance Cell (IQAC) of PCIET, Chhendipada, Dist.- Angul has been constituted vide Order No. PCIET/Estt./777/2019 dated 07.01.2019 & has been Reconstituted for the session 2025-26 by vide Order No.PCIET/Estt/4006/25 dated 18.08.2025.

  The objective of IQAC is to develop a quality system for conscious, consistent & catelic action to improve the academic & administrative performance of the institute & to promote measures for institutional function towards quality enhancement.

  Equal Opportunity Facilities Cell :

  In pursuance to A.I.C.T.E. F. No. AICTE/P & AP/MISC/ 2022 dated 27.09.2022 relating to follow-up-action for inclusive education for all including persons with disabilities and AICTE vide its Circular No. AICTE/P & AP/MISC/2022 dated 08.05.2022 relating to guidelines for inclusive education for all inclusive persons with disabilities to be followed by all AICTE approved institution, an "Equal Opportunity Facilitation Cell" (EQFC) of PCIET, Chhendipada, Dist. — Angul has been reconstituted for the session 2025-26 by vide Order No. PCIET/Estt/4002/25 dated 16.08.2025. In the above cell the Principal, PCIET functioning as Nodal Officer/Co-ordinator of EQFC. All HOD's & other senior staffs and students representatives are as member.

6. PROGRAMMES :

- Name of Programmes approved by AICTE :
  1) DIPLOMA IN CIVIL ENGG.
  2) DIPLOMA IN ELECTRICAL ENGG.
  3) DIPLOMA IN MECHANICAL ENGG.
  4) DIPLOMA IN MINING ENGG.
  5) DIPLOMA IN COMP. SC. & ENGG.

- Name of the Programmes Accredited by AICTE : NOT ACCREDIATED

- Status of Accrediation of the Courses : NOT ACCREDIATED

- Total Number of Courses : -

- No. of Courses for which applied for Accrediation : -
- Status of Accrediation — Preliminary / Applied for SAR and results awaited/Applied for SAR and visits completed/Results of the visits awaited/Rejected/ Approved for … Courses : -

- For each Programme the following details are to be given :

  - Name : DIPLOMA IN CIVIL ENGINEERING
  - Number of Seats : 60
  - Duration : 3 Years
  - Cut off marks/rank of admission during the last three years : 2023 - 303
2024 - 331
2025 - 363
  - Fee : Tuition Fee Per Year - Rs. 40,000/-
Hostel Cost – Rs.24,000/- per year per student
Transportation Cost – Rs.12,000/- upto 20 Kms. Rs. 17,000/- for more than 20 Kms.
Caution Money – Rs.500/- (one time refundable)
  - Placement Facilities : The institute has Training & Placement Cell to guide the students for their better placement,
  - Campus placement in last three years with Minimum salary, maximum salary and :

Year	Number of Company Visited	Number of Eligible Students	Total Placement	Lowest Package	Highest Package
2023	1	61	06	1.8 Lakh	2 Lakh
2024	3	45	05	1.8 Lakh	2 Lakh
2025	4	45	07	2 Lakh	2 Lakh

  - Name : DIPLOMA IN ELECTRICAL ENGINEERING
  - Number of Seats : 120
  - Duration : 3 Years
  - Cut off marks/rank of admission during the last three years : 2023 - 342
2024 - 411
2025 - 444
  - Fee : Tuition Fee Per Year - Rs. 40,000/-
Hostel Cost – Rs.24,000/- per year per student
Transportation Cost – Rs12,000/- upto 20 Kms. Rs. 17,000/- for more than 20 Kms.
Caution Money – Rs.500/- (one time refundable)
  - Placement Facilities : The institute has Training & Placement Cell to guide the students for their better placement,
  - Campus placement in last three years with Minimum salary, maximum salary and :

Year	Number of Company Visited	Number of Eligible Students	Total Placement	Lowest Package	Highest Package
2023	4	116	22	2 Lakh	2 Lakh
2024	1	75	18	1.8 Lakh	2 Lakh
2025	1	86	23	1.8 Lakh	2 Lakh

- Name : DIPLOMA IN MECHANICAL ENGINEERING
- Number of Seats : 120
- Duration : 3 Years
- Cut off marks/rank of admission during the last three years : 2023 - 313
  2024 - 405
  2025 - 393
- Fee : Tuition Fee Per Year - Rs. 40,000/-
  Hostel Cost – Rs.24,000/- per year per student
  Transportation Cost – Rs.12,000/- upto 20 Kms. Rs. 17,000/- for more than 20 Kms.
  Caution Money – Rs.500/- (one time refundable)
- Placement Facilities : The institute has Training & Placement Cell to guide the students for their better placement,
- Campus placement in last three years with: Minimum salary, maximum salary and

Year	Number of Company Visited	Number of Eligible Students	Total Placement	Lowest Package	Highest Package
2023	4	122	24	1.8 Lakh	2 Lakh
2024	1	80	17	1.8 Lakh	2 Lakh
2025	2	110	18	2 Lakh	2 Lakh

- Name : MINING ENGINEERING
- Number of Seats : 180
- Duration : 3 Years
- Cut off marks/rank of admission during the last three years : 2023 - 374
  2024 - 445
  2025 - 420
- Fee : Tuition Fee Per Year - Rs. 40,000/-
  Hostel Cost – Rs.24,000/- per year per student
  Transportation Cost – Rs.12,000/- upto 20 Kms. Rs. 17,000/- for more than 20 Kms.
  Caution Money – Rs.500/- (one time refundable)
- Placement Facilities : The institute has Training & Placement Cell to guide the students for their better placement,
- Campus placement in last three years with Minimum salary, maximum salary and :

Year	Number of Company Visited	Number of Eligible Students	Total Placement	Lowest Package	Highest Package
2023	5	127	21	1.8 Lakh	2 Lakh
2024	1	110	08	1.9 Lakh	2 Lakh
2025	2	125	25	2 Lakh	2 Lakh

- Name and duration of programme(s) having Twinning and Collaboration with Foreign University(s) and being run in the same Campus along with status of their AICTE approval. If there is Foreign Collaboration, give the following details : NOT APPLICABLE

- Name : DIPLOMA IN COMPUTER SCIENCE & ENGINEERING
- Number of Seats : 60
- Duration : 3 Years
- Cut off marks/rank of admission during the last three years : 2023 - -
  2024 - -
  2025 - 310
- Fee : Tuition Fee Per Year - Rs. 40,000/-
  Hostel Cost – Rs.24,000/- per year per student
  Transportation Cost – Rs.12,000/- upto 20 Kms. Rs. 17,000/- for more than 20 Kms.
  Caution Money – Rs.500/- (one time refundable)
- Placement Facilities : The institute has Training & Placement Cell to guide the students for their better placement,
- Campus placement in last three years with: Minimum salary, maximum salary and

Year	Number of Company Visited	Number of Eligible Students	Total Placement	Lowest Package	Highest Package
2023	-	-	-	-	-
2024	-	-	-	-	-
2025	-	-	-	-	-

7. FACULTY :

- Branch wise list Faculty Members : **BRANCH – CIVIL ENGINEERING**

1) ER. BABITA SAHU
2) ER. PRITAM SAGAR SAHOO
3) ER. NANDINI PRADHAN
4) ER. SWARNAPRAVA PARIDA
5) ER. SUMANTA KUMAR SAHOO
6) ER. SUMANTA PRADHAN
7) ER. YAJNASENI BEHERA
8) ER. SUMANA PRADHAN

- Permanent Faculty : 8 Nos.
- Adjunct Faculty : Nil
- Permanent Faculty : Student Ratio : 1 : 25
- Number of Faculty employed and left during last three years :

YEAR	EMPLOYED	LEFT
2023-24	01	01
2024-25	-	-
2025-26	2	2

- Branch wise list Faculty Members : **BRANCH – ELECTRICAL ENGINEERING**

1) ER. SUBHASHREE PRADHAN
2) ER. BIBHUTI BHUSAN SAHU
3) ER. BIJAYA KUMAR BEHERA
4) ER. SUVENDU SEKHAR BEHERA
5) ER. BISWARANJAN JENA
6) ER. SUSHIL SAHOO
7) ER. SAKTIDATTA PRADHAN
8) ER. SUGYANI SAHOO
9) ER. RAMESH CHANDRA PRADHAN
10) ER. DEBABRATA DIBYARANJAN
11) ER. PRADYUMNA GARNAIK
12) ER. RASHMITA GADANAYAK
13) ER. SUSHIL KUMAR MAJHI
14) ER. NAMITA DEHURY
15) ER. JAYANTA KUMAR DAS
16) ER. SNEHALATA BEHERA
17) ER. SIPAN KUMAR SAHU
18) ER. RAJAT KUMAR ASA

- Permanent Faculty : 18 Nos.
- Adjunct Faculty : Nil
- Permanent Faculty : Student Ratio : 1 : 20
- Number of Faculty employed and left during last three years :

YEAR	EMPLOYED	LEFT
2023-24	02	02
2024-25	-	-
2025-26	04	02

- Branch wise list Faculty Members : **BRANCH – MECHANICAL ENGINEERING**

1) ER. HEMANTA KUMAR PRADHAN
2) ER. TARANISEN MOHANTY
3) ER. MANAS RANJAN BEHERA
4) ER. GOURI SANKAR PRADHAN
5) ER. BIKASH RANJAN SAHU
6) ER. HIMANSU SEKHAR SAMAL
7) ER. LAKIN KUMAR SAHOO
8) ER. RASABIHARI SAHU
9) ER. DEWAN KUMAR SAHU
10) ER. ABINASH SAHOO
11) ER. SAMIR PRASAD SAHU
12) ER. SATYANARAYAN MAJHI
13) ER. SHUBHAM PRADHAN
14) ER. PRADIP KUMAR PRADHAN
15) ER. PRAVEEN KUMAR SAHU
16) ER. BIBHU SUNDAR SAHOO

- Permanent Faculty : 16 Nos.
- Adjunct Faculty : Nil
- Permanent Faculty : Student Ratio : 1 : 20
- Number of Faculty employed and left during : last three years

YEAR	EMPLOYED	LEFT
2023-24	-	-
2024-25	-	-
2025-26	03	02

- Branch wise list Faculty Members : **BRANCH – MINING ENGINEERING**

1) ER. DILLIP KUMAR DEHURY
2) ER. AJAY KUMAR
3) ER. CHANDAN SAHOO
4) ER. DIBYAMAYA ROUT
5) ER. JAGANDEEP MAHATO
6) ER. LIPUN DEHURY
7) ER. PRABIN KUMAR SAHOO
8) ER. PRANAYA KUMAR BEHERA
9) ER. PRATYUSH ROUT
10) ER. PRITAN KUMAR PRADHAN
11) ER. SIBASUNDAR MAIKAP
12) ER. SRIKANTA SAMAL
13) ER. SUNIL KUMAR SAHU
14) ER. PRATYUSHA PRAVANJAN BEHERA
15) ER. UDAYA BISWANATH PRADHAN
16) ER. SURAJ SAHOO
17) ER. SOUBHAGYA RANJAN BISWAL
18) ER. PRADIPTA KUMAR BEHERA
19) ER. LABANI NAIK
20) ER. MADHAV RANJAN SINGH

- Permanent Faculty : 20 Nos.
- Adjunct Faculty : Nil
- Permanent Faculty : Student Ratio : 1 : 20
- Number of Faculty employed and left during :

Last three Years

YEAR	EMPLOYED	LEFT
2023-24	-	-
2024-25	-	-
2024-25	05	01

FIRST YEAR/ OTHER FACULTIES:

1) DR. BASANTA KUMAR SAHOO, DIRECTOR
2) TAPAN KUMAR SAHU, LECT. IN CHEMISTRY
3) DOLAGOBINDA SAHOO, LECT. IN PHYSICS
4) KSHIRA MOHAN BEHERA, LECT. IN MATH.
5) SUVENDU KUMAR PANI, LECT. IN ENGLISH
6) ANUPAMA BEHERA, LECT. IN MGMT.
7) NIRUPAMA BEHERA, LECT. IN CHEMISTRY
8) SAROJ KUMAR SAHOO, LECT. IN MATH.
9) BHAKTA BATSALA NAIK, LECT. IN MGMT.
10) PUJARANI SAHOO, LECT. IN ENGLISH
11) VARSA VANDANA DAS, LECT. IN PHYSICS

- Permanent Faculty : 11 Nos.
- Adjunct Faculty : Nil
- Permanent Faculty : Student Ratio : 1 : 20
- Number of Faculty Employed & Left during last three years

YEAR	EMPLOYED	LEFT
2023-24	-	01
2024-25	-	-
2025-26	02	02

COMP. SCI. & ENGG. DEPT:

1) ER. ASWINI KUMAR PRADHAN, H.O.D COMP. SCI & ENGG.
2) ER. JYOTIRMAYEE PRADHAN, LECT. IN COMP. SCI. & ENGG.
3) ER. DIPTIMAYEE PRADHAN, LECT. IN COMP. SCI. & ENGG.
4) ER. GHASI BEHERA, LECT. IN COMP. SCI. & ENGG.
5) ER. MANASMITA SAHOO, LECT. IN COMP. SCI. & ENGG.
6) ER. SMRUTI CHARITA SAHU, LECT. IN COMP. SCI. & ENGG.

Permanent Faculty : 06 nos
Permanent Faculty Student Ratio : 1 : 20

8. PROFILE OF VICE CHANCELLOR/ DIRECTOR / PRINCIPAL / FACULTY :

i)	Name	:	**DR. BASANTA KUMAR SAHOO DIRECTOR**
ii)	Date of Birth	:	14/10/1960
iii)	Unique Id	:	1-463358455
iv)	Educational Qualifications	:	M.Sc., M.Phil, Ph.D (Math.)
v)	Work Experience	:	
	• Teaching	:	35 Years
	• Research	:	7 Years
	• Industry	:	-
	• Others	:	Administrative – 29 Years
vi)	Area of Specialization	:	(1) DIFFERENTIAL EQUATIONS (2) HIGHER ANALYSIS (3) THEORY OF RELATIVITY & COSMOLOGY (4) THEORY OF NUMBERS
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Diploma Level	:	ENGG. MATHEMATICS-I ENGG. MATHEMATICS-II ENGG. MATHEMATICS-III
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	4
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	4
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. HEMANTA KUMAR PRADHAN** **PRINCIPAL**
ii)	Date of Birth	:	14/07/1978
iii)	Unique Id	:	1-4364864697
iv)	Educational Qualifications	:	M.TECH.
v)	Work Experience	:	
	• Teaching	:	7 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	Administrative – 8 Years
vi)	Area of Specialization	:	PRODUCTION ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Diploma Level	:	1) PRODUCTION TECHNOLOGY 2) MANUFACTURING TECHNOLOGY 3) ADVANCE MANUFACTURING PROCESS
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. BABITA SAHU** **H.O.D. IN CIVIL ENGG.**
ii)	Date of Birth	:	05/01/1985
iii)	Unique Id	:	1-3612596034
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	9 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	TRANSPORTATION ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) RAILWAY & BRIDGE ENGG 2) BUILDING MATERIAL & CONSTRUCTION TECHNOLOGY . 3) HIGHWAY ENGG. 4)CONSTRUCTION MANAGEMENT .
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. PRITAM SAGAR SAHOO** **LECT. IN CIVIL ENGG.**
ii)	Date of Birth	:	04/06/1990
iii)	Unique Id	:	1-2899870919
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	11 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	STRUCTURAL ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) STRUCTURAL MECHANICS 2) ESTIMATION & COST EVALUATION -I 3) LAND SURVEY -I 4) LAND SURVEY -II
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. NANDINI PRADHAN** **LECT. IN CIVIL ENGG.**
ii)	Date of Birth	:	15/07/1993
iii)	Unique Id	:	1-2900768901
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	11 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	GEO TECHNICAL ENGG
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) GEO TECHNICAL ENGG. 2) STRUCTURAL DESIGN -II 3) HYDRAULIC IRRIGATION ENGG. HYDRAULICS & IRRIGATION ENGG. 4) CONCRETE TECHNOLOGY
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. SWARNAPRAVA PARIDA** **LECT. IN CIVIL ENGG.**
ii)	Date of Birth	:	09/03/1994
iii)	Unique Id	:	1-7521136446
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	6 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	GEO TECHNICAL ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) GEO TECHNICAL ENGG. 2)WATER SUPPLY &WASTE WATER ENGG. 3) ADVANCED CONSTRUCTION TECHINIQUES & EQUIPMENTS 4) HYDRAULIC IRRIGATION ENGG.
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER.SUMANTA KUMAR SAHOO LECT. IN CIVIL ENGG.**
ii)	Date of Birth	:	17/08/1999
iii)	Unique Id	:	1-11149725261
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	5 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	ENVIRONMENTAL ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ ENGG. Post Graduate / Post Graduate Diploma Level	:	1) ENVIRONMENTAL STUDIES 2) WATER SUPPLY & WASTE WATER 3) LAND SURVEY -
viii)	Research guidance	:	
	• No. of papers published	:	- in National/International Journals/Conferences
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with	:	- details

i)	Name	:	**ER.SUMANTA PRADHAN** **LECT. IN CIVIL ENGG.**
ii)	Date of Birth	:	05/02/1998
iii)	Unique Id	:	1-43804933155
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	2
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	STRUCTURAL ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) STRUCTURAL MECHANICS 2) STRUCTURAL DESIGN -II 3) CONCRETE TECHNOLOGY 4) LAND SURVEY -II
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER.SUMANA PRADHAN** **LECT. IN CIVIL ENGG.**
ii)	Date of Birth	:	02/07/1992
iii)	Unique Id	:	1-7439743980
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	STRUCTURAL ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) STRUCTURAL MECHANICS 2) STRUCTURAL DESIGN -II 3) CONCRETE TECHNOLOGY 4) LAND SURVEY -II
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. SUBHASHREE PRADHAN** **H.O.D. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	18/06/1997
iii)	Unique Id	:	1-7444782685
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	7 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) POWER ELECTRONICS ENGG. 2) POWER SYSTEM ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) POWER ELECTRONICS & PLC 2) CIRCUIT & NETWORK THEORY 3) ANALOG ELECTRONICS & OP-AMP 4) ELECTRICAL INSTALLATION & ESTIMATING
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. BIBHUTI BHUSAN SAHU** **LECT. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	07/02/1994
iii)	Unique Id	:	1-3620679256
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	9 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	POWER ELECTRONICS ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) CONTROL SYSTEM ENGG. 2) ELECTRICAL MEASUREMENT & INSTRUMENTATION 3) CIRCUIT & NETWORK THEORY
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. BIJAYA KUMAR BEHERA** **LECT. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	15/06/1985
iii)	Unique Id	:	1-2901265018
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	10 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	POWER ELECTRONICS ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) POWER ELECTRONICS & PLC 2) ANALOG ELECTRONICS & OP-AMP
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. SUVENDU SEKHAR BEHERA** **LECT. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	28/06/1987
iii)	Unique Id	:	1-2901090962
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	10 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	POWER SYSTEM ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) CIRCUIT & NETWORK THEORY 2) ENERGY CONVERSION-I 3) ENERGY CONVERSION-II 4) UTILIZATION OF ELECTRICAL ENERGY & TRACTION
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. BISWARANJAN JENA** **LECT. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	01/08/1985
iii)	Unique Id	:	1-2900984891
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	10 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	POWER SYSTEM ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) UTILIZATION OF ELECTRICAL ENERGY & TRACTION 2) ENERGY CONVERSION-I 3) SWITCH GEAR & PROTECTIVE DEVICES
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. SUSHIL SAHOO** **LECT. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	04/09/1991
iii)	Unique Id	:	1-2900888788
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	10 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	POWER SYSTEM ENGG
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) GENERATION TRANSMISSION & DISTRIBUTION 2) CIRCUIT & NETWORK THEORY
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. SAKTIDATTA PRADHAN** **LECT. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	07/04/1990
iii)	Unique Id	:	1-2900888486
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	10 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	POWER ELECTRONICS ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) ANALOG ELECTRONICS & OP-AMP 2) POWER ELECTRONICS & PLC
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. SUGYANI SAHOO** **LECT. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	04/04/1992
iii)	Unique Id	:	1-2900888576
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	10 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	POWER SYSTEM ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) RENEWABLE ENERGY 2) CONTROL SYSTEM ENGG.
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. RAMESH CHANDRA PRADHAN** **LECT. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	14/05/1986
iii)	Unique Id	:	1-4361047414
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	6 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	POWER SYSTEM ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) ENERGY CONVERSION -I 2) ENERGY CONVERSION -II 3) SWITCH GEAR & PROTECTIVE DEVICES
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. DEBABRATA DIBYARANJAN** **LECT. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	29/04/1993
iii)	Unique Id	:	1-11275212793
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	3 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	POWER ELECTRONICS ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) DIGITAL ELECTRONICS & MICROPROCESSOR 2) ANALOG ELECTRONICS & OP-AM 3) CONTROL SYSTEM ENGG.
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. PRADYUMNA GARNAIK** **LECT. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	23/07/1993
iii)	Unique Id	:	1-11149725304
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	3 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	POWER SYSTEM ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) ENERGY CONVERSION-I 2) SWITCH GEAR & PROTECTIVE DEVICES 3) GENERATION TRANSMISSION & DISTRIBUTION 4) RENEWABLE ENERGY
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. RASHMITA GADANAYAK** **LECT. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	15/06/1996
iii)	Unique Id	:	1-43738565565
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	2 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	POWER SYSTEM ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) DIGITAL ELECTRONICS & MICROPROCESSOR 2) ELECTRICAL ENGG. MATERIAL 3) GENERATION TRANSMISSION & DISTRIBUTION 4) RENEWABLE ENERGY
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. NAMITA DEHURY** **LECT. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	10/05/1994
iii)	Unique Id	:	1-44688926515
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	POWER SYSTEM ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) ENERGY CONVERSION-I 2) SWITCH GEAR & PROTECTIVE DEVICES 3) GENERATION TRANSMISSION & DISTRIBUTION 4) RENEWABLE ENERGY
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. JAYANTA KUMAR DAS** **LECT. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	19/06/1994
iii)	Unique Id	:	1-46617806082
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	POWER SYSTEM ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) DIGITAL ELECTRONICS & MICROPROCESSOR 2) ELECTRICAL ENGG. MATERIAL 3) GENERATION TRANSMISSION & DISTRIBUTION 4) RENEWABLE ENERGY
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. SIPAN KUMAR SAHU** **LECT. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	31/05/1988
iii)	Unique Id	:	1-46976872868
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	POWER SYSTEM ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) ENERGY CONVERSION-I 2) SWITCH GEAR & PROTECTIVE DEVICES 3) GENERATION TRANSMISSION & DISTRIBUTION 4) RENEWABLE ENERGY
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. RAJAT KUMAR ASA** **LECT. IN ELECTRICAL ENGG.**
ii)	Date of Birth	:	21/06/1997
iii)	Unique Id	:	1-46976872748
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	POWER SYSTEM ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) ENERGY CONVERSION-I 2) SWITCH GEAR & PROTECTIVE DEVICES 3) GENERATION TRANSMISSION & DISTRIBUTION 4) RENEWABLE ENERGY
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. TARANISEN MOHANTY** **H.O.D. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	12/07/1991
iii)	Unique Id	:	1-2906640916
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	10 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	MATERIAL ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) ENGINEERING MATERIALS 2) COMPOSITE MATERIALS
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. MANAS RANJAN BEHERA** **LECT. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	10/07/1979
iii)	Unique Id	:	1-2072020952
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	12 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	MECHANICAL SYSTEM DESIGN.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) STRENGTH OF MATERIAL 2) DESIGN OF MACHINE ELEMENT 3) THEORY OF MACHINES
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. GOURI SANKAR PRADHAN** **LECT. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	26/06/1993
iii)	Unique Id	:	1-2307981488
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	10 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	AUTOMOBILE ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) AUTOMOBILE ENGG. & HYBRID VECHILES
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. BIKASH RANJAN SAHU** **LECT. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	07/02/1991
iii)	Unique Id	:	1-2901652615
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	10 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	PRODUCTION ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) PRODUCTION TECHNOLOGY 2) MANUFACTURING TECHNOLOGY 3) ADVANCE MANUFACTURING PROCESS
.			
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. HIMANSU SEKHAR SAMAL** **LECT. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	15/06/1988
iii)	Unique Id	:	1-2901737966
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	10 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	INDUSTRIAL ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) ENTREPRENEURSHIP & MANAGEMENT & SMART TECHNOLOGY 2)INDUSTRIAL ENGG. &MANAGEMENT
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. LAKIN KUMAR SAHOO** **LECT. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	08/07/1991
iii)	Unique Id	:	1-3220113619
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	9 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	THERMAL ENGG
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) THERMAL ENGG-I 2) THERMAL ENGG-II 3) REFRIGERATION & AIR CONDITIONING 4) POWER STATION ENGINNERING
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. RASABIHARI SAHU** **LECT. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	07/04/1992
iii)	Unique Id	:	1-3613955847
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	8 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	MATERIAL TECHNOLOGY
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) ENGINEERING MATERIAL 2) COMPOSITE MATERIALS
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. DEWAN KUMAR SAHU** **LECT. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	16/06/1993
iii)	Unique Id	:	1-7446818189
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	4 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	MECHANICAL SYSTEM DESIGN
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1)STRENGTH OF MATERIALS 2)DESIGN OF M/C ELEMENT 3)THEORY OF MACHINE
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. ABINASH SAHOO** **LECT. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	28/04/1995
iii)	Unique Id	:	1-11149725340
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	4 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	THERMAL ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	1) THERMAL ENGG.- I 1) THERMAL ENGG.- II 3) REFRIGERATION & AIR CONDITIONING 4) POWER STATION ENGG.
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. SAMIR PRASAD SAHU** **LECT. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	03/04/1996
iii)	Unique Id	:	1-11149725370
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	3 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	AUTOMOBILE ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate/ Post Graduate/Post Graduate Diploma Level	:	1) AUTOMOBILE ENGG. 2) HYBRID VEHICLES
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. SATYA NARAYAN MAJHI** **LECT. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	12/05/1996
iii)	Unique Id	:	1-43489014211
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	3 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	THERMAL ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate/ Post Graduate/Post Graduate Diploma Level	:	1) THERMAL ENGG.- I 1) THERMAL ENGG.- II 3) REFRIGERATION & POWER STATION ENGG.
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. SHUBHAM PRADHAN** **LECT. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	10/05/2000
iii)	Unique Id	:	1-11149725358
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	4 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	INDUSTRIAL ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate/ Post Graduate/Post Graduate Diploma Level	:	1) FLUID MECHANICS 2) HYDRAULIC MACHINE 3) INDUSTRRIAL FLUID MECHANICS
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. BISHNU CHARAN BEHERA** **LECT. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	07/06/1993
iii)	Unique Id	:	1-44689017825
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	THERMAL ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate/ Post Graduate/Post Graduate Diploma Level	:	1) THERMAL ENGG.- I 1) THERMAL ENGG.- II 3) REFRIGERATION & POWER STATION ENGG.
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. PRATIK KUMAR PRADHAN** **LECT. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	29/05/2000
iii)	Unique Id	:	1-46628908279
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	THERMAL ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate/ Post Graduate/Post Graduate Diploma Level	:	1) THERMAL ENGG.- I 1) THERMAL ENGG.- II 3) REFRIGERATION & POWER STATION ENGG.
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. PRAVEEN KUMAR SAHU** **LECT. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	22/02/2000
iii)	Unique Id	:	1-46908812093
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	THERMAL ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate/ Post Graduate/Post Graduate Diploma Level	:	1) THERMAL ENGG.- I 1) THERMAL ENGG.- II 3) REFRIGERATION & POWER STATION ENGG.
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. BIBHU SUNDAR SAHOO** **LECT. IN MECHANICAL ENGG.**
ii)	Date of Birth	:	01/09/1997
iii)	Unique Id	:	1-46908812111
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	THERMAL ENGG.
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate/ Post Graduate/Post Graduate Diploma Level	:	1) THERMAL ENGG.- I 1) THERMAL ENGG.- II 3) REFRIGERATION & POWER STATION ENGG.
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. DILLIP KUMAR DEHURY** **H.O.D. IN MINING ENGG.**
ii)	Date of Birth	:	05/05/1991
iii)	Unique Id	:	1-7447128222
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	6 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) SURFACE MINING TECHNOLOGY 2) MINE LEGISLATION AND GENERAL SAFETY
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) SURFACE MINING TECHNOLOGY 2) MINE LEGISLATION AND GENERAL SAFETY (CMR2017) 3) MINES ACT 1952 MINES RULE 1955I 4) METALLIFERROUS MINES REGULATIONS 5) MLGS –I 6) MLGS –II
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with	:	-

details

i)	Name	:	**ER. AJAY KUMAR** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	02/01/1995
iii)	Unique Id	:	1-43488273077
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	2 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) MINE MACHINERY 2) SURFACE MINING TECHNOLOGY
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate/ Post Graduate/Post Graduate Diploma Level	:	1) MINE DEVLOPMENT 2) MINING METHOD (OPEN CAST / UNDERGROUND) 3) UNDERGROUND METAL MINING
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. CHANDAN SAHOO** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	21/06/1999
iii)	Unique Id	:	1-43488273049
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	2 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) UNDERGROUND COAL MINING. 2) MINE VENTILATION
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate/ Post Graduate/Post Graduate Diploma Level	:	1) UNDERGROUND COAL MINING 2) MINE VENTILATION SYSTEM 3) NUMERICAL PROBLEMS ON VENTILATION
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. JAGANDEEP MAHATO** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	24/06/1999
iii)	Unique Id	:	1-43488273135
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	2 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) MINING LEGISLATION & GENERAL SAFETY. 2) MINES ACTS MINES RULES
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	CMR 2017 MMR MINE ACTS MINE RULES 1) MLGS – I 2) MLGS - II
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. LIPUN DEHURY** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	18/04/1995
iii)	Unique Id	:	1-7444782837
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	6 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) MINE MACHINERY 2) MINE HAZARD & SAFETY
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) MINE METHOD 2) MINE MACHINARIES 3) MINE HAZARD & SAFETY 4) MINE VENTILATION MINE GAS TESTING
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

	i)	Name	:	**ER. PRABIN KUMAR SAHOO** **LECT. IN MINING ENGG.**
	ii)	Date of Birth	:	05/03/1996
	iii)	Unique Id	:	1-4796541640
	iv)	Educational Qualifications	:	B.TECH.
	v)	Work Experience	:	
		• Teaching	:	6 Years
		• Research	:	-
		• Industry	:	-
		• Others	:	-
1)	vi)	Area of Specialization	:	1) MINE GEOLOGY 2) MINERAL DRESSING .
	vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) MINE GEOLOGY 2) MINERAL DRESSING PETROLOGY, STRATIGRAPHY
	viii)	Research guidance	:	
		• No. of papers published in National/International Journals/Conferences	:	-
		• Master	:	-
		• Ph.D.	:	-
	ix)	Projects Carried out	:	-
	x)	Patents	:	-
	xi)	Technology Transfer	:	-
	xii)	Research Publications	:	-
	xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. PRANAYA KUMAR BEHERA** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	04/08/1995
iii)	Unique Id	:	1-7492920067
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	5 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) MINE GEOLOGY 2) MINERAL DRESSING
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) MINE GEOLOGY I 2) MINERAL DRESSING PETROLOGY, STRATIGRAPHY
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

	i)	Name	:	**ER. PRATYUSHA PRAVANJAN BEHERA** **LECT. IN MINING ENGG.**
	ii)	Date of Birth	:	24/06/1990
	iii)	Unique Id	:	1-11150131896
	iv)	Educational Qualifications	:	B.TECH.
	v)	Work Experience	:	
		• Teaching	:	3 Years
		• Research	:	-
		• Industry	:	-
		• Others	:	-
1)	vi)	Area of Specialization	:	1) SURFACE MINING TECHNOLOGY 2) MINING METHOD
	vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) MINEDEVLOPMENT 2) SURFACE MINING TECHNOLOGY 3) EXPLOSIVES & BLASTING ACCESSORIES
	viii)	Research guidance	:	
		• No. of papers published in National/International Journals/Conferences	:	-
		• Master	:	-
		• Ph.D.	:	-
	ix)	Projects Carried out	:	-
	x)	Patents	:	-
	xi)	Technology Transfer	:	-
	xii)	Research Publications	:	-
	xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. PRITAN KUMAR PRADHAN** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	15/07/1999
iii)	Unique Id	:	1-43488273030
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	2 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) MINE MACHINERY 2) MINE HAZARD & SAFETY
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) MINE PUMPS HEMM 2) MINE HAZARDS &SAFETY 3) MINE GASES & TESTING OF GAS
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. SIBASUNDAR MAIKAP** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	11/04/1998
iii)	Unique Id	:	1-11150131866
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	3 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) MINE GEOLOGY 2) MINERAL DRESSING
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) MINE GEOLOGY INDIAN STRATIGRAPHY PETROLOGY 2) MINERAL DRESSING
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. SRIKANTA SAMAL** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	23/04/1993
iii)	Unique Id	:	1-9470525032
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	4 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) MINERAL DRESSING . 2) MINES HAZARD &SAFETY
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) MINERAL DRESSING 2) MINES HAZARD &SAFETY 3) MINE GASES & TESTING OF GASES
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. UDAYA BISWANATH PRADHAN** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	01/06/1995
iii)	Unique Id	:	1-4795726879
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	7 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) MINE DEVLOPMENT
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) UNDERGROUND COAL MINING 2) UNDERGROUND METAL MINING OPEN CAST MINING
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. SUNIL KUMAR SAHU** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	15/04/1999
iii)	Unique Id	:	1-11150131844
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	4 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) MINE SURVEY & SURVEY
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) MINE SURVEY GPS DGPS SURVEYING & LEVCING
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. SURAJ SAHOO** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	29/08/1999
iii)	Unique Id	:	1-44689261637
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) SURFACE MINING TECHNOLOGY 2) MINE LEGISLATION AND GENERAL SAFETY
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) SURFACE MINING TECHNOLOGY 2) MINE LEGISLATION AND GENERAL SAFETY (CMR2017) 3) MINES ACT 1952 MINES RULE 1955I 4) METALLIFERROUS MINES REGULATIONS 4) MLGS –I 5) MLGS –II
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with	:	-

i)	Name	:	**ER. DIBYA RANJAN BEHERA** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	06/05/2000
iii)	Unique Id	:	1-44689017745
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) MINE DEVLOPMENT
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) UNDERGROUND COAL MINING 2) UNDERGROUND METAL MINING OPEN CAST MINING
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. DIBYAMAYA ROUT** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	22/08/2003
iii)	Unique Id	:	1-44689261902
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) MINE DEVLOPMENT
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) UNDERGROUND COAL MINING 2) UNDERGROUND METAL MINING OPEN CAST MINING
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. SOUBHAGYA RANJAN BISWAL** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	12/04/1999
iii)	Unique Id	:	1-46908812119
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) MINERAL DRESSING . 2) MINES HAZARD &SAFETY
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) MINERAL DRESSING 2) MINES HAZARD &SAFETY 3) MINE GASES & TESTING OF GASES
viii)	Research guidance	:	
	• No. of papers published	:	- in National/International Journals/Conferences
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with	:	- details

i)	Name	:	**ER. PRADIPTA KUMAR BEHERA** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	20/04/2000
iii)	Unique Id	:	1-46976873018
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) MINERAL DRESSING . 2) MINES HAZARD &SAFETY
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) MINERAL DRESSING 2) MINES HAZARD &SAFETY 3) MINE GASES & TESTING OF GASES
viii)	Research guidance	:	
	• No. of papers published	:	- in National/International Journals/Conferences
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**LABANI NAIK** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	15/07/2002
iii)	Unique Id	:	1-46976872997
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) MINERAL DRESSING . 2) MINES HAZARD &SAFETY
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) MINERAL DRESSING 2) MINES HAZARD &SAFETY 3) MINE GASES & TESTING OF GASES
viii)	Research guidance	:	
	• No. of papers published	:	- in National/International Journals/Conferences
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. MADHAV RANJAN SINGH** **LECT. IN MINING ENGG.**
ii)	Date of Birth	:	31/01/1999
iii)	Unique Id	:	1-46908812174
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	1 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	1) MINE DEVLOPMENT
vii)	Courses taught at Diploma/ Post Diploma/Undergraduate Post Graduate/Post Graduate Diploma Level	:	1) UNDERGROUND COAL MINING 2) UNDERGROUND METAL MINING OPEN CAST MINING
viii)	Research guidance	:	
	• No. of papers published	:	- in National/International Journals/Conferences
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**MR. ASWINI KUMAR PRADHAN** **H.O.D IN COMP. SC. & ENGG.**
ii)	Date of Birth	:	12/06/1987
iii)	Unique Id	:	1-7438688300
iv)	Educational Qualifications	:	MCA
v)	Work Experience	:	
	• Teaching	:	11 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	JAVA
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	COMPUTER APPLICATION OBJECT ORIENTED COMP. PROGRAMMING CAD/CAM LAB. APPLICATION OF SOFTWARE IN MINES
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**ER. JYOTIRMAYEE PRADHAN** **LECT. IN COMP. SC. & ENGG.**
ii)	Date of Birth	:	02/05/1988
iii)	Unique Id	:	1-2911105979
iv)	Educational Qualifications	:	B.TECH.
v)	Work Experience	:	
	• Teaching	:	10 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	DATA BASE MANAGEMENT
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	COMPUTER APPLICATION CAD/CAM LAB.
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**DIPTIMAYEE PRADHAN** **LECT. IN COMP. SC. & ENGG.**
ii)	Date of Birth	:	22/05/1991
iii)	Unique Id	:	1-43795728418
iv)	Educational Qualifications	:	B.TECH. (COMP.SC.)
v)	Work Experience	:	
	• Teaching	:	2 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	DATA BASE MANAGEMENT
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	COMPUTER APPLICATION CAD/CAM LAB .
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	ER. **GHASI BEHERA** **LECT. IN COMP. SC. & ENGG.**
ii)	Date of Birth	:	10/02/2001
iii)	Unique Id	:	1-44689262149
iv)	Educational Qualifications	:	B-TECH
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	JAVA
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	COMPUTER APPLICATION OBJECT ORIENTED COMP. PROGRAMMING CAD/CAM LAB. APPLICATION OF SOFTWARE IN MINES
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**MANASMITA SAHOO** **LECT. IN COMP. SC. & ENGG.**
ii)	Date of Birth	:	24/12/2000
iii)	Unique Id	:	1-44689263027
iv)	Educational Qualifications	:	MSC (COMP. SC.)
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	JAVA
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	COMPUTER APPLICATION OBJECT ORIENTED COMP. PROGRAMMING CAD/CAM LAB. APPLICATION OF SOFTWARE IN MINES
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**SMRUTISUCHARITA SAHU** **LECT. IN COMP. SC. & ENGG.**
ii)	Date of Birth	:	16/04/2002
iii)	Unique Id	:	1-446892622825
iv)	Educational Qualifications	:	MCA
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	JAVA
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	COMPUTER APPLICATION OBJECT ORIENTED COMP. PROGRAMMING CAD/CAM LAB. APPLICATION OF SOFTWARE IN MINES
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**MR.TAPAN KUMAR SAHU** **LECT. IN CHEMISTRY**
ii)	Date of Birth	:	28/12/1993
iii)	Unique Id	:	1-4363920014
iv)	Educational Qualifications	:	M.SC.
v)	Work Experience	:	
	• Teaching	:	7 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	INDUSTRIAL CHEMISTRY
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	ENGG. CHEMISTRY
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**MR.DOLAGOBIND SAHOO** **LECT. IN PHYSICS**
ii)	Date of Birth	:	25/04/1971
iii)	Unique Id	:	1-3614178950
iv)	Educational Qualifications	:	M.SC.
v)	Work Experience	:	
	• Teaching	:	8 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	PHYSICS
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	ENGG. PHYSICS
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**MR.KSHIRA MOHAN BEHERA** **LECT. IN MATHEMATICS**
ii)	Date of Birth	:	01/07/1977
iii)	Unique Id	:	1-7444782949
iv)	Educational Qualifications	:	M.SC.
v)	Work Experience	:	
	• Teaching	:	8 Years
	• Research	:	-
	• Industry	:	6 Years
	• Others	:	-
vi)	Area of Specialization	:	MATH.
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	ENGG. MATH-I, MATH-II, MATH-III
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**MR.SUBHENDU KUMAR PANI** **LECT. IN ENGLISH**
ii)	Date of Birth	:	09/07/1978
iii)	Unique Id	:	1-3613956453
iv)	Educational Qualifications	:	M.A.
v)	Work Experience	:	
	• Teaching	:	8 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	ENGLISH
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	COMMUNICATIVE ENGLISH – I & II
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**MS. ANUPAMA BEHERA** **LECT. IN MANAGEMENT**
ii)	Date of Birth	:	06/06/1996
iii)	Unique Id	:	1-7493418600
iv)	Educational Qualifications	:	MBA
v)	Work Experience	:	
	• Teaching	:	6 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	MBA
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	ENTREPRENEURSHIP AND MANAGEMENT & SMART TECHNOLOGY .
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**MS. NIRUPAMA BEHERA** **LECT. IN CHEMISTRY**
ii)	Date of Birth	:	25/06/1998
iii)	Unique Id	:	1-43488273153
iv)	Educational Qualifications	:	M.SC. (CHEMISTRY)
v)	Work Experience	:	
	• Teaching	:	3 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	INDUSTRIAL CHEMISTRY
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	ENGINEERING CHEMISTRY .
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**MR. SAROJ KUMAR SAHOO** **LECT. IN MATH.**
ii)	Date of Birth	:	11/06/1998
iii)	Unique Id	:	1-43488273171
iv)	Educational Qualifications	:	M.SC. (MATH.)
v)	Work Experience	:	
	• Teaching	:	2 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	MATH
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	MATH-1, MATH-II, MATH-III .
viii)	Research guidance	:	
	• No. of papers published in National/International Journals/Conferences	:	-
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**MR. BHAKTA BATSALA NAIK LECT. IN MANAGEMENT**
ii)	Date of Birth	:	03/07/1998
iii)	Unique Id	:	1-43488273189
iv)	Educational Qualifications	:	MBA
v)	Work Experience	:	
	• Teaching	:	2 Years
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	MBA
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	ENTREPRENEURSHIP AND MANAGEMENT & SMART TECHNOLOGY .
viii)	Research guidance	:	
	• No. of papers published	:	- in National/International Journals/Conferences
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with	:	- details

i)	Name	:	**PUJA RANI SAHOO** **LECT. IN ENGLISH**
ii)	Date of Birth	:	20/03/2003
iii)	Unique Id	:	1-46617683038
iv)	Educational Qualifications	:	M.A.
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	ENGLISH
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	COMMUNICATIVE ENGLISH – I & II
viii)	Research guidance	:	
	• No. of papers published	:	- in National/International Journals/Conferences
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

i)	Name	:	**VARSHA VANDANA DAS** **LECT. IN PHYSICS**
ii)	Date of Birth	:	12/06/1995
iii)	Unique Id	:	1-46628905557
iv)	Educational Qualifications	:	M.SC.
v)	Work Experience	:	
	• Teaching	:	1 Year
	• Research	:	-
	• Industry	:	-
	• Others	:	-
vi)	Area of Specialization	:	PHYSICS
vii)	Courses taught at Diploma/ Post Diploma/Under Graduate/ Post Graduate / Post Graduate Diploma Level	:	ENGG. PHYSICS
viii)	Research guidance	:	
	• No. of papers published	:	- in National/International Journals/Conferences
	• Master	:	-
	• Ph.D.	:	-
ix)	Projects Carried out	:	-
x)	Patents	:	-
xi)	Technology Transfer	:	-
xii)	Research Publications	:	-
xiii)	No. of Books published with details	:	-

9. FEE :

- Details of fee, as approved by State Fee Committee, for the student Institution. : Tuition Fee Per Year - Rs. 40,000/-
  Hostel Cost (Rent) – Rs.24,000/- per year per
  Transportation Cost — Rs.12000/- upto 12 Kms.
  Rs. 17000/- for more than 20 Kms.
  Caution Money – Rs.500/- (one time refundable)

- Time schedule for payment of fee For entire programme. : From the beginning of each session.

- No. of Fee waivers granted with Amount and name of students. : 72 Nos.(Last 3 years)
  Rs, 6,500/- each students per annum

SL. NO.	NAME OF THE STUDENTS	BRANCH	YEAR OF ADMISSION
01	BIKASH KUMAR PRADHAN	CIVIL ENGG.-1ST SEM	2023
02	GANESWAR PRADHAN	CIVIL ENGG.-1ST SEM	2023
03	BISWAJIT SAHU	ELECT. ENGG.-1ST SEM	2023
04	CHINMAYA KUMAR PRADHAN	ELECT. ENGG.-1ST SEM	2023
05	DEBASHISH PRADHAN	ELECT. ENGG.-1ST SEM	2023
06	RAHUL KUMAR SAMAL	ELECT. ENGG.-1ST SEM	2023
07	TAPAN MAJHI	ELECT. ENGG.-1ST SEM	2023
08	HIMANSU PRADHAN	MECH. ENGG.-1ST SEM	2023
09	JAYANTA DEHURY	MECH. ENGG.-1ST SEM	2023
10	PINU PRADHAN	MECH. ENGG.-1ST SEM	2023
11	RITIK KIRTIRADITYA	MECH. ENGG.-1ST SEM	2023
12	ROSAN SAHU	MECH. ENGG.-1ST SEM	2023
13	DEBASISH JENA	MECH. ENGG.-1ST SEM	2023 (EWS)
14	BANKIM CHANDRA PRADHAN	MINING ENGG.-1ST SEM	2023
15	JASHOBANTA PRADHAN	MINING ENGG.-1ST SEM	2023
16	KAILASH PRADHAN	MINING ENGG.-1ST SEM	2023
17	PRATAP BEHERA	MINING ENGG.-1ST SEM	2023
18	RITESH KUMAR SAHOO	MINING ENGG.-1ST SEM	2023
19	SOYANSHU SEKHAR BEHERA	MINING ENGG.-1ST SEM	2023
20	MANJIT PRADHAN	CIVIL ENGG – 1ST SEM	2024
21	PRABINA PRADHAN	CIVIL ENGG – 1ST SEM	2024
22	SRITAM PRADHAN	CIVIL ENGG – 1ST SEM	2024
23	BIKUN MAJHI	ELECT. ENGG. – 1ST SEM	2024
24	PUPENDRA BEHERA	ELECT. ENGG. – 1ST SEM	2024
25	GOBINDA CHANDRA SAHOO	ELECT. ENGG. – 1ST SEM	2024
26	MITHUN PRADHAN	ELECT. ENGG. – 1ST SEM	2024
27	TAPAS KUMAR PRADHAN	ELECT. ENGG. – 1ST SEM	2024
28	CHANDAN BISWAL	ELECT. ENGG. – 1ST SEM	2024
29	SUBHADARSAN MAJHI	ELECT. ENGG. – 1ST SEM	2024
30	RAKESH BEHERA	MECH. ENGG. – 1ST SEM	2024
31	JIBAN PRADHAN	MECH. ENGG. – 1ST SEM	2024
32	RINKU PRADHAN	MECH. ENGG. – 1ST SEM	2024
33	ANIRUDHA MOHAPATRA	MECH. ENGG. – 1ST SEM	2024
34	KANHU CHARAN LAHARA	MECH. ENGG. – 1ST SEM	2024
35	SUBHAKANTA BISWAL	MECH. ENGG. – 1ST SEM	2024
36	SUKANTA SAHOO	MINING ENGG – 1ST SEM	2024
37	BAPUN BEHERA	MINING ENGG – 1ST SEM	2024
38	CHINMAYA PRADHAN	MINING ENGG – 1ST SEM	2024
39	AMIT PRADHAN	MINING ENGG – 1ST SEM	2024
40	MAMUN PRADHAN	MINING ENGG – 1ST SEM	2024
41	KAJAL DEHURY	MINING ENGG – 1ST SEM	2024
42	DIKAN KUMAR BEHERA	ELECT ENGG – 3RD SEM	2024
43	GYANARANJAN SAHU	MECH ENGG – 3RD SEM	2024
44	RAJA GARNAYAK	CIVIL ENGG – 1 STSEM	2025
45	SACHIN BISWAL	CIVIL ENGG – 1 STSEM	2025
46	SAMBIT KUMAR GARNAYAK	CIVIL ENGG – 1 STSEM	2025
47	ADITYA SENAPATI	ELECT ENGG – 1ST ENGG	2025
48	AMAR PRADHAN	ELECT ENGG – 1ST ENGG	2025

SL. NO.	NAME OF THE STUDENTS	BRANCH	YEAR OF ADMISSION
49	ANSHUMAN PRADHAN	ELECT ENGG – 1ST ENGG	2025
50	CHIKUN SAHU	ELECT ENGG – 1ST ENGG	2025
51	RAJENDRA BARIK	ELECT ENGG – 1ST ENGG	2025
52	RAJESH PRADHAN	ELECT ENGG – 1ST ENGG	2025
53	ADITYA NARAYAN PRADHAN	MECH ENGG – 1ST ENGG	2025
54	INDRAJIT KHILAR	MECH ENGG – 1ST ENGG	2025
55	RAKI DHAL	MECH ENGG – 1ST ENGG	2025
56	SUBHAM BARIK	MECH ENGG – 1ST ENGG	2025
57	SUMAN SAHU	MECH ENGG – 1ST ENGG	2025
58	SUSIL SENAPATI	MECH ENGG – 1ST ENGG	2025
59	AMARESH BISWAL	MINING ENGG – 1ST SEM	2025
60	ASHISH KUMAR PRADHAN	MINING ENGG – 1ST SEM	2025
61	BAISAKHI PRIYADARSHINI PRADHAN	MINING ENGG – 1ST SEM	2025
62	KUNA PRADHAN	MINING ENGG – 1ST SEM	2025
63	PRADYUMNA KUMAR BEHERA	MINING ENGG – 1ST SEM	2025
64	SANTOSH KUMAR PRADHAN	MINING ENGG – 1ST SEM	2025
65	SOUDAMINI SAHU	MINING ENGG – 1ST SEM	2025
66	SUBHAM BEHERA	MINING ENGG – 1ST SEM	2025
67	TIKESWAR PRADHAN	MINING ENGG – 1ST SEM	2025
68	JITENDRA MAHAPATRA	MINING ENGG – 1ST SEM	2025 (EWS)
69	ULLASH PANIGRAHI	MINING ENGG – 1ST SEM	2025 (EWS)
70	SIKUN KUMAR SAHU	ELECT ENGG – 3RD SEM	2025
71	SIBANANDA SAHU	MECH ENGG – 3RD SEM	2025
72	TAPAS BEHERA	MINING ENGG – 3RD SEM	2025

- Number of scholarship offered by the Institution, duration and amount : -
- Criteria for fee waiver/scholarship : Poor & meritorious students
- Estimated cost of Boarding and Lodging in Hostels : Rs. 24,000/- per year.
- Any other fee please specify : -

1. ADMISSION :

- Number of seats sanctioned with the year of approval :

Sl. No.	Session/ Academic Year	A.I.C.T.E. Approved/Sanctioned Annual Intake					
		Civil Engg.	Electrical Engg.	Mechanical Engg.	Mining Engg.	Comp. Sci. & Engg	Total Intake
1	2009 – 10	60	60	60	60	-	240
2	2010 – 11	60	60	60	60	-	240
3	2011 – 12	60	90	90	60	-	300
4	2012 – 13	60	90	90	60	-	300
5	2013 – 14	60	120	120	120	-	420
6	2014 – 15	60	120	120	120	-	420
7	2015 – 16	60	120	120	120	-	420
8	2016 – 17	60	120	120	120	-	420
9	2017 – 18	60	120	120	120	-	420
10	2018 – 19	60	120	120	120	-	420
11	2019 – 20	60	120	120	120	-	420
12	2020 – 21	60	120	120	120	-	420
13	2021 – 22	60	120	120	120	-	420
14	2022 – 23	60	120	120	120	-	420
15	2023 - 24	60	120	120	120	-	420
16	2024 - 25	60	120	120	120	-	420
17	2025 – 26	60	120	120	180	60	540

Number of students admitted under various categories each year in the last three years :

YEAR	BRANCH	APPROVED INTAKE	ADMISSION TAKEN IN 1ST SEM	ADMISSION UNDER TFW & EWS CATEGORY (1ST SEM)	TOTAL BOYS	TOTAL GIRLS	NO. OF GEN. STUDENTS		NO. OF S.T. STUDENTS		NO. OF S.C. STUDENTS		NO. OF MINORITY STUDENTS
							BOYS	GIRLS	BOYS	GIRLS	BOYS	GIRLS	
2023 (1ST SEM)	CIVIL ENGG.	60	46	02	29	19	26	19	01	-	-	-	
	ELECT. ENGG.	120	120	05	124	01	107	01	05	-	07	-	
	MECH. ENGG.	120	103	06	108	-	95	-	03	-	05	-	
	MINING ENGG.	120	120	06	120	06	110	06	02	-	02	-	

YEAR	BRANCH	APPROVED INTAKE	ADMISSION TAKEN IN 1ST SEM	ADMISSION UNDER TFW & EWS CATEGORY (1ST SEM)	TOTAL BOYS	TOTAL GIRLS	NO. OF GEN. STUDENTS		NO. OF S.T. STUDENTS		NO. OF S.C. STUDENTS		NO. OF MINORITY STUDENTS
							BOYS	GIRLS	BOYS	GIRLS	BOYS	GIRLS	
2024 (1ST SEM)	CIVIL ENGG.	60	60	04	47	17	28	03	03	03	16	11	
	ELECT. ENGG.	120	120	07	125	02	111	02	06	-	08	-	
	MECH. ENGG.	120	120	06	126	-	102	-	10	-	14	-	
	MINING ENGG.	120	119	06	117	08	96	07	11	-	10	01	

YEAR	BRANCH	10% OF APPROVED INTAKE + 1ST SEM CARRY FORWARD VACANT SEATS	ADMISSION TAKEN IN 3RD SEM	ADMISSION UNDER TFW & EWS CATEGORY (3RD SEM)	TOTAL BOYS	TOTAL GIRLS	NO. OF GEN. STUDENTS		NO. OF S.T. STUDENTS		NO. OF S.C. STUDENTS		NO. OF MINORITY STUDENTS
							BOYS	GIRLS	BOYS	GIRLS	BOYS	GIRLS	
2024 (3RD SEM)	CIVIL ENGG.	20	17	-	12	05	12	04	-	-	-	01	
	ELECT. ENGG.	13	13	02	15	-	15	-	-	-	-	-	
	MECH. ENGG.	30	30	01	31	-	29	-	-	-	02	-	
	MINING ENGG.	12	12	-	12	-	11	-	01	-	-	-	

- Number of applications received during last Two years for admission under Management Quota and number admitted. : NIL

YEAR	BRANCH	APPROVED INTAKE	ADMISSION TAKEN IN 1ST SEM	ADMISSION UNDER TFW & EWS CATEGORY (1ST SEM)	TOTAL BOYS	TOTAL GIRLS	NO. OF GEN. STUDENTS		NO. OF S.T. STUDENTS		NO. OF S.C. STUDENTS		NO. OF MINORITY STUDENTS
							BOYS	GIRLS	BOYS	GIRLS	BOYS	GIRLS	
2025 (1ST SEM)	CIVIL ENGG.	60	59	03	49	19	27	10	06	-	10	09	
	ELECT. ENGG.	120	120	06	125	01	117	01	-	-	08	-	
	MECH. ENGG.	120	120	06	126	-	115	-	03	-	08	-	
	MINING ENGG.	180	180	11	184	07	168	07	03	-	13	-	
	COMP. SC ENGG	60	36	-	24	12	15	06	03	03	06	03	

YEAR	BRANCH	10% OF APPROVED INTAKE + 1ST SEM CARRY FORWARD VACANT SEATS	ADMISSION TAKEN IN 3RD SEM	ADMISSION UNDER TFW & EWS CATEGORY (3RD SEM)	TOTAL BOYS	TOTAL GIRLS	NO. OF GEN. STUDENTS		NO. OF S.T. STUDENTS		NO. OF S.C. STUDENTS		NO. OF MINORITY STUDENTS
							BOYS	GIRLS	BOYS	GIRLS	BOYS	GIRLS	
2025 (3RD SEM)	CIVIL ENGG.	06	08	-	05	03	05	01	-	01	-	01	
	ELECT. ENGG.	12	13	01	14	-	12	-	-	-	02	-	
	MECH. ENGG.	12	15	01	16	-	15	-	-	-	01-	-	
	MINING ENGG.	12	13	01	11	03	09	03	01	-	01	-	

- Number of applications received during last Two years for admission under Management Quota and number admitted. : NIL

2. ADMISSION PROCEDURE :

- Mention the admission test being followed, name and address of the Test Agency and its URL (website) : Admission of the students are done through online admission counseling by Diploma Admission Cell, Govt. of Odisha, under the Chairmanship of the D.T.E. & T, Odisha, Cuttack and its website URL is **: www.dtetrorissa.gov.in/ www.samsodisha.gov.in**

- Number of seats allotted to different Test Qualified candidate separately (AIEE/CET (State conducted test)/University tests/ CMAT/GPAT)/Association conducted test : All the online admission counseling are done through Diploma Admission Cell, Govt. of Odisha.

- Calendar for admission against Management/vacant seats :

  - Last date of request for applications : 15.09.2025

  - Last of date of submission of applications: 15.09.2025
  - Dates for announcing final results :

  - Release of admission list : 15.09.2025
    (main list and waiting list shall be announced on the same day)

  - Date for acceptance by the candidate : 15.09.2025
    (time given shall in no case shall be less than 15 days)

  - Last date for closing of admission : 15.09.2025

  - Starting of the Academic session : 14.07.2025

  - The waiting list shall be activated only on the expiry of date of main list :

  - The policy of refund of the fee in case of withdrawal, shall be clearly notified : Strictly followed by the institute.

12. CRITERIA AND WEIGHTAGES FOR ADMISSION :

- Describe each criterian with its respective weightages i.e. Admission Test, marks in qualifying examination etc.
  Eligibility :-
  (i) Admission to 1st Semester of Engineering & Technology :-
  Pass in H.S.C. Examination/10th standard examination conducted/declared equivalent by B.S.E., Odisha with Mathematics, Science & English subject.
  (ii) **Admission to 3rd Sem. Under Lateral Entry scheme for eligible candidates :-**
  Pass in +2 Science examination from CHSE, Odisha or its equivalent examination with PCM/+2 Vocational (2 years course) in any Engineering Trade/2 years ITI in Engineering Trade with pass in HSC exam/10th standard conducted/declared equivalent by BSE, Odisha securing 30% marks in each subject at the qualifying examination.

  Age :- Minimum 14 years for all courses as on 1st July. No upper age limit.

- Mention the minimum level of acceptance, if any : -
  The candidate must be a Diploma Admission counseling rank holders.

- Mention the cut-off levels of percentage and percentile score of the candidates in the admission test for the last three years :

The minimum cut-ff levels of percentage and percentile score of the candidates in the admission test for the last three years is given below.

Session	Lowest Rank Nos.				
	Civil Engg.	Elect. Engg.	Mech. Engg.	Mining Engg.	Comp. Sc. & Engg
2023-24	303	342	313	374	-
2024-25	331	411	405	445	-
2025-26	363	444	393	420	310

- Display marks scored in Test etc. and in aggregate for all candidates who were admitted : Not Applicable

13. LIST OF APPLICANTS : Not Applicable

14. RESULTS OF ADMISSION UNDER MANAGEMENT SEATS/VACANT SEATS : Not Applicable

15. INFORMATION ON INFRASTRUCTURE AND OTHER RESOURCES AVAILABLE :

- Number of Class Rooms and size of each : 15 Nos. Classrooms

SL NO	ROOM TYPE	ROOM ID	AREA IN SQM	BLOCK	FLOOR
1	CLASS ROOM - 1 (SMART CLASS ROOM)	C-1	73.78	A	FIRST
2	CLASS ROOM - 2 (SMART CLASS ROOM)	C-2	73.78	A	FIRST
3	CLASS ROOM – 3 (SMART CLASS ROOM)	C-3	73.66	A	FIRST
4	CLASS ROOM – 4 (SMART CLASS ROOM)	C-4	74.29	A	FIRST
5	CLASS ROOM - 5	C-5	66	A	FIRST
6	CLASS ROOM – 6 (SMART CLASS ROOM)	C-6	85.94	A	FIRST
7	CLASS ROOM - 7 (SMART CLASS ROOM)	C-7	85.83	A	FIRST
8	CLASS ROOM - 8	C-8	75.67	B	FIRST
9	CLASS ROOM – 9 (SMART CLASS ROOM)	C-9	75.67	B	FIRST
10	CLASS ROOM - 10 (SMART CLASS ROOM)	C-10	90.96	B	FIRST
11	CLASS ROOM – 11 (SMART CLASS ROOM)	C-11	72.07	B	FIRST
12	CLASS ROOM – 12 (SMART CLASS ROOM)	C-12	73.47	B	FIRST
13	CLASS ROOM - 13	C-13	81.03	C	FIRST
14	CLASS ROOM – 14 (SMART CLASS ROOM)	C-14	82.49	C	FIRST
15	CLASS ROOM - 15 (SMART CLASS ROOM)	C-15	79.57	C	FIRST

- Number of Tutorial rooms and size of each : 05 Nos. Tutorial Rooms

SL NO	ROOM TYPE	ROOM ID	AREA IN SQM	BLOCK	FLOOR
57	TUTORIAL ROOM - 1	T-1	61.18	B	SECOND
58	TUTORIAL ROOM - 2	T-2	61.92	B	THIRD
59	TUTORIAL ROOM - 3	T-3	61.92	B	THIRD
60	TUTORIAL ROOM - 4	T-4	61.92	B	THIRD
61	TUTORIAL ROOM - 5	T-5	60.96	B	THIRD

- Number of Laboratories and size of each : Laboratories : 24 Nos.
  Workshops : 17 Nos.

SL NO	ROOM TYPE	ROOM ID	AREA IN SQM	BLOCK	FLOOR
1	ENGG. CHEMISTRY LAB	CHE LAB	105.73	A	GROUND
2	ENGG. PHYSICS LAB	PHY LAB	121.75	A	GROUND
3	COMPUTER LAB (CAD/CAM/MAT LAB)	CLAB	120	A	FIRST
4	COMPUTER CENTRE	COMP.C	239.08	B	SECOND
5	LANGUAGE LAB.	LANGL.	128.62	C	GROUND
6	CONCRETE & SOIL LAB	C&SL	118.57	B	GROUND
7	PUBLIC HEALTH LAB	PH LAB	66	A	SECOND
8	SURVEY LAB	S.L.	73.97	A	SECOND
9	CONSTRUCTION WORKSHOP PRACTICE LAB	CWSPL	73.97	A	SECOND
10	DIGITAL ELECTRONICS & MICRO PROCESSOR LAB	DE&MPL	83.82	A	GROUND
11	ELECTRICAL MACHINE LAB	EMLAB	96.25	A	GROUND
12	BASIC ELECTRONICS AND ANALOG LAB	BE&AL	85.47	A	GROUND
13	BASIC ELECTRICAL & MEASUREMENT LAB	BEML	81.25	A	GROUND
14	CIRCUIT THEORY LAB	CTL	66	A	SECOND
15	ELECTRICAL WORKSHOP PRACTICE LAB	EWSP	120	A	SECOND
16	ADDITIONAL ELECTRICAL WORKSHOP	EWSPL-1	120	C	GROUND
17	MATERIAL TESTING & MEASUREMENT MACHINE LAB	MTMML	122	B	GROUND
18	FLUID MECHANICS & HYDRAULIC MACHINES LAB	FMHML	121.2	B	GROUND
19	HEAT POWER & THERMAL ENGG. LAB	HP&TEL	110.4	B	GROUND
20	TRANSPORTATION LAB	TRPNL	117.41	B	GROUND
21	MACHINES SHOP	M SHOP	135.62	B	GROUND
22	CARPENTRY SHOP	CYSHOP	127.75	C	GROUND
23	FITTING SHOP	FGSHOP	128.62	C	GROUND
24	SHEET METAL SHOP	SMSHOP	128.62	C	GROUND
25	BLACKSMITH & FOUNDRY SHOP	BS&FS	107.36	C	GROUND
26	WELDING SHOP	WGSHOP	128.2	C	GROUND
27	TURNING SHOP	TGSHOP	67.02	C	GROUND
28	MOULDING SHOP	MGSHOP	77.51	C	GROUND
29	ADDITIONAL WORKSHOP (WELDING SHOP)	WGS-1	80	C	GROUND
30	ADDITIONAL WORKSHOP (FITTING SHOP)	FGS-1	77.91	C	GROUND
31	ADDITIONAL WORKSHOP (MACHINE SHOP)	MSHOP-1	75	C	GROUND

32	ADDL. CARPENTRY SHOP	CYS-1	78.07	C	FIRST
33	ADDL. SHEET METAL SHOP	SMS-1	145	C	FIRST
34	ADDL. BLACKSMITH & FOUNDRY SHOP	BS&FS-1	83.02	C	FIRST
35	ADDITIONAL WORKSHOP (TURNING SHOP)	TGS-1	67.02	C	GROUND
36	ADDITIONAL WORKSHOP (MOULDING SHOP)	MGS-1	77.28	C	GROUND
37	MINE MACHINERY LAB	MML	136.01	B	FIRST
38	MINE ENVIRONMENT & HAZARD LAB.	ME&HL	110.84	B	FIRST
39	GEOLOGY LAB	GEOLAB	94.02	B	SECOND
40	MINE VENTILATION LAB	MVENTL	94.02	B	SECOND
41	MINING SURVEY LAB	MSL	69.2	B	SECOND
42	ELECTRICAL EQUIPMENTS LAB	EEL	66	B	SECOND
43	CAD CENTRE	CAD.C	139.65	B	THIRD

- No. of Drawing Halls with capacity each : 01 No. Drawing Hall

SL NO	ROOM TYPE	ROOM ID	AREA IN SQM	BLOCK	FLOOR
1	DRAWING HALL - 1	D-1	140.87	B	THIRD

- No. of Computer Centres with capacity of each : 01 No.

SL NO	ROOM TYPE	ROOM ID	AREA IN SQM	BLOCK	FLOOR
1	COMPUTER CENTRE	COMP.C	239.08	B	SECOND

- Central Examination Facility, Number of rooms Nos. and capacity of each : Available & no. of rooms. — 23 (35 students in each room)
- Barrier Free Built Environment for disabled and Elderly persons : Available
- Occupancy Certificate : Obtained from Block Development Officer, Chhendipada.
- Fire and Safety Certificate : Available
- Hostel Facilities : Available
  Boys Hostel – 01 No.
  Girls Hostel – 01 No.

- **LIBRARY :**

  - Number of Library books/Titles/Journals Available (program-wise) : Total Volumes : 11432 Nos.
    Total Titles : 1827 Nos.
    Total No. of Journals: 15 Nos.

  - List of online National/International Journals subscribed : -

  - E-Library facilities : E-Library facilities available
    URL : pciet.kopykitab.com
    Total No. of Titles of Books : 48 Nos.

    National Digital Library (NDL) Subscription details : -

- **LABORATORY AND WORKSHOP :**

· LIST OF MAJOR EQUIPMENTS / FACILITIES IN EACH LABORATORY / WORKSHOP

ENGINEERING CHEMISTRY LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Woulfs Bottle	10
2	Thistle Funnel	10
3	Reagent Bottle 250 Ml	60
4	Delivery Tube	2
5	Rubber Cork	30
6	Gas Jar With Lid	10
7	Test Tube Borosil	50
8	Test Tube Hard Glass	15
9	Spirit Lamp	10
10	Corck Borrer Set Of Six	2
11	Beaker Borosil 250 Ml	12
12	Funnel 3'	12
13	Filter Paper	5
14	Glass Rod	2
15	Porcelein Basin 3 '	10
16	Wire Gauge With Frame	15
17	Tripod Stand Heavy 6X4	20
18	Test Tube Holder	12
19	Test Tube Stand	20
20	Test Tube Brush	10
21	Burette 50 Ml	5
22	Burette Borosilicate Transparent	5
23	Conical Flask Borosil 250Ml	10
24	Wash Bottle 500 Ml	20
25	Pipette Borocilicate 10 Ml	10
26	Tile Porcelein	10
27	Burner With Stop Cock	5
28	Chemical Balance	1
29	Weight Box Brass 100Fgm	1
30	Hydrochloric Acid	2
31	Sulphuric Acid	2
32	Nitric Acid	2
33	Marble Chips	4
34	Solid Amonium Chloride	1
35	Calcium Carbonate	1
36	Litmus Paper	2
37	Magnesium Metal Ribbon	2
38	Nessler,S Reagent	1
39	Cobalt Nitrate	1
40	Borax	1
41	Ammonium Hydroxide	1
42	Acetic Acid	1
43	Lime Water	1
44	Ammonium Sulphate	1
45	Sodium Hydroxide	1

46	Calcium Sulphate	1
47	Magnesium Sulphate	1
48	Sodium Carbonate	1
49	Corck Borrer German Type	1
50	Ammonium Sulphide	1
51	Silver Nitrate	1
52	Copper Turning	1
53	Barium Chloride	1
54	Spatula 8" S S	3
55	Methyl Orange Indicator	1
56	Trangular File	1
57	Burret Stand With Clamp	5
58	Clamp Bosshead	5
59	Measuring Cylinder 50 Ml	1
60	Rubber Cork	24
61	Thermometer 110 C	1
62	Gas Jar With Lid	1
63	Spatula 8" Plastic	3
64	Sodium Hydroxide	1
65	Kolida Automatic Level	**2**
66	Edta Soln1/50	1
67	Ammonia Buffer Soln	1
68	Erichrome Blask T	1
69	Manganese Sulphate	1
70	Sodium Thiosulphate	1
71	Manganesium Sulphate	1
72	Calcium Chloride Dehyde	1
73	Distil Water	1
74	Pot. Dichromate	1
75	Ferrus Ammo. Sulphate	1
76	Ammonium Sulphate	1
77	Phenolpthalein Indicator	1
78	Pottasium Iodide	1
79	Bleaching Powder	1
80	Acetic Acid	1
81	Burette Stand Plastic	2
82	Litmus Paper	2
83	Marble Chips	1
84	Test Tube	1
85	Measuring Flask 100Ml Borosillicate	1
86	Pipette Borosillicate 5Ml	1
87	Physical Balance	1
88	Thistle Funnel	6
89	Test Tube Hard Glass	6
90	Test Tube (Ord)	3
91	Blowing Pipe	3
92	Charcoal Cavity	7
93	Copper Sulphate	1
94	Spirit Lamp	5
95	Test Tube Brush	10

96	Wash Bottle 500 Ml Plastic	15
97	Mercury	2
98	Sodium Hydroxide	2
99	Methyl Red Solution	1
100	P H Paper	4
101	Magnesium Metal Ribbon	2
102	Marble Chips	1
103	Lime Water	2
104	Magnesium Sulphate	1
105	Litmus Paper	2
106	Mercury	1
107	Aluminium Sulphate Merck	2
108	Aluminium Potassium Sulphate B. B	1
109	Nessler,S Reagent	1
110	Sulphuric Acid	1
111	Hydrochloric Acid	1
112	Sodium Hydroxide	1
113	Spirit Lamp	12
114	Marble Chips	1
115	Methyl Orange Indicator	1
116	Methyl Red Indcator Solution	1
117	Litmus Paper Red	1
118	Litmus Paper Blue	1
119	Dropper Big	3
120	Dropper Small	3
121	Magnesium Metal Ribbon	1
122	Rubber Cork	3
123	Rubber Cork	3
124	Glass Tube	2
125	Woulfs Bottle	2
126	Chain Disk 3 inch	3
127	Thistle Funnel	2
128	Gas Jar With Lid	2
129	Spirit Lamp	1
130	Test Tube Holder	10
131	Test Tube Brush	4
132	Burette 10 Ml	5
133	Bunsen Burner	5
134	Hydrochloric Acid	1
135	Magnesium Metal Ribbon	1
136	Lime Water	1
137	Dropper	3
138	Pipette 10 Ml	10
139	Calcium Oxide Quick Lime	1
140	P H METER COMBO 01	1
141	TDS METER DIGITAL	1
142	WINDSHIELD DIGITAL BALANCE	1
143	SEPARATIG FUNNEL	4

ENGINEERING PHYSICS LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Water Heater	1
2	Ball 2"	12
3	Prism 50x50Mm Superior	12
4	Hair Pins	12
5	Hair Pins	120
6	Bar Magnet	12
7	Magnetic Needle	12
8	Screw Gauge	4
9	Physical Balance	1
10	Simple Pendulum	2
11	Slide Caliper	4
12	Turning For Set Of 8 Welch Type	1
13	Burette Stand Iron	10
14	Burette Stand With Clamp	10
15	Conical Flask Borosil 500Ml	15
16	Pipette Stand	3
17	Pipette 10 Ml	5
18	Marble Chips	3
19	File Trangular	2
20	Ammonium Chloride	1
21	Quick Line	1
22	Paraffin Wax	1
23	Chemical Balance	1
24	Copper Foil	1
25	Burner With Stop Cock	10
26	Round Bottom Flask 500 Ml	2
27	Round Bottom Flask 250 Ml	2
28	Reagent Bottle 500 Ml	6
29	Filter Clamp Plastic	2
30	Slide Caliper	12
31	Hollow Cylinder	12
32	Parad	500
33	Measuring Cylinder 100Ml Plastic	1
34	3D Solid Model No Ml 121	1
35	Volume Relationship Set Model No Ml 218	1
36	Bar Magnet	3
37	Compass (North/South)	24
38	Hollow Cylinder	30
39	Bar Magnet	16
40	Magnetic Needle	32
41	Glass Prism	50
42	Fixing Pins	4
43	Metalic Bob	20
44	Hair Pins	96
45	Vernier Caliper	40
46	Hollow Cylinder	40
47	Screw Gauge	40

48	Spherometer	40
49	Spherical Glass Plate	24
50	Plane Glass Plate	20
51	Glass Prism	20
52	Hair Pins	300
53	Fixing Pins	6
54	Drawing Board	40
55	Bar Magnet	30
56	Compass Needle	60
57	Simple Pendulum	30
58	Stop Watch Digital	10
59	Clamp Stand	10
60	Split Cork	60
61	Meter Bridge	6
62	Lechanche Cell	6
63	Physical Balance	6
64	Weight Box 100 Gm	6
65	Young Modules App	1

COMPUTER CENTRE

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	HP CPU CORE I5 / 16 GB RAM / 512 SSD / WINDOWS 10 PRO / KEEYBOARD & MOUSE / 22” MONITOR	50
2	DEL CPU CORE I3 / 8GB RAM / 256 SSD / WINDOWS 10 PRO / KEYBOARD & MOUSE / 19.5” MONITOR	43
3	ACER CPU I3 / 4GB RAM / 256 SSD / WINDOWS 10 PRO / KEYBOARD & MOUSE / 18.5” MONITOR	27
4	D LINK 24 PORT GIGA ETHERNET / LAN SWITCH	06

LANGUAGE LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Monitor Foxin 18.5 " Tft Led	61
2	Desktop Foxin	61
3	Head Set With Mic	10
4	Web Cam	1
5	Head Phone Mega Fronttech Jil-3442	61
6	ALL PCS ARE CONNECTED THROUGH LOCAL HOST & ORELL TALK SOFTWARE	

COMPUTER LAB (CAD/CAM LAB)

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Desktop Hcl Ac2V0121	25
2	Monitor Hcl 18.5 "	25
3	Desktop V 0150 Hcl	10
4	Desktop V 0126 Hcl	4
5	Monitor 18.5 Led Hcl	14
6	Desktop Hcl Ac2 V 0150	10
7	Monitor Hcl 18.5 Led	10
8	Ups Super Comp. 625 V	10
9	Monitor 18.5 Led Hcl	25
10	Desktop Ac2 V 0180 Hcl	25
11	Desktop Acer Variton M-200	35
12	Monitor Acer 18.5"Tft Led	35
13	Microsoft Lincense No 49956733	45
14	Ram Dynet 2 Gb D.D.R. 2	1
15	Kw 90031 -Win -10 Home	15
16	Fqc -0971-Win 10 Pro	15
17	021-01539-Office Std	15
18	Optical Fiber 6 Core Cable	1000
19	Giga Switch 24 Port	1
20	Office S.T.D/ 2019 Sngl/Olpnl	15

CONCRETE & SOIL LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Oven	4
2	Vicat Apparatus With Complete Set	**3**
3	Trowel	10
4	Standard Spatula	10
5	Measuring Cylinder 500 Ml	10
6	Le Chatlier Apporatus Set Six Mould Complete With Glass Plate And Lead Wt	3
7	Enamel Tray 12"X8"	5
8	Water Bath	2
9	Cube Mould 7.06 Cm	10
10	Cube Mould 150 Mm	6
11	Vibrating Table 1 Meter	1
12	Compressing Testing Machine 100 Ton Cap	1
13	3 Ply Wood Sheet 9"X9"Set Of Two	4
14	Is Sieves 4.75/2.36/1.18Mm /600Mic/300Mic/150/75Mic Lid & Pan	2
15	Is Sieves100/80/63/40/20/16/12.5/10/4.75/2.36Mm With Lid & Pan	1
16	Is Sieves4.7/2.36/710/600/425/300/180/90/75Mic Lid & Pan	2
17	Sieve Shaker 200 Mm Dia	2
18	Therom Ststically Controlled Oven 18"X18"	5
19	Sample Drying Tray(600X600)	1
20	Sample Drying Tray(450X450)	2
21	Camel Hair Brush	2
22	Le-Chatelier Flask	5
23	Tamping Raw	10
24	Graduated Cylinder 500 Ml Cap	5
25	Cylindrical Metal Measur (3,15,30)Ltr	3
26	Slump Cone Complet Set	2
27	G.I. Sieves 12" Dia125/100/90/75/53/45/37.5/26.6/22.4/19/13.2/11.2/9.5/5.6 Mm Lid And Pan	1
28	G.I. Sieves 12" Dia 63/50/40/31.5/25/20/16/12.5/10/6.3 Mm Lid And Pan	1
29	Metal Cylinder Closed Cap 3 Ltr	5
30	Metal Sccop Cap 1 Ltr	5
31	Sample Container 2"X1"	20
32	Crushing Value Appt 150 Dia With Measurement & Temp.	2
33	Los Angles Abrassion Testing Machine With Abrasive	1
34	Impact Testing Machine	1
35	G.I Tray 600X600 Mm	2
36	G.I Tray 450X450 Mm	2
37	Compaction Factor Apparatus	2
38	Platform Weighing Machine (Digital) 200Kg	2
39	Vee Bee Consito Meter Apparatus Set (A+B+C+D)	1
40	Hydrolic Test Bench	1
41	Digital Stop Watch	10
42	Thermo Meter (0-50)C	10
43	Metal Cylinder	1
44	Hammer	**5**

45	Digital Balance Cap 1 Kg	2
46	Ball 2"	12
47	Cone Penetrometre H.T 303	1
48	Cube Mould 15 Mm	5
49	Cube Mould 20Mm	5
50	C.B.R. Testing Machine	1
51	Pata (civil)	1
52	Gulmira	6
53	MIXTURE MACHINE WITH HYDROLIC 10/7 CFT CPACIT	1
54	VIBRATING MACHINE WITH 1 HP CG MOTER	1
55	VIBRATOR	1
56	Cube Mould 100 Mm	5

PUBLIC HEALTH ENGINEERING LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	**BEAKER 1000ML**	**6**
2	**BEAKER 500ML**	**3**
3	**Blowing Pipe**	**4**
4	**Burette 50 Ml**	**10**
5	**Burette Stand**	**15**
6	**Deosicater With Plate**	**1**
7	**Durhams Tubes**	**1**
8	**EVAPORATING DISC**	**6**
9	**Flat Bottle Flask 250 Ml**	**14**
10	**Gas Jar With Lid**	**6**
11	**Geometrical Shape**	**1**
12	**Hot Plate**	**4**
13	**Jouls Calorimeter Teak Wood (4"X3")**	**1**
14	MEASURING CYLINDER	6
15	**Nesslers Tube**	**3**
16	**P H Paper**	**2**
17	**P H Paper With Indicator**	**2**
18	**P.H Meter**	**1**
19	**Pipette 10 Ml**	**8**
20	**Pipette Stand**	**10**
21	**Plane Glass**	**24**
22	**Reagent Bottle 250 Ml**	**20**
23	**Sample Test Tube**	**12**
24	**Separating Funnel Holder**	**2**
25	**SIX JAR APPARATUS**	**1**
26	**Spherometer**	**12**
27	**Spirit Lamp**	**15**
28	**Starch Iodide Paper**	**1**
29	**Steam Water Bath**	**1**
30	**Steel Rule**	**2**
31	**Test Tube Brush**	**30**
32	**Test Tube Hard Glass**	**12**
33	**Test Tube Holder**	**30**
34	**Test Tube Stand**	**20**
35	**Thermometer**	**2**
36	**Thermometer**	
37	**THERMOmeter**	**4**
38	**TURBID METER**	**1**
39	**Wash Bottle 500 Ml Plastic**	**30**
40	**Watch Glass 3"**	**24**

CIVIL ENGINEERING

SURVEY LABORATORY

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Abney Level	01
2	Abney Level	02
3	Abney Level	01
4	Arrows	05
5	Arrows	10
6	Auto Level Bosch Gol 26 D	01
7	Auto Level Bosch Gol 32 D	
8	Auto Level Model Nl 32	
9	Auto Level Nikon Ac 2S	01
10	Auto Level Sokkia B 40A	01
11	Auto Level Topcon At B4A	01
12	Auto Level With Al. Stand	01
13	Balancing Wt	
14	Beam Compass	02
15	Beam Compass	02
16	Box Sextent	01
17	Box Sextent	01
	Brass Knurling Terminal	30
	Chain 100 ft	05
	Chain 30 mtr	05
18	Clino Meter	01
19	Compass (North/South)	01
20	Compass (Propotional)	10
21	Cross Staff	01
22	Cross Staff	05
23	Cyclone Ghat Tracer	02
24	Cyclone Ghat Tracer	01
25	Digital Theodolite	02
26	Dumpy Level 12 inch dia with tripod	01
27	Dumpy Level	02
28	Dumpy Level	02
29	Engineers Chain 100 Ft	02
30	Engineers Chain 100 Ft	03
31	Fiber Tape 15 Mtr	10
32	Fiber Tape 15 Mtr	05
33	Fiber Tape 30 Mtr	10
34	Fiber Tape 30 Mtr	05
35	Fiber Tape 50 Mtr	05
36	French Cross Staff	05
37	French Curve	01
38	Hand Level	01
39	Hand Level	02
40	Hand Level	01
	Hammer	05
	Kolida automatic level	02
41	Levelling Staff 5 Mtr	01
42	Levelling Staff 6 Mtr	01

48	Line Ranger Sokia	01
49	Matric Chain 20 Mtr	05
50	Matric Chain 30 Mtr	02
51	Matric Chain 30 Mtr	03
52	Meatallic Tape Size 15 Mtr	05
53	Meatallic Tape Size 30 Mtr	05
54	Offset Rod 2 Mtr	05
55	Offset Rod 3 Mtr	05
56	Optical Square	05
57	Optical Square 12 "	01
58	Optical Square 6 "	01
59	Pantograph	02
60	Pantograph	01
61	Pantograph 24 "	01
62	Pantograph 30"	01
63	Plane Table P T A	02
64	Plani Meter	01
65	Plani Meter	01
66	Plani Meter (Digital)	01
67	Plani Meter (Mannual)	01
68	Prismastic Compas 100 Mm	03
69	Prismastic Compas 150 Mm	02
70	Prismastic Compas 5"	01
71	Ranging Rod 2 Mtr	05
72	Ranging Rod 2 Mtr	05
73	Ranging Rod 3 Mtr	05
74	Ranging Rod 3 Mtr	05
75	Revenue Chain 33 Ft	05
76	Steel Band	05
77	Steel Tape 15 Mtr	05
78	Steel Tape 30 Mtr	05
79	Steel Tape 5 Mtr	05
80	Surveyor Chain 66 Ft	05
81	Surveyor Compas S C A	01
82	Surveyor Compas S C A	01
	Surveyor Compas with Tripod	01
	South automatic level model NL 32	02
83	**Tachometer**	
84	Telescopic Alidade	01
85	Telescopic Alidade	02
86	Theodolite 20Sec With Stand	02
87	Tilting Level	01
88	Tilting Level	02
89	Total Station Prism	01
90	Total Station Topcon Model Es55	01
91	Transit Theodolite 20 Sec	02
92	Tripoid Stand	01
93	Transit Theodolite Erect Image	02
94	Wooden Peg	05
95	Woven Metal Wired Tape	05
96	Wye Level	01

BASIC ELECTRICAL AND MEASUREMENT LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Pipe Cutter 2"	6
2	Screw Driver Contctor 4"	60
3	Soldering Iron Copper Bit	30
4	Tester Digital	1
5	R.C.B	1
6	Soldring Iron Elct.	**30**
7	Solding Iron Des	15
8	C.R.O (Diff)	**1**
9	Screw Driver Contctor 4"	60
10	Wireless Micro Phone	1
11	Wireless Micro Phone Stand	1
12	Wireless Micro Phone Clip	1
13	Wireless Microphone	1
14	Wireless Microphone Stand	1
15	Wireless Microphone Clip	1
16	MICROPHONE AHUJA	1
17	MICROPHONE STAND	1

BASIC ELECTRONICS AND ANALOG LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Screw Driver 8"	60
2	Screw Driver 8"	60
3	Plier Sid Cutting	42
4	Screw Driver Contctor 4"	60
5	Load Bank 5Kw	**6**
6	Screw Driver Contctor 4"	60
7	Knife	60
8	I C	10
9	Series Resonance Model No B3	1
10	Analog To Dogital Converter Model No 32	1
11	Dogital To Analog Conveter Model No 33	1
12	Basic Logic Gate Model N-1	1
13	Digital Logic Traner Mod X 1	1
14	Half And Full Subtractor Kits	1
15	16 Line To 01 Line Multi Plexer Model N 13	1
16	4 Line To 6 Line Demulti Plexer Model N 14	1
17	Master Slave J.K Flip Flop Model No N 4	1
18	Binary 4 Bit Model N 21	1
19	Left/ Righe Shift Model N 42	1
20	Rapid M	1
21	Rheo Starter 05 Amp	3
22	Frequence Meter	1
23	Rheo Starter 01 Amp	3
24	Power Factor Meter	1
25	Stop Watch	5
26	Ohm 01 Amp 300	5
27	Ohm 01 Amp 50	2
28	Ohm 01 Amp 25	2
29	Ohm 01 Amp 10	2
30	Soldering Iron	20
31	I C	295
32	P C B Board	20
33	Diod	500
34	Capacitor	50
35	Solding Wire	500
36	Wire Flexible	2
37	Wire Copper	1
38	Transformer 6 V	15
39	Transformer 12 V	5
40	Starter D.O.L	1
41	Meter 300 V	3
42	R.C Coupled Amplifire Kit	2
43	Push Pull Amp Kit	2
44	Multi Vibrator Kit (Diff)	4
45	Colpits	1
46	Phase Shift	1
47	Hartley OSCILLATOR	1

48	Power Mosfet	1
49	Igbt Kit	1
50	Oscilloscope 30 Mhz	2
51	C.R.O (Diff)	2
52	Rectifier Kits	2
53	Voltage Regulator By Zener Diode Kit	1
54	V.L Characteristics Of Diode Kit	1
55	Gimlet	60
56	Hygrometer	8
57	Wireless Micro Phone	2

CIRCUIT THEORY LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Maximum Power Transfer Theorom Model A4	1
2	Notch Filter Model No P 15	1
3	Variac	4
4	C.R.O (Diff)	**2**
5	Stepar Moter With Digital Controller	1
6	Therom Couple	1
7	Thermistor	1
8	Rectifier Kits	2
9	Transistor Charctories	3
10	Voltage Regulator By Zener	1
11	Voltage Regulator By Zener Diode Kit	1
12	V.L Characteristics Of Diode Kit	1
13	V.L Characteristics	1
14	Power Amplifire Kit	4
15	Wein Bridge	1
16	Mosfet Kits	1
17	Nand Nor Gate Kits (Diff)	2
18	Jeft Kits	1
19	Demux Ic	1
20	Half Adder And Full Adder Kits	4
21	Half And Full Subtractor Kits	4
22	Transistor Charctories	4
23	Comparator Kit	1
24	Varification Of Kcl,Kvl,Kits	2
25	Varification Of Superposition Norton ,Maximum,Power Transfer	4
26	Passive Filters	4
27	2 Port Network Kits	1
28	R.L.C Resonant Kit	2
29	Strain Guage	1
30	Lvdt Charcteristcs	1
31	Filter Circuite Kits	1
32	Oil Circuit Breakers	1
33	2 Port Network Kits	1
34	R.L.C Resonant Kit	2
35	Strain Guage	1
36	Lvdt Charcteristcs	1
37	Rectifier Kits Using Scr	1
38	Rectifier Kits	2
39	Filter Circuite Kits	1
40	Power Mosfet	1
41	Igbt Kit	1
42	Chopper Circuit Kit	1
43	Microprocessor 8085	2
44	Light Controller Kit (Trafic)	1
45	Sodium Mercury Vapour Lamps	4
46	Oil Circuit Breakers	1
47	S.F-6 Circuit Breakers	1

48	Gate And Box	2
49	Over Current Relay	1
50	Earth Fault Relay	1
51	Buchholz Relay	1
52	Relay Test Bench	1
53	H.R.C & Rewirable Fuses	4
54	Circuit Breakers Air	1
55	Circuit Breakers Oil	1
56	Megger Check The Continuly Winding	2
57	Dual Power Supply With Automatic Over Load	4
58	Function Generator	4
59	Oscilloscope 30 Mhz	2
60	Mux And Demux	2

DIGITAL ELECTRONICS & MICROPROCESSOR LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Screw Driver 8"	30
2	Screw Driver 8"	30
3	Analog Oscileoscope 10 Mhz	1
4	Digitla Storageoscileoscope 20Mhz	1
5	Function Generator	1
6	Bread Board System	1
7	Linear I.C Trainer	1
8	Microprocessor 8085	2
9	Digital Multimetar 3.5	2
10	D.C Power Supply Regulator	5
11	Deasauty 'S Bridge	1
12	Anderson Bridge	1
13	Transistorised Wein Bridge Oscillator	1
14	Temp. Transducer Traner	1
15	Lvdt Charcteristcs	1
16	V.C.O Using P.L.L	1
17	Analog Multimeter	2
18	Const.Of Single Phase Half & Fully Controlled Bridge Rectifier Usuing Scr	1
19	Series Resonance Model No B3	1
20	Active Low Pass Filter Model No P 11	1
21	Active High Pass Filter Model No P 12	1
22	Active Band Pass Filter Model No P 13	1
23	Parallel Resonance Model No B4	1
24	Active Low Pass Filter Model No P 11	1
25	Active High Pass Filter Model No P 12	1
26	Active Band Pass Filter Model No P 13	1
27	Notch Filter Model No P 15	1
28	Parallel Resonance Model No B4	1
29	Digital I.C Traner	1
30	Master Slave J.K Flip Flop Model No N 5	1
31	Master Slave J.K Flip Flop Model No N 6	1
32	Oscilloscope 30 Mhz	2
33	Mod -10-Counter	1
34	Converter A/D&D/A	2
35	U.P. Down (Counter)	2
36	Shift Register	1
37	Seven Segment Display	1
38	Seven Segment Display Inter Facing Kits	1
39	Flip Flops Kits	5
40	Rectifier Kits Using Scr	1
41	Rectifier Kits	2
42	Chopper Circuit Kit	1
43	Microprocessor 8085	2
44	Light Controller Kit (Trafic)	1
45	Gate And Box	2
46	Mux And Demux	2

ELECTRICAL MACHINE LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Load Box 5 K.W	3
2	Volt Meter	17
3	Megger 500 Volt	1
4	Wire Bound Registance	1
5	Current Transformer	2
6	Load Box Capacitance	2
7	Ammiter 16 Amp	23
8	D.C. Shunt Motor	1
9	D.C. Series Motor	1
10	D.C. Shunt Motor Couple With Alternater	1
11	Motor Converter	1
12	Slip Ring Induction Motor	1
13	A.C. Series Motor	1
14	Synchronces Motor	1
15	Induction Motor	1
16	Squirrel Cage Induction Motor	1
17	Pole Changing Induction Motor	1
18	Capacitor Motor Single Phase	1
19	Rectifire Set	1
20	Pannel Board Ac/Dc	1
21	Watt Meter 0-1-3Kw	5
22	Earth Tester	1
23	Ohm Meter	2
24	Single Phase Indicator	1
25	Potencial Transformer	2
26	Load Box Induction	1
27	Variac	2
28	D.C.Compound Motor With Generator	1
29	D.C.Shunt Motor With Series Generator	1
30	D.C.Shunt Motor With Shunt Generator	1
31	Deepth Micrometre	1
32	Transformer 3 Kva	2
33	Transformer 1 Kva	2
34	Transformer Auto 1 Kva	1
35	Rheo Starter 01 Amp	7
36	Rheo Starter 05 Amp	7
37	Tacho Meter With Stop Watch	3
38	Energy Meter (01Ph/5 Amp/230 Volt.)	3
39	Whealstone Bridge	1
40	Power Factor Meter	1
41	Screw Driver 4"	60
42	Screw Driver 6"	60
43	Screw Driver Contctor 4"	60
44	Hand Gloves (Rubber)	2
45	Limite Swhith	**6**
46	Screw Driver Contctor 4"	60
47	Starter Delta With Manual	1

48	Starter Star 3 Ph	1
49	Starter Dol 3 Ph	1
50	Tester Neon	60
51	Volt Meter	4
52	Tacho Meter With Stop Watch	3
53	Megger 500 Volt	3
54	Variac	1
55	Induction Coil	**1**
56	I.C.T.P.	**9**
57	I.C.D.P.	**8**
58	Oil Testing Kit	**1**
59	Clamp Meter(0-100)Amp	4
60	01 H P D.C. Series Motor With Brake	1
61	01 Kva 03 Ph Transformer 415/230V	2
62	1 H P D.C. Compound Motor With Break	1
63	1 H.P A.C Capacitor Motor With Break & Stater	1
64	1 K V A Single Phase Transformer 230/115 V	2
65	Synchronising Panel For 3 Phase Transformer	1
66	Synchronising Panel For Alternater	1
67	D.C Motor Control Panel	1
68	Control Panel For Alternator	1
69	Control Panel For D.C Generator	1
70	2 H.P A.C Squirrrel Cage3 Phase Motor	1
71	Rectifire Set 20 Amp	1
72	Starter For D.C Moter 3 Point	1
73	Starter For D.C Series 2 Point	2
74	Rheo Starter 01 Amp	2
75	Rheo Starter 05 Amp	2
76	Synchronces Motor 3 Ph Pannel And Brake	1
77	Power Factor Meter	1
78	Variac	2
79	Alternater Set 5 Hp 3 Kw	1
80	Water Tube Boiler	1
81	D.C Motor Panel With Exciter	2
82	Loading Rheostat 5 Kw 3 Ph	1
83	Loading Rheostat 3 Kw 1 Ph	1
84	Logic Probe	3
85	Earth Testing Megger (Analog)	1
86	Inductive Choke 1 Ph	1
87	Variable Capacitive Load 1 Ph	1
88	Cochoram Boiler	1
89	Laminated Education .Chart	37
90	S.F-6 Circuit Breakers	1
91	Over Current Relay	1
92	Earth Fault Relay	1
93	Buchholz Relay	1
94	Relay Test Bench	1
95	H.R.C & Rewirable Fuses	4
96	Circuit Breakers Air	1
97	Circuit Breakers Oil	1

98	Megger Check The Continuly Winding	2
99	Dual Power Supply With Automatic Over Load	4
100	Function Generator	4

ELECTRICAL WORKSHOP PRACTICE LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Elct. Furnace Melting	2
2	Folding Rule (Wood)	30
3	Drill Sleve	2
4	Divider 6"	68
5	Screw Pitch Gouge	1
6	Royal Plug Tool & Bit	8
7	Steel Rule 6"	0
8	Screw Driver 6"	60
9	Pipe Cutter 2" Above	4
10	Pucker	60
11	Nose Plier	12
12	Plier Gase	15
13	Plier Cutting	6
14	Micro Meter (0-25)	4
15	Micro Meter (25-50)	4
16	Micro Meter (50-75)	4
17	Keeping Tools	4
18	Screw Driver Contctor 4"	60
19	Dril Bit 20 Mm	10
20	Royal Plug Tool & Bit	4
21	Sessiors Cold	10
22	Sessiors	8
23	Knife	60
24	Kettle Electrical	**2**
25	Cutting Plier(Side Bit)	60
26	Cutting Plier(Gose) 6"	60
27	Cutting Plier(Nose)	60
28	Pincer	60
29	Rotary Swithch	18
30	Screw Driver 6"	60
31	Soldering Iron	60
32	Wire Stipper 6"	**10**
33	Hand Drill Machine	6
34	Bradwal	16
35	Ammieter 6 Amp	15
36	Series Meter	2
37	Shunt Meter	2
38	Growler	4
39	Flux Meter	2
40	Hydro Meter	4
41	Frequence Meter	3
42	Stepar Moter With Digital Controller	1
43	Digital Thermo Meter	8
44	Twezere	16
45	Multi Tester	6
46	Digital Multimetar 3.5	23
47	Discrete Componate Traner	2

48	Micro Meter (0-25)	4
49	S.W.G.	7
50	Augur	60
51	Function Generator	2
52	Rheo Starter 01 Amp	4
53	Whealstone Bridge	1
54	Power Factor Meter	4
55	Energy Meter (01Ph/5 Amp/230 Volt.)	2
56	Rheo Starter 05 Amp	4
57	Screw Driver Contctor 4"	60
58	Contactor 32 Amp	4
59	Contactor 16 Amp	2
60	Knife	30
61	Micro Meter (25-50)	3
62	Micro Meter (0-25)	10
63	Screw Driver 4"	60
64	Screw Driver Contctor 8"	60
65	Scriber	60
66	Tester Neon	60
67	Portable A.C Voltmeter 0-150-300	4
68	Portable D.C Ammeter 0-1 A	1
69	Portable D.C Ammeter 0-5 A	2
70	Portable A.C Ammeter 0-5 A	2
71	Portable A.C Ammeter 0-10 A	2
72	Rectifier Set 70 Amp Capacity	1
73	Brass Knurling Terminal	30
74	Steel Rule 6"	100
75	Screw Pitch Gouge	10
76	Fillar Gouge	10
77	Royal Chart	5
78	Wire Stipper	1
79	Rod	100
80	Whealstone Bridge(W.D.W.M)	1
81	Sodium Mercury Vapour Lamps	4
82	Mcb 10 Amp	24
83	Switch 15 Amp	20
84	Socket 15 Amp	20
85	4 Pole 63 Amp	2
86	Ar 2L .2.5 Sq Mm Cable	3
87	Ar 3C 2.50 Sq Mm Multi Core Copper Cable	3
88	7X5 Fiber	150
89	4" Round Cover	150
90	13X5 Fiber	50
91	9X11 Fiber	10
92	1.5 Mm Wire 180 Mtr (Red)	6
93	1.5 Mm Wire 180 Mtr (Black)	4
94	1.5 Mm Wire 180 Mtr (Green)	2
95	6 Mm Coper Wire (Red)	1
96	6 Mm Coper Wire (Black)	1
97	Celling Rose	150

98	6 Mm Coper Wire (Red)	2
99	6 Mm Coper Wire (Blue)	2
100	6 Mm Coper Wire (Yellow)	2
101	6 Mm Coper Wire (Black)	2
102	Socket 16 Amp	10
103	Switch 16 Amp	10
104	E 32 Amp Sp Mcb	24
105	Switch 6 Amp	100
106	Socket 6 Amp	20
107	6 Mm Coper Wire (Yellow)	3
108	6 Mm Coper Wire (Black)	1
109	6 Mm Coper Wire (Blue)	1
110	6 Mm Coper Wire (Red)	1
111	Switch 6 Amp	40
112	Pvc Tape	30
113	10 Mmcoper Ring Socket	16
114	35 Mm Coper Wire Ring Socket	16
115	10 Mm Coper Wire 100 Mtr	4
116	Board 6X4	5
117	Board	5
118	Tester	2
119	Tape	1
120	Tube Light	90
121	T. Fitting	60
122	Mcv 32 Amp	12
123	Pvc Tape	30
124	Socket 16 Amp	30
125	Switch 16 Amp	20
126	Socket 3 Pin	2
127	Adopter	1
128	Street Light	1
129	Main Switch	1
130	Mcb Box 2 Pol	5
131	Dp Mcb 32 Amp	5
132	Switch 6 Amp	20
133	Socket 6 Amp	40
134	Pvc Tape	10
135	Pvc Box	5
136	Change Over 1000 Amp	1
137	Mcb 100 Amp	1
138	Rcb 100 Amp	1
139	Mcb Box	1
140	Coper V Socket	100
141	Coper Pen Socket	100
142	100 Amp Charger 4 Pole	1
143	200 Amp Switch	1
144	Wire Cable 10 Mm	1
145	5 Hp Motor Panel Board	2
146	Mcb Box 2 Polo	10
147	Mcb 32 Amp	12

148	Coper Wire 6 Mm	2
149	Coper Wire 6 Mm	2
150	Coper Wire 1.5 Mm	1
151	Mcb 4 Polo 100 Amp	1
152	Socket 16 Amp	20
153	3 Pin Top 16 Amp	10
154	Coper Link 6 Mm	200
155	Coper Link 10 Mm	50
156	COATED WIRE	5
157	LABLE PIPE	1
158	COATED WIRE	5
159	CASING 2"	100
160	WIRE 6 MM	2
161	WIRE 1.5 MM	3
162	MCB 32 AMP	5
163	ROUND COVER PVC 4"	15
164	MCB 32 AMP	10
165	COPER PIN 6 MM	38
166	COPER PIN 10 MM	10
167	75 WT LED STRIEET LIGHT	6
168	40 MM GI PIPE	6

BLACKSMITH AND FOUNDRY SHOP

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Hearth	8
2	Anvil-25 Kg	2
3	Spanner Adj.	6
4	Spanner D	6
5	Hand Blower	2
6	Chisel (Crome)	60
7	Chisel(Cold)	20
8	Chisel(Cross)	4
9	Soldering Iron	17
10	Swages (Top With Bottom)	2
11	Hammer D F Headed	2
12	Hammer Set	3
13	Chisel(Hot)	2
14	Chisel(Flat)	4
15	Hammer Cross Peen	60
16	Fuller (Top With Botom)	2
17	Flatter	4
18	Brass Rule 12 "	60
19	Hand Blower	4
20	Hammer D F S 3 Kg	60
21	5 H.P A.C Squirrrel Cage Induction Motor with blower	1
22	Anvil-50 Kg	3
23	Swage Block 50 Kg	2
24	Anvil 100 Kg	2
25	Fire Bricks 230*115*75 Mm	500
26	Fire Clay Motar	3
27	Leg Vice 10 Cm	6

CARPENTRY SHOP

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Augur	16
2	Gimlet	16
3	Rip Saw	19
4	Tennon Saw	6
5	Dovetail Saw	30
6	Compass Saw	11
7	Scraper Round	16
8	Scraper Half Round	16
9	Scraper Trangular	16
10	Oil Stone	2
11	File Rasp 6"	16
12	Jackplain Iron	1
13	Jackplain Wood	16
14	Chisel(Farmer)	30
15	Hammer Clay	20
16	Chisel(Bevelled)	30
17	Chisel(Farmer)	60
18	Folding Rule (Wood)	60
19	Chisel(Farmer)	60
20	Folding Rule (Wood)	30
21	File Card	10
22	File Rasp 6"	15
23	Iron Jackplain	15
24	Hand Saw	60
25	Augur	14
26	Chisel(Bevelled)	30
27	Anvil-25 Kg	1
28	File Half Round	70

FITTING SHOP

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Drilling Machine	8
2	Drilling Machine	1
3	Drilling Machine(Breast)	6
4	Drill Bit	16
5	Apron	6
6	Fire Extingusher	4
7	File Niddle	12
8	Center Punch 6"	60
9	Pipe Wrench 10"	1
10	Pipe Wrench 14"	1
11	Pipe Wrench 18"	2
12	Surface Plate	1
13	Sine Bar	2
14	Tap With Dies	1
15	Vernier Caliper	0
16	Bench Vice	32
17	Bevel Square	1
18	Caliper (Inside)	60
19	Caliper (Outside)	60
20	Dies With Handle (40 Mm)	1
21	Spanner Box	2
22	Surface Gouge	4
23	Vernier Height Gouage	2
24	Pincer	60
25	Grinder	2
26	File Trangular	7
27	Hammer Ballpin 1/2 Kg	60
28	Hammer Ballpin 3/4 Kg	0
29	Hacksaw Frame	60
30	Hand Vice	30
31	Letter Punch 1/8	2
32	C- Clamp 2"	3
33	C- Clamp 4"	16
34	C- Clamp 6"	7
35	File Round	21
36	File Half Round	23
37	File Flat Smooth	60
38	Number Punch	3
39	File Flat Bastard	60
40	Center Punch 6"	60
41	File Trangular	25
42	File Half Round	40
43	Bench Vice	50
44	Dot Punch	80
45	File Trangular	30
46	File Round	30
47	File Sqaure	30

48	Number Punch	5
49	Letter Punch	5
50	File Handle	50

FLUID MECHANICS AND HYDRAULIC MACHINES LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Accessories For Hydrolic Test Bench	1
2	Hydrolic Test Bench Set	1
3	Centrifugal Pump	1
4	Reciprocating Pump	1
5	Pelton Wheele Turbine Test Rig 1 H.P	1
6	**Kaplan Turbine Testing**	1
7	**Fransic Turbine Testing**	1

HEAT POWER & THERMAL ENGG. LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Puller (Pully)	2
2	Puller (Bearing	2
3	2 Stroke Petrol Engine (Model)	1
4	4 Stroke Petrol Engine (Model)	1
5	2 Stroke Disel Engine (Model)	1
6	4 Stroke Disel Engine (Model)	1
7	Cochoram Boiler model	1
8	Air Conditioner Trainer Test Rig	1
9	Refrigation Cycle Test Rig	1
10	Governor Apparatus	1
11	4 Stroke Peterol Engine Four Cylinder	1
12	Steam Power Plant Model	1
13	Thermal Oven Repairing	1
14	Penske Martins Flash Point &Fire Point Reparing	1
15	Cleveland Flash Point &Fire Point Reparing	1
16	I.C.Engine Test Rig To Find Out The Heat Balance 01 Nos	1
17	Flash & Fire Point Apprt	1
18	COMPRESSOR 2 STAGE	1
19	2 STROKE SINGLE CYLINDER PETROL	1
20	4 STROKE DISEL ENGINE	1
21	STEAM ENGINE MODEL	1
22	VERTICAL WATER TUBE BOILER MODEL	1

MACHINES SHOP

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Lathe Machine 4 1/2 '	4
2	Grinder	1
3	Dot Punch	45
4	Vernier Caliper	12
5	S.W.G.	3
6	Steel Rule 6"	43
7	Allen Key	4
8	Cutting Tools 1/4	10
9	Cutting Tools 3/8	10
10	Cutting Tools 5/16	10
11	Steel Rule 12"	60
12	Drill Bit	32
13	Shank Drill Bit	4
14	Cutting Tools 1/4	15
15	Cutting Tools 3/8	50
16	Cutting Tools 5/16	45
17	File Flat Smooth	30
18	Knurling Tools	50
19	Hammer Ballpin 3/4 Kg	60
20	Power Hacksaw	1
21	Lathe Machine 6'	2
22	Lathe Machine 6'	3
23	Universal Milling Machine	1
24	Shaping Machine 8"Cap	1
25	8" Slot Cutting Machine With Rotating Table *Motor	1
26	File Flat Rough	200
27	Universal Duty Block	4
28	File Round	30
29	C N C Lathe Traner With Servo Moters	1
30	Universal Sribing Block 22 Cm	6
31	Cnc Lathe Trainer With All Acc	1

MATERIAL TESTING & MEASUREMENT MACHINES LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Pedulum Impact Testing Machine	1
2	Universal Testing Machine	1
3	Brinal Hardness Tester Cap 3000 Kgf	1
4	Torsion Testing Machine	1
5	Polygon Of Forces Apprt.	1
6	Law Of Moment Apprt.Rs 4900	1
7	Law Of Moment Apprt.Rs 9800	1
8	Angle Of Respose Wooden	1
9	Simple Wheel And Axle Wooden	1
10	Winch Crab Single	1
11	Winch Crab Double	1
12	Worm And Worm Wheel Single	1
13	Simple Screw Jack Apprat.	1
14	Gouquss 1520 Pto Engine Disel No A9G1322094	1
15	**UNiversal FORCE TABLE APP**	1

SHEET METAL SHOP

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Divider Wing	4
2	Hollow Punch	4
3	Prick Punch	1
4	Rebate Punch	8
5	Steel Rule 2'	6
6	Straight Snips	4
7	Bent Snips	4
8	Spring Snips	8
9	Steel Square 2'	2
10	Try Square	81
11	Blow Lamp	14
12	Scriber	120
13	S.W.G.	0
14	Solid Punch	4
15	Steel Rule 12"	85
16	Hammer Ballpin 3/4 Kg	0
17	Laddle	12
18	Mallete Round(Wood)	16
19	Melting Pot	4
20	C- Clamp 8"	9
21	Oil Cane	6
22	Scriber	60
23	File Flat Smooth	30
24	Divider 6"	30
25	Try Square	30
26	Cone Mould	1
27	Number Punch	5
28	Spanner D	4
29	Gp Sheets /Coil	171.2
30	G I sheet	210

WELDING SHOP

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Goggless	30
2	Spark Lighter	1
3	Blow Lamp	14
4	S.W.G.	0
5	Electro Holder	2
6	Earth Clamp	6
7	Hand Gloves (Asbestos)	9
8	Hammer Ballpin 3/4 Kg	60
9	Hose Pipe (Blue And Red)	50
10	Handscreen	6
11	Letter Punch 3/32	3
12	Gas Cutter	1
13	Hammer Ballpin 1 Lb	60
14	Welding D.C.Motor	1
15	Welding Tip Nozzle	5
16	Hammer Ballpin 1/2 Kg	60
17	Welding Transformer	1
18	Hand Vice	30
19	Cable Lug	10
20	Cable Connector	10
21	File Bastard	60
22	Electrode	50
23	Black Glass	100
24	Black Gogless	30
25	Caliper (Outside)	60
26	Caliper (Inside)	60
27	Hacksaw Frame	60
28	Letter Punch 1/8	4
29	Welding Machine	2
30	Welding Cable 20 Mtr & Accessories	2
31	Letter Punch	5

MINE ENVIRONMENT & HAZARD LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Velo Xgl 50 Non-Relighting	1
2	Gas Testing Chamber	1
3	Velox Gl 7 Gas Testing Flame Sefety Lamp	1
4	Velox Gl 7 Sefety Lamp Spairs	1
5	Tool Kit For Service Mantanance	1
6	Velox Flame Sefety Lamp (Magnet Unlocker)	1
7	Velox Exp3 Safety Torch	1
8	Velox Gl 7 Gas Testing Flame Sefety Lamp	2
9	Velox Gl 7 Gas Testing Flame Sefety Lamp	1
10	Gasket	100
11	Wick	13
12	Inner Gauge	5
13	Outer Gauge	5
14	Fixed Filament Unit	11
15	Fuel Vessel (Oil Pot0For Gl 50 Lamp	1
16	Battery For Gl 7 Lamp	6
17	Glass Cylinder	1
18	A Complete Gas Cap Indicator Box	1
19	Methane Gas Testing Chamber With All Acc	1
20	Fixed Filament Unit	2
21	Lid With Positive Connector Of Battery Box	2
22	Toximeter	1
23	Multi Gas Detector	1
24	Helment	1
25	Gum Boots	1
26	Hand Gloves	5
27	Ear Muff/Plug	1
28	Fluorescent Jackets (Cottons)	1
29	Nose Mask (Dust Mask)	1
30	Shin Guard /Knee Cap	1
31	First-Aid Box	1
32	Mining Safety Belt	1
33	Goggless	1
34	Sampling Bladder	1
35	Colliery Lamp Room	1
36	Stone Dust Barrier	1
37	Approching Ald Water Logged Working	1
38	Colliery Lamp Room	1
39	Stone Dust Barrier	1
40	Approching Ald Water Logged Working	1
41	Multi Gas Detector	1

MINE MACHINERY LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Model Of Singile Deck Tandem Cage	1
2	Model Of Shaft Sinking	1
3	Model Of Direct Rope Haulage	1
4	Model Of White Metal Cappel	1
5	Cylinderical Drum	1
6	Conical Drum	1
7	Cylindro- Conical Drum	1
8	Bi-Cylindro Conical Drum	1
9	Center Susperded Caliper Brakes	1
10	King Detaching Hook	1
11	Rope Guids	1
12	Stop Block	1
13	Spring Clatch	1
14	Back Stay	1
15	Back Clatch	1
16	Jazz Rail	1
17	Run Way Switch	1
18	Roof & Side Stiching	1
19	Intercoupled Stop-Block & Run Way Switch	1
20	Intercoupled Stop-Block & Run Way Switch& Jazz Rails Combind	1
21	Tub-Retarder	1
22	Tub-Re Railer	1
23	Man Riding Car	1
24	Shaker Conveyor	1
25	Belt Conveyor	1
26	Fore Poling	1
27	Anchored Post Breakes	1
28	Agecroft Divice	1
29	Cylinderical Drum	1
30	Conical Drum	1
31	Cylindro- Conical Drum	1
32	Bi-Cylindro Conical Drum	1
33	Center Susperded Caliper Brakes	1
34	King Detaching Hook	1
35	Rope Guids	1
36	Stop Block	1
37	Spring Clatch	1
38	Back Stay	1
39	Back Clatch	1
40	Jazz Rail	1
41	Run Way Switch	1
42	Roof & Side Stiching	1
43	Intercoupled Stop-Block & Run Way Switch	1
44	Intercoupled Stop-Block & Run Way Switch& Jazz Rails Combind	1
45	Tub-Retarder	1
46	Tub Re-Railer	1
47	Man Riding Car	1

48	Shaker Conveyor	1
49	Belt Conveyor	1
50	Fore Poling	1
51	Anchored Post Breakes	1
52	Cylinderical Drum	1
53	Conical Drum	1
54	Cylindro- Conical Drum	1
55	Bi-Cylindro Conical Drum	1
56	Center Susperded Caliper Brakes	1
57	King Detaching Hook	1
58	Rope Guids	1
59	Stop Block	1
60	Spring Clatch	1
61	Back Stay	1
62	Back Clatch	1
63	Jazz Rail	1
64	Run Way Switch	1
65	Roof & Side Stiching	1
66	Intercoupled Stop-Block & Run Way Switch	1
67	Intercoupled Stop-Block & Run Way Switch& Jazz Rails Combind	1
68	Tub-Retarder	1
69	Tub-Re Railer	1
70	Man Riding Car	1
71	Shaker Conveyor	1
72	Belt Conveyor	1
73	Fore Poling	1
74	Anchored Post Breakes	1
75	Agecroft Divice	1
76	Winding Rope Caple	1
77	Reliance Caple	1
78	White Metal Caple	1
79	Zinc Cone And Tail Strand Type Haulage Roop Caple	1
80	Detaching Hooks	1
81	King Detaching Hooks	1
82	Onnreod Detaching Hooks	1
83	Kep Gear	1
84	Prop Keps	1
85	Collapsing Keps Status	1
86	Tippler	1
87	End-On- Tippler	1
88	Side On Tippler	1
89	Mining Wire Roofs (Displayed)	1
90	Endless Rope Haulage Layout	1
91	Rope Splicing Tools & Tackless	1
92	Rope Splicing	1
93	Gate Belt Conveyor With Loop Take Up Open Caste Mining Machinery (Not Working Model)	1
94	Dumper	1
95	Shovel	1
96	Bulldozer	1

97	Drageline	1
98	Scraper	1
99	Bucket Wheel Ex-Cavator	1
100	Cone Cut (Short Hole)	1
101	Wedge Cut (Short Hole)	1
102	Fan Cut (Short Hole)	1
103	Burn Cut	1
104	Drag Cut (Short Hole)	1
105	Types Of Roof Support By Timber	1
106	Chock Relese Device	1
107	Side And Roof Support In A Road Way	1
108	Sofari Supports	1
109	Roof Bolting	1
110	Back Stay	1
111	Run Way Switch	1
112	Inter Coupled Stop Block And Runaway Switch	1
113	Gate Belt	1
114	Conveyor With Loop Take Up	1
115	Cone Cut	1
116	Wedge Cut	1
117	Fan Cut	1
118	Burn Cut	1
119	Drag Cut	1
120	Types Of Roof Support By Timber	1
121	Chock Relese Device	1
122	Side And Roof Support In A Road Way	1
123	Fore Poling	1
124	Sofari Supports	1
125	Roof & Side Stiching	1
126	Roof Bolting	1
127	Mining Wire Roofs (Displayed)	1
128	Single Deck Cage	1
129	Double Deck Cage	1
130	Reliance Caple	1
131	White Metal Caple	1
132	Rigid Guides	1
133	Rope Guide Shoe	1
134	Prop Keps	1
135	Collapsing Keps Status	1
136	Man Riding Car	1
137	Mine Car	1
138	Shaker Conveyor	1
139	Man And Tail Rope Haulage Layout	1
140	Friction Or Koepe Winding System- Tower Mounted Winder	1
141	Endless Rope Haulage Layout	1
142	Mechanized Open Cast Coil Mine	1
143	Regulator	1
144	Single Rope Friction Or Koepe Pully Tower Mounted	1
145	Single Rope Friction Or Koepe Pully Ground Mounted	1
146	Multi Rope Friction Or Koepe Pully Wheel Mounted	1

147	Multi Rope Friction Or Koepe Pully Ground Mounted	4
148	Ormerod Detaching Hook	1
149	Pit-Top Lay Out With Turntable	1
150	Drop Warwick	1
151	Tipping Tub	1
152	Rope Splicing	1
153	Scraper Chain Conveyor	1

MINE VENTILATION LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Diff. Types Of Stopping	1
2	Axial Flow Fan	1
3	Redial Flow Fan	1
4	Air Crossing	1
5	Ventilation Door With Regulator	1
6	Depillaring Board & Pillar Panel	1
7	Long Wall Reatratoy Face With Caving	1
8	Long Wall Advancing Face With Stowing	1
9	Ventalation Systym In A Board & Pilar	1
10	Ventalation Systym In A Board & Pilar	1
11	Ventalation Systym In A Board & Pilar	1
12	Higrometer Digital	1
13	Whirling Hygrometer	1
14	Mechanical Anemometer	1
15	Velo Meter	1
16	Kata Theromometer	1
17	Development Working In A Bord And Pillar Panel	1
18	Brattic Partition	1
19	Regulator	1
20	Booster Fan In Return Airway	1
21	Booster Fan In Intake Airway	1
22	Development Working In A Bord And Pillar Panel	1
23	Booster Fan In Intake Airway	1

MINING SURVEY LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Meatallic Tape Size 15 Cm	**5**
2	Meatallic Tape Size 30 Cm	**5**
3	Steel Tape 5 Mtr	**5**
4	Steel Tape 15 Mtr	**5**
5	Steel Tape 30 Mtr	**5**
6	Prismastic Compas 4"	1
7	Levelling Staff 4 Mtr	1
8	Wooden Peg	5
9	Total Station Prism	1

GEOLOGY LAB

SL.NO.	NAME OF EQUIPMENTS	QUANTITY
1	Streak Plate	1
2	Rock Speciman With Labels	25
3	Pocket Knife (Multi)	1
4	Mineral Specimen With Labele	30
5	Hardness Box(Moh'S Scale)	1
6	Hand Lens	1
7	Hand Specimen Of Minerals	36
8	Hand Specimen Of Rocks	55
9	Hand Specimen Of Ore	18
10	Moh'S Scale Of Hardness Spl	1
11	Measuring Tape 3 Mtr S.S	1
12	Measuring Tape 15 Mtr S.S	1
13	Measuring Tape 30 Mtr S,S	1
14	Measuring Tape 50 Mtr S.S	1
15	Petrological Microscope	1
16	Trimming Hammer 1000 Gm	1
17	Pocket Magnet	1
18	Geologist Field Note Book	1
19	Munshell Rock Colour Chart	1
20	Geological Map Of India	1
21	Mineral Map Of India	1
22	Tectonic Map Of India & Adj.Country	1
23	3 D Geologcal Model Fiber Glass 100X75 Cm	1
24	3 D Geomorplolical Model 25X35 Cm	2
25	Miniral Hand Specimens	6
26	Rock Speciman Assorted	5
27	Petrological Microscope	1
28	Estwing Rock Hammer	1

- **List of Experimental Setup in each Laboratory / Workshop :**
  The experimental set up in all the Laboratories and Workshops in all the branches are done as per SCTE&VT, Odisha diploma prescribed syllabus.

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- **COMPUTING FACILITIES :**
  - Internet Bandwidth : 300 Mbps
  - Number of configuration of system : 210
  - Total number of system connected by LAN : 280
  - Total number of system connected by WAN : -
  - Major software packages available : Legal System Software – 10
Legal Application Software- 20
  - Special purpose facilities available : -
- Innovation Cell : -
- Social Medical Cell : -
- Compliance of the National Academic Depository (NAD), applicable to PGCM/PGDM Institutions And University Departments : Not Applicable
- **LIST OF FACILITIES AVAILABLE :**
  - Games and Sports Facilities : Volley Ball, Foot Ball, Basket Balls Badminton, Cricket, Javeline Throw, Carom Board.
  - Extra-curricular Activities : Debates, Quiz & Song Competitions, Seminars etc.
  - Soft Skill Development Facilities : The institute has well furnished Communicative English Language Lab. with required software's for soft skill & communication skills development of the students.
- **TEACHING LEARNING PROCESS :**
  - Curricula and syllabus for each of the programmes As approved by the University : Attached
  - Academic Calendar of the University : Attached
  - Academic Time Table with the name of the Faculty Members handling the Course : Attached
  - Teaching Load of each Faculty : 20 classes per week
  - Internal Continuous Evaluation System and Place : Strictly followed the teaching & evaluation scheme & academic calendar of SCTE&VT, Odisha
  - Student's assessment of Faculty, System in the place : Implemented by the Institute.
- **FOR EACH POST GRADUATE COURSES GIVE THE FOLLOWING :** Not Applicable

16. ENROLLMENT & PLACEMENT DETAILS OF STUDENTS IN THE LAST 3 YEARS :

ENROLLMENT DATA (LAST 3 YEARS)

Sl. No.	Session/ Academic Year	A.I.C.T.E. Approved/Sanctioned Annual Intake					
		Civil Engg.	Electrical Engg.	Mechanical Engg.	Mining Engg.	Comp. Sc. & Engg	Total Intake
1	2023 – 24	60	120	120	120	-	420
2	2024 – 25	60	120	120	120	-	420
3	2025 – 26	60	120	120	180	60	540

PLACEMENT DATA (LAST 3 YEARS)

Year	Branch	Number of Company Visited	Number of Eligible Students	Total Placement	Lowest Package	Highest Package
2023	Civil Engg.	01	60	06	1.8 Lakh	2 Lakh
2024	Civil Engg.	02	54	11	1.8 Lakh	2 Lakh
2025	Civil Engg.	02	53	15	1.8 Lakh	2 Lakh
2023	Elect. Engg.	04	116	22	1.8 Lakh	2 Lakh
2024	Elect. Engg.	02	103	33	1.8 Lakh	2 Lakh
2025	Elect. Engg.	4	105	24	1.8 Lakh	2 Lakh
2023	Mech. Engg.	04	98	24	1.8 Lakh	2 Lakh
2024	Mech. Engg.	02	104	19	1.8 Lakh	2 Lakh
2025	Mech. Engg.	04	109	22	1.8 Lakh	2 Lakh
2023	Mining Engg.	05	105	21	1.8 Lakh	2 Lakh
2024	Mining Engg.	02	108	12	1.8 Lakh	2 Lakh
2025	Mining Engg.	01	97	16	1.8 Lakh	2 Lakh

17. LIST OF RESEARCH PROJECTS/CONSULTANCY WORKS :

- Number of Projects carried out, funding agency : No
- Publications (if any) out of research in last three Years out of master's projects :
- Industry Linkages : For Training & Industrial visit purpose.
- MOus with Industries (minimum 3) : For Training & Industrial visit purpose.

18. LOA AND SUBSEQUENT EOA TILL THE CURRENT ACADEMIC YEAR :Attached

19. ACCOUNTED AUDITED STATEMENT FOR THE LAST THREE YEARS Attached.

BEST PRACTICES ADOPTED, IF ANY :

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 1ST SEMESTER (Common to All ENGINEERING Programme) (W.e.f 2024-25)

Sl. No	Code No.	Course Title	Hours per week		Total contact hrs/ week	Credits	Evaluation Scheme			
			L	P			Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
1	TH 1(a) TH 1(b)	Communication Skills in English Or Introduction to IT Systems	3	-	3	3	30	70	3	100
2	TH 2	Applied Physics-I	4	-	4	4	30	70	3	100
3	TH 3	Mathematics-I	4	-	4	4	30	70	3	100
4	TH 4(a) TH 4(b)	Fundamentals of Electrical & Electronics Engineering Or Engineering Mechanics	4	-	4	4	30	70	3	100
5	TH 5	Environmental Science	4	-	4	4	30	70	3	100
		TOTAL	**19**	**-**	**19**	**19**	**150**	**350**	**---**	**500**
6	PR 1(a) PR 1(b)	Communication Skills in English Lab OR Introduction to IT Systems Lab	-	4	4	2	25	---	---	25
7	PR 2	Applied Physics-I Lab	-	2	2	1	25	25	3	50
8	PR 3(a) PR 3(b)	Engineering Graphics OR Engineering Workshop Practice	-	4	4	2	25	75	4	100
9	PR 4(a) PR 4(b)	Fundamentals of Electrical & Electronics Engineering Lab Or Engineering Mechanics Lab	-	2	2	1	25	---	----	25
10	PR 5	Sports and Yoga	-	2	2	1	50	--	--	50
			-	14	14	7	150	100		
		TOTAL	**19**	**14**	**33**	**26**	**300**	**450**	**---**	**750**

Abbreviations: L-Lecturer, P-Practical. Each class is of 1 Hour duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

There shall be Induction Program before beginning of 1st Semester and Internships at the end of 2nd Semester Classes as per AICTE norm. The best of 2 IA conducted in a subject out of 20 marks to be considered. Assignment/ quiz etc. of 10 marks to be treated as part of IA. Besides this ,Monthly Test to be conducted for each subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester. Club/Innovation/ Idea Tinkering Activities etc. shall be encouraged to be performed by students beyond the above stipulated hours.

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 2nd SEMESTER (Common to All ENGINEERING Programme) (W.e.f 2024-25)

Sl. No	Code No.	Course Title	Hours per week		Total contact hrs/ week	Credits	Evaluation Scheme			
			L	P			Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
1	TH 1(a) TH 1(b)	Communication Skills in English Or Introduction to IT Systems	3	-	3	3	30	70	3	100
2	TH 2	Applied Physics-II	4	-	4	4	30	70	3	100
3	TH 3	Mathematics-II	4	-	4	4	30	70	3	100
4	TH 4(a) TH 4(b)	Fundamentals of Electrical & Electronics Engineering Or Engineering Mechanics	4	-	4	4	30	70	3	100
5	TH 5	Applied Chemistry	4	-	4	4	30	70	3	100
		TOTAL	**19**	**-**	**19**	**19**	**150**	**350**	**---**	**500**
6	PR 1(a) PR 1(b)	Communication Skills in English Lab OR Introduction to IT Systems Lab	-	4	4	2	25	---	---	25
7	PR 2	Applied Physics-II Lab	-	2	2	1	25	25	3	50
8	PR 3(a) PR 3(b)	Engineering Graphics OR Engineering Workshop Practice	-	4	4	2	25	75	4	100
9	PR 4(a) PR 4(b)	Fundamentals of Electrical & Electronics Engineering Lab Or Engineering Mechanics Lab	-	2	2	1	25	---	----	25
10	PR 5	Applied Chemistry Lab	-	2	2	1	25	25	3	50
			-	14	14	7	125	125		
		TOTAL	**19**	**14**	**33**	**26**	**275**	**475**	**---**	**750**

Abbreviations: L-Lecturer, P-Practical. Each class is of 1 Hour duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

There shall be Induction Program before beginning of 1st Semester and Internships at the end of 2nd Semester Classes as per AICTE norm. The best of 2 IA conducted in a subject out of 20 marks to be considered. Assignment/ quiz etc. of 10 marks to be treated as part of IA. Besides this ,Monthly Test to be conducted for each subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester. Club/Innovation/ Idea Tinkering Activities etc. shall be encouraged to be performed by students beyond the above stipulated hours.

Communication Skills in English(Revised)

Course Code- TH 1(a) (Common to 1st& 2nd Sem)

Period per week:	03	IA:	30 Marks
Total Period:	45	End Sem:	70 Marks
Timing of End Exam:	03 Hours	No of Credit:	03

Course outcomes:

At the end of this course, the students will be able to:

•Understand the meaning, process of communication, types of communication and barrier in communication and manner to communicate effectively.

•Comprehend soft skill and hard skill and to apply it in day to day life.

•Comprehend the seen passages and develop basic speaking and writing skills including proper usage of language and vocabulary so that they can become highly confident and skilled speakers and writers.

•Write personnel & business letter and drafting of notice and minutes of a meeting.

• Enhancement of vocabulary and apply English grammar rules correctly while framing a sentence, answer and writing letter, application etc and enhancement of vocabulary

Course Content

Unit-1 Communication: Theory and Practice (8 Hours)

- Basics of communication: Introduction, meaning and definition, process of communication
- Types of communication: formal and informal, verbal, non-verbal and barriers to effective communication
- **7** Cs for effective communication (considerate, concrete, concise, clear, complete, correct, courteous)
- Art of Effective communication
  - Choosing words
  - Voice
  - Modulation
  - Clarity
  - Time
  - Simplification of words
- Technical Communication

Unit-2 Soft Skills for Professional Excellence (5 Hours)

- Introduction: Soft Skills and Hard Skills
- Importance of Soft Skills
- Life Skills: Self-awareness and Self-analysis
- Applying Soft Skills across cultures

Unit-3: Reading Comprehension (12 hours)

Comprehension, vocabulary enhancement and grammar exercises based on reading of the following texts:

Section-1

- "An Astrologer's Day", "The Missing Mail", " Doctor's Word" by R.K. Narayan (*Malgudi Days*)
- "The Gift of the Magi" by O.Henry

Section-2

- "Stopping by Woods on a Snowy Evening" by Robert Frost,
- "Where the Mind is Without Fear" by Rabindranath Tagore

Unit-4: Professional Writing (10 hours)

- Summary writing and Report writing
- Letters: Business and Personal
- Drafting e-mail, notices, Minutes of a Meeting
- Filling-up different forms such as banks and on-line forms for placement

Unit-5: Vocabulary and Grammar (10 hours)

- Vocabulary of commonly used words
- Commonly used administrative terms (English only), One-word substitution, Parts of Speech, Active and Passive voice, Tenses , Punctuation

References:

1. M. Ashraf Rizvi. *Effective Technical Communication*. Mc-Graw Hill, 2002.
2. John Nielson. *Effective Communication Skills*. Xlibris, 2008.
3. *Roget's Thesaurus of English Words and Phrases*
6. Wren & Martin. *High School English Grammar and Composition*. S Chand,2024
7. A. J. Thomson & A. V. Martinet. *Practical English grammar*.Oxford University Press,1997
8. R.K.Narayan.*Malgudi Days*. Indian Thought Publications,2017
9. Sanjay.Kumar&Pushp.Lata. *Communication Skills*. Oxford University Press,2024

Introduction to IT Systems

Course Code- TH 1(b)

(Common to 1st & 2nd sem)

Period per week:	3	IA:	30 Marks
Total Period:	45	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	3

Course outcomes:

At the end of the course, students will be able to:

- ✓ Develop the skill to handle & operate computer and access the internet.
- ✓ Assemble the PC, install & configure OS and other software/Hardware.
- ✓ Design & develop the website using mark up language.
- ✓ Create and work with various office tools.
- ✓ Enhance the skill to protect the system and its information from cyber attacks.

Course Content:

UNIT 1:

Basic Internet skills: Understanding browser, efficient use of search engines, awareness about Digital
India portals (state and national portals) and college portals.

General understanding of various computer hardware components – CPU, Memory, Display, Key- board, Mouse, HDD and other Peripheral Devices.

UNIT 2:

OS Installation (Linux and MS Windows), Unix Shell and Commands, vi editor.

UNIT 3:

HTML4, CSS, making basic personal webpage.

UNIT 4:

Office Tools: OpenOffice Writer, OpenOffice Spreadsheet (Calc), OpenOffice Impress.

UNIT 5: Information security best practices.

Class lectures will only introduce the topic or demonstrate the tool, actual learning will take place in the Lab by practicing regularly.

Suggested Lab Work:

This is a skill course. Topics/concepts taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. This course is all about some theory and a lot of practice.

References:

1. Introduction to IT Systems (English) by Prof. Prashant Joshi (Download from https://ekumbh.aicte-india.org/dbook.php)
2. R.S. Salaria, Computer Fundamentals, Khanna Publishing House
3. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House
4. Online Resources, Linux man pages, Wikipedia
5. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett

Applied Physics –I
Course Code- TH 2
(Common to 1st Sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course Outcome:

After completion of the course the students will be able to:

1) Classify different physical quantities and derive their units and dimensions.

2) Differentiate between scalar and vector quantity and use its properties to understand physical laws & different types of motion .

3) Apply the basic concept of force, torque, work, energy, power, friction, Moment of Inertia to solve simple classical Mechanics problems.

4) Apply different laws of elasticity, hydro statics and hydro dynamics to calculate various mechanical properties of solid and fluids.

5) Analyze various modes of heat transfer and behaviour of matter under exposure of heat and select appropriate thermometer to measure various range of temperature in industrial application.

Course Content:

Unit 1: **Physical world, Units and Measurements**

Physical quantities; fundamental and derived, Units and systems of units (FPS, CGS and SI units),

Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimensions, Dimensional equations and their applications (conversion from one system of units to other, checking of dimensional equations and derivation of simple equations), Limitations of dimensional analysis.

Measurements: Need, measuring instruments, least count, types of measurement (direct, indirect), Errors in measurements (systematic and random), absolute error, relative error, error propagation, error estimation and significant figures.

Unit 2: Force and Motion

Scalar and Vector quantities – examples, representation of vector, types of vectors. Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product, Resolution of a Vector and its application to inclined plane and lawn roller.

Force, Momentum, Statement and derivation of conservation of linear momentum, its applications such as recoil of gun, rockets, Impulse and its applications.

Circular motion, definition of angular displacement, angular velocity, angular acceleration, frequency, time period, Relation between linear and angular velocity, linear

acceleration and angular acceleration (related numerical), Centripetal and Centrifugal forces with live examples, Expression and applications such as banking of roads and bending of cyclist.

Unit 3: Work, Power and Energy

Work: Concept and units, examples of zero work, positive work and negative work

Friction: concept, types, laws of limiting friction, coefficient of friction, reducing friction and its engineering applications, Work done in moving an object on horizontal and inclined plane for rough and plane surfaces and related applications.

Energy and its units, kinetic energy, gravitational potential energy with examples and derivations, mechanical energy, conservation of mechanical energy for freely falling bodies, trans- formation of energy (examples).

Power and its units, power and work relationship, calculation of power (numerical problems).

Unit 4: **Rotational Motion**

Translational and rotational motions with examples, Definition of torque and angular momentum and their examples, Conservation of angular momentum (quantitative) and its applications.

Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid); (Formulae only).

Unit 5: **Properties of Matter**

Elasticity: definition of stress and strain, moduli of elasticity, Hooke's law, significance of stress-strain curve.

Pressure: definition, units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications.

Surface tension: concept, units, cohesive and adhesive forces, angle of contact, Ascent Formula (No derivation), applications of surface tension, effect of temperature and impurity on surface tension.

Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature
on viscosity, application in hydraulic systems.

Hydrodynamics: Fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem (only formula and numericals) and its applications.

Unit 6: Heat and Thermometry

Concept of heat and temperature, modes of heat transfer (conduction, convection and radiation with examples), specific heats, scales of temperature and their relationship, Types of Thermometer (Mercury thermometer, Bimetallic thermometer, Platinum resistance thermometer, Pyrometer) and their uses.

Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them, Co-efficient of thermal conductivity, engineering applications.

References:

1. Applied Physics-I (English) by Prof. Vinod Kumar Yadav (down load from https://ekumbh.aicte-india.org/dbook.php)
2. 'Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
3. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi.
4. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
5. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
6. Engineering Physics by DK Bhhatacharya & PoonamTandan; Oxford University Press, New Delhi.
7. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
8. Practical Physics by C. L. Arora, S. Chand Publication.
9. e-books/e-tools/ learning physics software/websites etc.

Mathematics- I

Course Code- TH 3

(Common to 1st Sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course Outcomes:

At end of the course, the students will be able to:

(i) Acquire necessary background in Trigonometry to appreciate the importance of the geometric study as well as for the calculation and the mathematical analysis of engineering problems.

(ii) Find the effects of changing conditions on a system in probability and calculus.

(iii) Apply Complex numbers to physical phenomena.

(iv) Decompose rational function to partial fraction for computing the anti-derivative of a function.

Course Content:

UNIT - I: Trigonometry

Concept of angles, measurement of angles in degrees, grades and radians and their conversions, T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T- Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2).

Graphs of sin x, cos x, tan x and e^x .

UNIT-II: Differential Calculus

Definition of function; Concept of limits. Four standard limits $\lim_{x \to a} \frac{x^n - a^n}{x-a}$, $\lim_{x \to 0} \frac{\sin x}{x}$, $\lim_{x \to a} \left(\frac{a^x - 1}{x}\right)$ and $\lim_{x \to a} (1+x)^{\frac{1}{x}}$

Differentiation by definition of x^n, $\sin x$ $\cos x$, $\tan x$, e^x and $\log_a x$. Differentiation of sum, product and quotient of functions. Differentiation of function of a function. Differentiation of trigonometric and inverse trigonometric functions, Logarithmic differentiation, Exponential functions.

UNIT - III: Algebra

Complex Numbers: Definition, real and imaginary parts of a Complex number, polar and Cartesian, representation of a complex number and its conversion from one form to other, conjugate of a com- plex number, modulus and amplitude of a complex number Addition, Subtraction, Multiplication and Division of a complex number. De-movier's theorem, its application.

Partial fractions: Definition of polynomial fraction proper & improper fractions and definition of partial fractions. To resolve proper fraction into partial fraction with denominator containing non-repeated linear factors, repeated linear factors and irreducible non-repeated quadratic factors. To resolve improper fraction into partial fraction.

Permutations and Combinations: Value of ${}^{n}P_{r}$ and ${}^{n}C_{r}$.

Binomial theorem: Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof) first and second binomial approximation with applications to engineering problems

References:

✓ Mathematics-I by Dr. Deepak Singh (Download from https://ekumbh.aicte-india.org/dbook.php)

✓ B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.

✓ G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.

✓ Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 2018)

✓ V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Engineering Mathematics, 6/e., Vikas Publishing House.

✓ Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

Fundamentals of Electrical & Electronics Engineering

Course Code- TH 4(a)

(Common to 1st & 2nd Sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course Outcome-

At the end of this course, the students will be able to:

- ✓ Identify & analyze different types of electronics components and signals.
- ✓ Analyze basic op-amp circuits and digital circuits.
- ✓ Develop the concept on Electrical and magnetic circuit parameters.
- ✓ Acquire knowledge of Machines & Transformer.
- ✓ Develop knowledge on AC circuit & solve numericals.

Course Content:

UNIT I Overview of Electronic Components & Signals:

Passive Active Components: Resistances, Capacitors, Inductors, Diodes, Transistors, FET, MOS and CMOS and their Applications. (Concept and simple problems of Resistance, Capacitor & Inductor, Definition, classification and Working of diode(PN juction,LED, Zener), transistor, FET, Concept of MOS and CMOS)

Signals: DC/AC, voltage/current, periodic/non-periodic signals, average, rms, peak values, different types of signal waveforms, Ideal/non-ideal voltage/current sources, independent/dependent voltage current sources. (Definitions)

UNIT II Overview of Analog Circuits:

Operational Amplifiers-Ideal Op-Amp, Practical op amp, Open loop and closed loop configurations, Application of Op-Amp as amplifier, adder, differentiator and integrator.

UNIT III Overview of Digital Electronics: Introduction to Boolean Algebra, Electronic Implementation of Boolean Operations, Gates-Functional Block Approach (Simple problems of Number system)

Storage elements-Flip Flops-A Functional block approach, Counters: Ripple, Up/down and decade, Introduction to digital IC Gates (of TTL Type).

Unit IV Electric and Magnetic Circuits:

EMF, Current, Potential Difference, Power and Energy; M.M.F, magnetic force, permeability, hysteresis loop, reluctance, leakage factor and BH curve; Electromagnetic induction, Faraday's laws of electromagnetic induction, Lenz's law; Dynamically induced emf; Statically induced emf; Equations of self and mutual inductance; Analogy between electric and magnetic circuits.

Unit V A.C. Circuits:

Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor Peak Factor, impedance, phase angle, and power factor; Mathematical and phasor representation of alternating emf and current; Voltage and Current relationship in Star and Delta connections; A.C in resistors, inductors and capacitors; A.C in R-L series, R-C series, R-L-C series and parallel circuits; Power in A. C. Circuits, power triangle.

Unit VI (Revised) Transformer and Machines: General construction and principle of different type of transformers; Emf equation and transformation ratio of transformers; Auto transformers; Construction and Working principle of DC motors; Basic equations and characteristic of motors.

References:

1. Fundamentals of Electrical and Electronics Engineering by Prof. Susan S. Mathew (Download from https://ekumbh.aicte-india.org/dbook.php)
2. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House
3. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN : 978-0-07-0088572-5
4. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN : 9781107464353
5. Theraja, B. L., Electrical Technology Vol – I, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924405
6. Theraja, B. L., Electrical Technology Vol – II, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924375
7. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN : 97881236529513
8. Sedha, R.S., A text book of Applied Electronics, S.Chand, New Delhi, 2008, ISBN-13: 978-8121927833
9. Malvino, Albert Paul, David, Electronics Principles, McGraw Hill Education, New Delhi,2015, ISBN-13**:** 0070634244-978
10. Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi, 2014, ISBN-13-9788121924504
11. Bell Devid, Fundamental of Electronic Devices and Circuits, Oxford University Press, NewDelhi 2015 ISBN : 9780195425239

Engineering Mechanics

Course Code- TH 4(b)

(Common to 1st & 2nd sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	Term End Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course outcomes:

After completing this course, student will be able to:

1. Analyze the coplanar force system and find out the resultant force of this system by applying basics of mechanics.
2. Determine unknown forces of different engineering systems by applying laws of equilibrium.
3. Apply the principle of friction in various conditions when the object is in static equilibrium.
4. Find the centroid and centre of gravity of various components in engineering system.
5. Analyze different simple machines to find out different influencing parameters viz. Mechanical Advantage, Velocity Ratio and Efficiency.

Course Contents:

Unit – I Basics of mechanics and force system

Significance and relevance of Mechanics, Applied mechanics, Statics, Dynamics.

Space, time, mass, particle, flexible body and rigid body.

Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units.

Force – unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification.

Resolution of a force - Orthogonal components of a force, moment of a force, Varignon's Theorem.

Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon of forces.

Unit– II Equilibrium

Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical methods of analysing equilibrium

Lami's Theorem – statement and explanation, Application for various engineering problems.

Types of beam, supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, uniformly distributed load, couple),

Beam reaction for cantilever, simply supported beam with or without overhang – subjected to combination of Point load and uniformly distributed load.

Beam reaction graphically for simply supported beam subjected to vertical point loads only.

Unit– III Friction

Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction.

Equilibrium of bodies on level surface subjected to force parallel and inclined to plane.

Equilibrium of bodies on inclined plane subjected to force parallel to the plane only.

Unit– IV Centroid and centre of gravity

Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle)

Centroid of composite figures composed of not more than three geometrical figures

Centre of Gravity of simple solids (Cube, cuboid, cone, cylinder, sphere, hemisphere)
Centre of Gravity of composite solids composed of not more than two simple solids.

Unit – V Simple lifting machine

Simple lifting machine, load, effort, mechanical advantage, applications and advantages. Velocity
ratio, efficiency of machines, law of machine.

Ideal machine, friction in machine, maximum Mechanical advantage and efficiency, reversible and non-reversible machines, conditions for reversibility

Velocity ratios of Simple axle and wheel, Differential axle and wheel, Worm and worm wheel, Single purchase and double purchase crab winch, Simple screw jack, Weston's differential pulley block, geared pulley block.

Suggested Learning Resources:

1. Engineering Mechanics by Prof. Bhankhar Bharat Gokaldas (Download from https://ekumbh.aicte-india.org/dbook.php)
2. D.S. Bedi, Engineering Mechanics, Khanna Publications, New Delhi (2008)
3. Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi.
4. Bansal R K, A text book of Engineering Mechanics, Laxmi Publications.
5. Ramamrutham, Engineering Mechanics, S. Chand & Co. New Delhi.
6. Dhade, Jamadar & Walawelkar, Fundamental of Applied Mechanics, Pune Vidhyarthi Gruh.
7. Ram, H. D.; Chauhan, A. K., Foundations and Applications of Applied Mechanics, Cam- bridge University Press.
8. Meriam, J. L., Kraige, L.G., Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.

Environmental Science

Course Code-TH 5(a)

(Common to 1st & 2nd sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course outcomes

At the end of the course student will be able to

1. Understand the ecosystem and terminology and solve various engineering problems applying ecosystem knowledge to produce eco-friendly products.
2. Understand the suitable air, extent of noise pollution, and control measures and acts.
3. Understand the water and soil pollution, and control measures and acts.
4. Understand different renewable energy resources and efficient process of harvesting.
5. Understand solid Waste Management, ISO 14000 & Environmental Management

Course Content:

Unit-1 Ecosystem

Structure of ecosystem, Biotic & Abiotic components Food chain and food web

Aquatic (Lentic and Lotic) and terrestrial ecosystem Carbon, Nitrogen, Sulphur, Phosphorus cycle.

Global warming -Causes, effects, process, Green House Effect, Ozone depletion

Unit– 2 Air and, Noise Pollution

Definition of pollution and pollutant, Natural and man made sources of air pollution (Refrigerants, I.C., Boiler)

Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator)

Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler

Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000

Unit- 3 Water and Soil Pollution

Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation

Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis).

Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.

Unit– 4 Renewable sources of Energy

Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills.

Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas.

Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy.

New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin and power plants of geothermal energy

Unit-5 Solid Waste Management, ISO 14000 & Environmental Management 06 hours

Solid waste generation- Sources and characteristics of : Municipal solid waste, E- waste, bio-medical waste.

Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries.

Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste.

Air quality act 2004, air pollution control act 1981 and water pollution and control act1996.

Structure and role of Central and state pollution control board.

Concept of Carbon Credit, Carbon Footprint. Environmental management in fabrication industry. ISO14000: Implementation in industries, Benefits.

References:

(a) Suggested Learning Resources:

Books:

1. Environmental Science (English) by Dr. Subrat Roy (Download from https://ekumbh.aicte-india.org/dbook.php)
2. S.C. Sharma & M.P. Poonia, Environmental Studies,Khanna Publishing House,NewDelhi
3. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
4. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099-
5. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940.
6. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi
7. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
8. Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi, 1988, ISBN: 0-07- 451871-8.
9. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 1978, ISBN: 9780070354760.

10. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.

11. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993-502-6

12. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.

13. Keshav Kant, Air Pollution & Control, Khanna Publishing House, New Delhi (Edition 2018)

(b) Open source software and website address:

1) www.eco-prayer.org
2) www.teriin.org
3) www.cpcp.nic.in
4) www.cpcp.gov.in
5) www.indiaenvironmentportal.org.in
6) www.whatis.techtarget.com
7) www.sustainabledevelopment.un.org
8) www.conserve-energy-future.com)

Teachers should use the following strategies to achieve the various outcomes of the course.

- Different methods of teaching and media to be used to attain classroom attention.
- Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
- 15-20% of the topics which are relatively simpler of descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations.
- Micro-projects may be given to group of students for hand-on experiences.
- Encouraging students to visit to sites such as Railway station and research establishment around the institution.

Applied Chemistry

Course Code- TH 5(b)

(Common to 1st & 2nd sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course Outcome:

After completing this course, student will be able to:

1) Solve various engineering problems applying the basic knowledge of atomic, molecular, electronic modifications and Chemical bonding by analyzing the technology based on them.
2) Identify the problems associated with raw water used in drinking & boilers and sewage water and solve the problems by using different water treatment methods.
3) Analyze the properties engineering materials and substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.
4) Use relevant fuel and lubricants for domestic and industrial applications
5) To impart knowledge on the essential aspects of electrochemical cells, emf, applications of emf measurements and understand the Principles of corrosion and corrosion control.

- **Unit 1: Atomic Structure, Chemical Bonding and Solutions**

Rutherford model of atom, Bohr's theory (expression of energy and radius to be omitted), and hydrogen spectrum explanation based on Bohr's model of atom, Heisenberg uncertainty principle, Quantum numbers – orbital concept. Shapes of s,p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration.

Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding (NaCl example), covalent bond (H_2, F_2, HF hybridization in $BeCl_2$, BF_3, CH_4, NH_3, H_2O), coordination bond in NH_4^+, and anomalous properties of NH_3, H_2O due to hydrogen bonding, and metallic bonding.

Solution – idea of solute, solvent and solution, methods to express the concentration of solution molarity (*M* = mole per liter), ppm, mass percentage, volume percentage and mole frac tion.

- **Unit 2: Water**

Graphical presentation of water distribution on Earth (pie or bar diagram). Classification of soft and hard water based on soap test, salts causing water hardness, unit of hardness and simple numerical on water hardness.

Cause of poor lathering of soap in hard water, problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion etc), and quantitative measurement of water hardness by ETDA method, total dissolved solids (TDS) alkalinity estimation.

I) Water softening techniques – soda lime process, zeolite process and ion exchange process.

II) Municipal water treatment (in brief only) – sedimentation, coagulation, filtration, sterilization.

Water for human consumption for drinking and cooking purposes from any water sources and enlist Indian standard specification of drinking water (collect data and understand standards).

- **Unit 3: Engineering Materials**

  Natural occurrence of metals – minerals, ores of iron, aluminium and copper, gangue (matrix), flux, slag, metallurgy – brief account of general principles of metallurgy.

  Extraction of - iron from haematite ore using blast furnace, aluminium from bauxite along with reactions. Alloys – definition, purposes of alloying, ferrous alloys and non-ferrous with suitable examples, properties and applications.

  General chemical composition, composition based applications (elementary idea only details omitted):

  Port land cement and hardening, Glasses Refractory and Composite materials.

  Polymers – monomer, homo and co polymers, degree of polymerization, simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (using PVC, PS, PTFE, nylon – 6, nylon-6,6 and Bakelite), rubber and vulcanization of rubber.

- **Unit 4: Chemistry of Fuels and Lubricants**

  Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV), calculation of HCV and LCV using Dulong's formula.

  Proximate analysis of coal solid fuel

  petrol and diesel - fuel rating (octane and cetane numbers),

  Chemical composition, calorific values and applications of LPG, CNG, water gas, coal gas, producer gas and biogas.

  Lubrication – function and characteristic properties of good lubricant, classification with examples, lubrication mechanism – hydrodynamic and boundary lubrication, physical proper- ties (viscosity and viscosity index, oiliness, flash and fire point, could and pour point only) and chemical properties (coke number, total acid number saponification value) of lubricants.

- **Unit 5: Electro Chemistry**

  Electronic concept of oxidation, reduction and redox reactions.

  Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws of electrolysis and simple numerical problems.

  Industrial Application of Electrolysis –
  - Electrometallurgy
  - Electroplating
  - Electrolytic refining.

  Application of redox reactions in electrochemical cells –
  - Primary cells – dry cell,
  - Secondary cell - commercially used lead storage battery, fuel and

  Solar cells. Introduction to Corrosion of metals –
  - definition, types of corrosion (chemical and electrochemical), H_2 liberation and O_2 absorption mechanism of electrochemical corrosion, factors affecting rate of corrosion.

  Internal corrosion preventive measures –
  - Purification, alloying and heat treatment and

External corrosion preventive measures: a) metal (anodic, cathodic) coatings, b) organic inhibitors.

Suggested Sessional work:

- **Unit 1: Atomic Structure, Chemical Bonding and Solutions**

  Assignments: Writing electronic configuration of elements up to atomic number 30 (Z= 30). Numerical on molarity, ppm, mass percentage, volume percentage and mole fraction of given solution.

  Seminar: 1. Quantum numbers,

  2. Discuss the metallic properties such as malleability, ductility, hardness, high melting point, conductance of heat and electricity, magnetic properties of metals.

  Projects: Model of molecules $BeCl_2$, BF_3, CH_4, NH_3, H_2O.

- **Unit 2: Water**

  Assignments: Simple problems on hardness calculation.

  Seminar: 1. Quality and quantity requirement of water in house and industry.

  2. Quality of control measures of effluents (BOD & COD).

  Projects: Collect water samples from different water sources and measure of hardness of water.

- **Unit 3: Engineering Materials**

  Assignments: Preparation of table showing different ores of iron, copper and aluminium metals along with their chemical compositions and classify in to oxide sulphide halide ores.

  Seminar: Discuss the chemical reactions taking place in blast furnace in extraction
  of Fe, Cu and Al metals.

  Projects: Make table showing place of availability of different ores in India and show places on India map.

- **Unit 4: Chemistry of Fuels and Lubricants**

  Assignments: Calculation of HCV and LCV of fuel using fuel composition in Dulong's formula.

  Seminar: Chemical structure of fuel components influence on fuel rating.

  Projects: Mapping of energy resources in India. Collection of data of various lubricants available in the market.

- **Unit 5: Electro Chemistry**

  Assignments: Simple problems on Faradays laws of electrolysis.

  Seminar: 1. Corrosion rate and units.
  2. Corrosion preventions.

  Projects: Mapping of area in India prone to corrosion. Collection of data of various electrochemical cells batteries used in equipment and devices and avail- able in market. Visit to sites such as Railway station to watch corrosion area in railways and research establishment in and around the institution.

References/Suggested Learning Resources:

(a) Books :

✓ Applied Chemistry by Dr. Anju Rawlley (Download from https://ekumbh.aicte-india.org/dbook.php)
✓ Text Book of Chemistry for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
✓ Agarwal, & Shikha, Engineering Chemistry, Cambridge University Press; New Delhi, 2015.
✓ C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
✓ Dara, S. S. & Dr.S.S.Umare, Engineering Chemistry, S.Chand. Publication, New Delhi, New Del- hi, 2015.
✓ Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.
✓ Dr. Vairam, S., Engineering Chemistry, Wiley India Pvt.Ltd., New Delhi, 2013.
✓ Dr. G. H. Hugar & Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
✓ Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.

(b) Open source software and website address:

1. www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2. www.visionlearning.com (Atomic structure and chemical bonding)
3. www.chem1.com (Atomic structure and chemical bonding)
4. https://www.wastewaterelearning.com/elearning/ (Water Treatment)
5. www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials)
6. www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf (Fuel and Combustion)
7. www.chemcollective.org (Metals, Alloys)
8. www.wqa.org(Water Treatment)

Communication Skills in English Lab(Revised)

Course Code- PR 1(a)

(Common to 1st& 2nd Sem)

Period per week:	04	Sessional	25 Marks
Total Period:	60	End Sem:	----
Timing of End Exam:	---	No of Credit:	02

COURSE OUTCOME:

After completion of the course the students will be able to:

1. Apply 4s i.e Listening, Speaking, Reading and Writing effectively in day to day life.
2. Use of correct pronunciation, intonation, stress, rhythm, speed and pause while communicating with others .
3. Comprehend the basic etiquette of interview, GD, Conversation and Presentation
4. Analyze a given topic and way to present it.
5. Build vocabulary and use in every day situation.

Course Content:

Unit 1 : Listening Skills (10 hours)

Listening Process and Practice: Introduction to recorded lectures, poems, interviews and speeches, listening tests

Unit II : Introduction to Phonetics (20 hours)

Sounds: Consonant, Vowel, Diphthongs, Transcription of Words (IPA), weak forms, syllable division, word stress, intonation, voice

Unit III : Speaking Skills (30 hours)

Standard and formal speech: Group Discussion, Oral Presentations, Public Speaking, Business Presentations, Conversation practice and Role play

Recommended Readings:

1. Bansal And Harrison. *Spoken English*. Orient Black Swan, 2011.
2. James Hartman & et al. Ed. *English Pronouncing Dictionary.* Cambridge: Cambridge University Press, 2006.
3. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, New Delhi (Revised Ed. 2018)
4. J.D.O'Connor. *Better English Pronunciation.* Cambridge: Cambridge University Press, 1980.
5. Lindley Murray. *An English Grammar: Comprehending Principles and Rules.* London: Wilson and Sons, 1908.
6. Margaret M. Maison. *Examine your English.* Orient Longman: New Delhi, 1964.
7. J.Sethi & et al. *A Practice Course in English Pronunciation*. New Delhi: Prentice Hall, 2004.
8. Pfeiffer, William Sanborn and T.V.S Padmaja. *Technical Communication: A Practical Approach*. 6th edn. Delhi: Pearson, 2007.

8. Pfeiffer, William Sanborn and T.V.S Padmaja. *Technical Communication: A Practical Approach*. 6th ed. Delhi: Pearson, 2007.

Introduction to IT System Lab

Course Code- PR 1(b)

(Common to 1st & 2nd sem)

Period per week:	4	Sessional:	25 Marks
Total Period:	60	End Sem Exam:	---
Timing of End Exam:	---	No. Of Credit:	2

Course outcomes:

At the end of the course students will be able to:

1) Analyze the components of computer hardware such as ports, interfaces, cables etc. and assemble them.
2) Install & configure Linux/Windows Operating System and explore the security features/tools of OS.
3) Create & work with various Office Tools.
4) Apply the knowledge to access browsers, search engines, Web Pages and understand the features of government sites/portals by accessing the services offered by them.
5) Design & Develop the Web Pages by using mark-up language /scripts.

Course Content:

S.No.	Topics for Practice
1	Browser features, browsing, using various search engines, writing search queries
2	Visit various e-governance/Digital India portals, understand their features, services offered
3	Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognize various ports/interfaces and related cables, etc.
4	Install Linux and Windows operating system on identified lab machines, explore various options, do it multiple times.
5	Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.
6	Practice HTML commands, try them with various values, make your own Webpage
7	Explore features of Open Office tools, create documents using these features, do it multiple times.
8	Explore security features of Operating Systems and Tools, try using them and see what happens.

This is a skill course. More you practice, better it will be.

References:

1) Introduction to IT Systems (English) by Prof. Prashant Joshi (Download from https://ekumbh.aicte-india.org/dbook.php)
2) Online resources, Linux man pages, Wikipedia.
3) R.S. Salaria, Computer Fundamentals, Khanna Publishing House.

4) Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House.
5) Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett.
6) IT Essentials PC Hardware and Software Companion Guide, Davis Anfinson and Ken Quamme, CISC Press, Pearson Education.
7) PC Hardware and A+ Handbook, Kate J. Chase PHI (Microsoft).

Applied Physics-I Lab

Course Code- PR 2

(Common to 1st sem)

Period per week:	2	Sessional:	25 Marks
Total Period:	30	End Sem Exam:	25 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	1

List of Practical's/Activities (To perform minimum 8 practicals).

1. To measure length, radius of a given cylinder, a test tube and a beaker using a Vernier caliper and find volume of each object.
2. To determine diameter of a wire, a solid ball and thickness of cardboard using a screw gauge.
3. To determine radius of curvature of a convex and a concave mirror/surface using a spherometer.
4. To verify triangle and parallelogram law of forces.
5. To find the co-efficient of friction between wood and glass using a horizontal board.
6. To determine force constant of a spring using Hook's Law.
7. To verify law of conservation of mechanical energy (PE to KE).
8. To find the moment of inertia of a flywheel.
9. To find the viscosity of a given liquid (Glycerin) by Stoke's law.
10. To find the coefficient of linear expansion of the material of a rod.
11. To determine atmospheric pressure at a place using Fortin's barometer.
12. To measure room temperature and temperature of a hot bath using mercury thermometer and convert it into different scales.

SUGGESTED STUDENT ACTIVITES & STRATEGIES

Apart from classroom and laboratory learning following are the suggested student related activities which can be undertaken to accelerate the attainment of various outcomes of the course

a. Make survey of different physical products and compare the following points
   - Measurements of dimensions
   - Properties
   - Applications
b. Library survey regarding engineering materials/products used in different industries
c. Seminar on any relevant topic.

Teachers should use the following strategies to achieve the various outcomes of the course.

- Different methods of teaching and media to be used to attain classroom attention.
- Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
- 15-20% of the topics which are relatively simpler of descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations.
- Micro-projects may be given to group of students for hand-on experiences.

References:

1. Applied Physics-I (English) by Prof. Vinod Kumar Yadav (Download from https://ekumbh.aicte-india.org/dbook.php)
2. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
3. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P)Ltd.,
4. Practical Physics by C. L. Arora, S. Chand Publication.
5. e-books/e-tools/ learning physics software/YouTube videos/websites etc.

Engineering Graphics

Course Code- PR 3(a)

(Common to 1st & 2nd sem)

Period per week:	4	Sessional:	25 Marks
Total Period:	60	End Sem Exam	75 Marks
Timing of End Exam:	4 Hours	No. Of Credit	2

Course Outcomes

At the end of this course, the students will be able to:

1) Select and construct appropriate drawing scales, use drawing equipment's, and understand Indian Standards of engineering drawing
2) Draw views of given object and components
3) Sketch orthographic projections into isometric projections and vice versa.
4) Apply computer aided drafting tools to create 2D engineering drawings

Course Content

Unit – I Basic elements of Drawing

Drawing Instruments and supporting materials: method to use them with applications.
Convention of lines and their applications.
Representative Fractions – reduced, enlarged and full size scales; Engineering Scales such as plain and diagonal scale.

Dimensioning techniques as per SP-46:2003 – types and applications of chain, parallel and coordinate dimensioning.

Geometrical and Tangency constructions. (Redraw the figure)

Unit – II Orthographic projections

Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications. (No question to be asked in examination).

Introduction to orthographic projection, First angle and Third angle method, their symbols.

Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle Projection method only)

Unit – III Isometric Projections

Introduction to isometric projections. Isometric scale and Natural scale.

Isometric view and isometric projection.

Illustrative problems related to objects containing lines, circles and arcs shape only.

Conversion of orthographic views into isometric view/projection.

Unit – IV Free Hand Sketches of engineering elements

Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washer, Locking arrangements. (For branches other than mechanical Engineering, the teacher should select branch specific elements for free hand sketching)

Free hand sketches of orthographic view (on squared graph paper) and isometric view (on isometric grid paper)

Unit – V Computer aided drafting interface

Computer Aided Drafting: concept.

Hardware and various CAD software available.

System requirements and Understanding the interface.

Components of AutoCAD software window: Title bar, standard tool bar, menu bar, object properties tool bar, draw tool bar, modify tool bar, cursor cross hair. Command window, status bar, drawing area, UCS icon.

File features: New file, Saving the file, Opening an existing drawing file, Creating templates, Quit.

Setting up new drawing: Units, Limits, Grid, Snap. Undoing and redoing action.

Unit – VI Computer aided drafting

Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, PolyLine.

Method of Specifying points: Absolute coordinates, Relative Cartesian and Polar coordinates.

Modify and edit commands like trim, extend, delete, copy, offset, array, block, layers.

Dimensioning: Linear, Horizontal Vertical, Aligned, Rotated, Baseline, Continuous, Diameter, Radius, Angular Dimensions.

Dim scale variable.

Editing dimensions.

Text: Single line Text, Multiline text.

Standard sizes of sheet. Selecting Various plotting parameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plot area, print preview.

S. No.	Practical Exercises	Unit No.
1	Draw horizontal, Vertical, 30 degree, 45 degree, 60 and 75 degrees lines, different types of lines, dimensioning styles using Tee and Set squares/ drafter. (do this exercise in sketch book)	I
2	Write alphabets and numerical (Vertical only) (do this exercise in sketch book)	I
3	Draw regular geometric constructions and redraw the given figure (do this exercise in sketch book) Part I	II
4	Draw regular geometric construction and redraw the given figure (do this exercise in sketch book) Part II	II
5	Draw a problem on orthographic projections using first angle method of projection having plain surfaces and slanting. Part I	III
6	Draw another problem on orthographic projections using first angle method of projection having slanting surfaces with slots. Part II	III
7	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs. Part I	III
8	Draw two problems on Isometric view of simple objects having plain and slant- ing surface by using natural scale. Part I	IV
9	Draw some problems on Isometric projection of simple objects having cylindrical surface by using isometric scale. Part I	IV
10	Draw free hand sketches/ conventional representation of machine elements in sketch book such as thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements. Part I	V

11	Problem based Learning: Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views in sketch book. Part I	III, II, V
12	Draw basic 2D entities like: Rectangle, Rhombus, Polygon using AutoCAD (Print out should be a part of progressive assessment). Part I	V
13	Draw basic 2D entities like: Circles, Arcs, circular using AutoCAD (Printout should be a part of progressive assessment). Part II	V
14	Draw basic 2D entities like: Circular and rectangular array using AutoCAD (Printout should be a part of progressive assessment). Part III	V
15	Draw blocks of 2D entities comprises of Rectangle, Rhombus, Polygon, Circles, Arcs, circular and rectangular array, blocks using AutoCAD (Print out should be a part of progressive assessment). Part IV	V
16	Draw basic branch specific components in 2D using AutoCAD (Print out should be a part of term work). Part I	VI
17	Draw complex branch specific components in 2D using AutoCAD (Print should be a part of progressive assessment). Part I	VI

SUGGESTED LEARNING RESOURCES

1. Engineering Graphics (English) by Dr. Sharad K. Pradhan (Download from https://ekumbh.aicte-india.org/dbook.php)
2. Bureau of Indian Standards. *Engineering Drawing Practice for Schools and Colleges IS: Sp-46.* BIS. Government of India, Third Reprint, October 1998; ISBN: 81-7061-091-2.
3. Bhatt, N. D. *Engineering Drawing*. Charotar Publishing House, Anand, Gujrat 2010; ISBN: 978-93- 80358-17-8.
4. Jain & Gautam, Engineering Graphics & Design, Khanna Publishing House, New Delhi (ISBN: 978- 93-86173-478)
5. Jolhe, D. A. *Engineering Drawing*. Tata McGraw Hill Edu. New Delhi, 2010; ISBN: 978-0-07- 064837-1
6. Dhawan, R. K. *Engineering Drawing*. S. Chand and Company, New Delhi; ISBN: 81-219-1431-0.
7. Shah, P. J. *Engineering Drawing*. S. Chand and Company, New Delhi, 2008, ISBN:81-219-2964-4.
8. Kulkarni, D. M.; Rastogi, A. P.; Sarkar, A. K. *Engineering Graphics with AutoCAD*. PHI Learning Pri- vate Limited-New Delhi (2010); ISBN: 978-8120337831.
9. Jeyapoovan, T. *Essentials of Engineering Drawing and Graphics using AutoCAD*. Vikas Publishing HousePvt. Ltd, Noida, 2011; ISBN: 978-8125953005.
10. Autodesk. *AutoCAD User Guide*. Autodesk Press, USA, 2015.
11. Sham, Tickoo. *AutoCAD 2016 for Engineers and Designers*. Dreamtech Press; Galgotia Publication, New Delhi, 2015; ISBN 978-9351199113.

Software/Learning Websites

1. https://www.youtube.com/watch?v=TJ4jGyD-WCw
2. https://www.youtube.com/watch?v=dmt6_n7Sgcg
3. https://www.youtube.com/watch?v=_MQScnLXL0M
4. https://www.youtube.com/watch?v=3WXPanCq9LI
5. https://www.youtube.com/watch?v=fvjk7PlxAuo
6. http://www.me.umn.edu/coursesme2011/handouts/engg%20graphics.pdf
7. https://www.machinedesignonline.com

Engineering Workshop Practice

Course Code- PR 3(b)

(Common to 1st & 2nd sem)

Period per week:	4	Sessional:	25 Marks
Total Period:	60	End Sem Exam:	75 Marks
Timing of End Exam:	4 Hours	No. Of Credit:	2

Course outcomes

At the end of the course, the student will be able to:

✓ Acquire skills in basic engineering practice to identify, select and use various marking, measuring, and holding, striking and cutting tools & equipment's and machines.

✓ Understand job drawing and complete jobs as per specifications in allotted time.

✓ Inspect the job for the desired dimensions and shape.

✓ Operate, control different machines and equipment's adopting safety practices.

Course Content:

S.No.	Details Of Practical Content
I	**Carpentry:** i) Demonstration of different wood working tools / machines. ii) Demonstration of different wood working processes, like plaining, marking, chiseling, grooving, turning of wood etc. iii) One simple job involving any one joint like mortise and tenon dovetail, bridle, half lap etc.
II	**Fitting:** i) Demonstration of different fitting tools and drilling machines and power tools ii) Demonstration of different operations like chipping, filing, drilling, tapping, sawing, cutting etc. iii) One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc
III	**Welding:** i) Demonstration of different welding tools / machines. ii) Demonstration on Arc Welding, Gas Welding, MIG, MAG welding, gas cutting and rebuilding of broken parts with welding. iii) One simple job involving butt and lap joint
IV	**Sheet Metal Working:** i) Demonstration of different sheet metal tools / machines. ii) Demonstration of different sheet metal operations like sheet cutting, bending, edging, end curling, lancing, soldering, brazing, and riveting. iii) One simple job involving sheet metal operations and soldering and riveting.
V	**Electrical House Wiring:** Practice on simple lamp circuits (i) one lamp controlled by one switch by surface conduit wiring, (ii) Lamp circuits- connection of lamp and socket by separate switches, (iii) Connection of Fluorescent lamp/tube light, (iv) simple lamp circuits-in- stall bedroom lighting. And (v) Simple lamp circuits- install stair case wiring.
VI	**Demonstration:** i) Demonstration of measurement of Current, Voltage, Power and Energy. ii) Demonstration of advance power tools, pneumatic tools, electrical wiring tools and accessories. iii) Tools for Cutting and drilling

References:

1. Engineering Workshop Practice (English) by Dr. A. K. Sarathe (Download from https://ekumbh.aicte-india.org/dbook.php)
2. S.K. Hajara Chaudhary, Workshop Technology, Media Promoters and Publishers, New Delhi, 2015
3. B.S. Raghuwanshi, Workshop Technology, Dhanpat Rai and sons, New Delhi 2014
4. K. Venkat Reddy, Workshop Practice Manual, BS Publications, Hyderabad 2014
5. Kents Mechanical Engineering Hand book, John Wiley and Sons, New York

Fundamental of Electrical & Electronics Engineering Lab(*Revised*)

Course Code-PR4(a)

(Common to1st & 2nd Sem)

Period per week:	2	Sessional:	25 Marks
Total Period:	30	End Sem Exam:	---
Timing of End Exam:	---	No.of Credit:	1

Course Outcomes:

After completion of the course the students will be able to:

1. Classify different type of magnetic material by calculating permeability using B-H curve.
2. Calculate voltage, current and power in 1-phase and 3-phase circuit by connecting different load (R, R-L, R-C)
3. Determine the transformation ratio(K) other parameters of single phase transformer.
4. Distinguish various electronic components and measure values using multimeter,
5. Draw the input and output characteristics of transistor and Diodes and identify the region of operation.

Suggested Practicals/Exercises:

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

Sl.No.	List of the Practical
1.	Determine the permeability of magnetic material by plotting its B-H curve
2.	Measure voltage, current and power in 1-phase circuit with resistive load
3.	Measure voltage, current and power in R-L series circuit
4.	Determine the transformation ratio(K) of 1-phase transformer
5.	Connect single phase transformer and measure input and output quantities
6.	Make Star and Delta connection in starter to run induction motor
7.	Identify various passive and active electronics components
8.	Connect resistors in series and parallel combination and measure its value using digital multimeter
9.	Connect capacitors in series and parallel combination and measure its value using multimeter
10.	Use multimeter to measure the value of given resistor and determine the value to confirm with colour code
11.	Test the PN-junction diode and LED using digital multimeter
12.	Test the performance of PN-junction diode
13.	Test the performance of Zener diode
14.	Identify three terminals of a transistor using digital multimeter
15.	Test the performance of NPN transistor

Engineering Mechanics Lab

Course Code- PR 4(b)

(Common to 1st & 2nd sem)

Period per week:	2	Sessional:	25 Marks
Total Period:	30	End Sem Exam:	---
Timing of End Exam:	---	No. Of Credit:	1

Course outcomes:

After completion of the course the students will be able to:

1. Analyze different simple machines to find out different influencing parameters viz. Mechanical Advantage, Velocity Ratio and Efficiency.
2. Understand the phenomena of friction in different condition and make analysis through experiment to find out coefficient of friction.
3. Determine resultant of various force systems and analyse the equilibrium of a rigid body by Lamis theorem.
4. Analyse and find out the value of support reactions of different types of beam.
5. Determine Centroid of geometrical plane figures.

List of Practical to be performed:

1. To study various equipments related to Engineering Mechanics.
2. To find the M.A., V.R., Efficiency and law of machine for Differential Axle and Wheel.
3. To find the M.A., V.R., Efficiency and law of machine for Simple Screw Jack.
4. Derive Law of machine using Worm and worm wheel.
5. Derive Law of machine using Single purchase crab.
6. Derive Law of machine using double purchase crab.
7. Derive Law of machine using Weston's differential or wormed geared pulley block.
8. Determine resultant of concurrent force system applying Law of Polygon of forces using force table.
9. Determine resultant of concurrent force system graphically.
10. Determine resultant of parallel force system graphically.
11. Verify Lami's theorem.
12. Study forces in various members of Jib crane.
13. Determine support reactions for simply supported beam.
14. Obtain support reactions of beam using graphical method.
15. Determine coefficient of friction for motion on horizontal and inclined plane.
16. Determine centroid of geometrical plane figures.

Suggested Learning Resources:

1. Engineering Mechanics by Prof. Bhankhar Bharat Gokaldas (Download from https://ekumbh.aicte-india.org/dbook.php)
2. Bedi D.S., Engineering Mechanics, Khanna Publishing House
3. Khurmi, R.S., Applied Mechanics, S.Chand & Co. New Delhi.
4. Bansal R K, A text book of Engineering Mechanics, Laxmi Publications.
5. Ramamrutham, Engineering Mechanics, S.,S Chand & Co. New Delhi.
6. Dhade, Jamadar & Walawelkar, Fundamental of Applied Mechanics, Pune Vidhyarthi Gruh.
7. Ram, H. D.; Chauhan, A. K. Foundations and Applications of Applied Mechanics, Cambridge Uni- versity Press.
8. Meriam, J. L., Kraige, L.G. , Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.

Sports and Yoga (*Revised*)

Course Code- PR 5(a)
(Common to 1st & 2nd Sem)

Period per week:	2	Sessional:	50 Marks
Total Period:	30	End Sem Exam:	-------
		No. Of Credit:	1

Course Outcomes:

On successful completion of the course the students will be able to:

(i) Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.

(ii) Learn breathing exercises and healthy fitness activities

(iii) Understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.

(iv) Perform yoga movements in various combination and forms.

(v) Identify opportunities for participation in yoga and sports activities.

(vi) Improve personal fitness through participation in sports and yogic activities.

(vii) Assess yoga activities in terms of fitness value.

Course Content:

- **Physical Fitness, Wellness & Lifestyle**
  - Meaning & Importance of Physical Fitness & Wellness
  - Components of Physical fitness
  - Components of Health related fitness
  - Components of wellness
  - Preventing Health Threats through Lifestyle Change
  - Concept of Positive Lifestyle
- **Postures**
  - Meaning and Concept of Postures.
  - Causes of Bad Posture.
  - Concept & advantages of Correct Posture.
- **Yoga**
  - Meaning & Importance of Yoga
  - Elements of Yoga
  - Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas
  - Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana & Shashankasana)
  - Relaxation Techniques for improving concentration - Yog-nidra

- **Yoga & Lifestyle**

  - Asanas as preventive measures.

  - Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Shavasana.

  - Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana.

  - Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.

  - Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana.

  - Asthma: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.

- **Training and Planning in Sports**

  - Meaning of Training

  - Warming up and limbering down

  - Skill, Technique & Style

  - Meaning and Objectives of Planning.

  - Tournament – Knock-Out, League/Round Robin & Combination.

- **Sports Medicine**

  - First Aid – Definition, Aims & Objectives.

  - Sports injuries: Classification, Causes & Prevention.

  - Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries

- **Sports / Games**

  Following sub topics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc.

  - History of the Game/Sport.

  - Latest General Rules of the Game/Sport.

  - Specifications of Play Fields and Related Sports Equipment.

  - Important Tournaments and Venues.

  - Sports Personalities.

  - Proper Sports Gear and its Importance.

References:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light on Yoga By B.K.S. Iyengar.
3. Health and Physical Education – NCERT (11th and 12th Classes)

Applied Chemistry Lab

Course Code- TH 5(b)

(Common to 1st & 2nd sem)

Period per week:	2	Sessional:	25 Marks
Total Period:	30	End Sem Exam:	25 Marks
Timing of End Exam:	3 Hours	No. Of Credit	1

Course Outcome:

After completion of the course the students will be able to:

1) Explain various methods of volumetric analysis i.e. Redox, Iodometric, complexometric, Neutralization etc. and use of conductivity meter for measurement of conductance of water sample.

2) Apply the use of internal and external indicators and their comparison for redox titrations and mechanisms of iodometric titrations and use of double indicator method in a single titration.

3) Estimate the % values of moisture, volatile matter, ash and carbon of fuel by Proximate analysis and instrument handling.

4) Analyse the properties of lubricants viz. Flash & fire point, viscosity, cloud & pour point and their significance.

LIST OF PRACTICALS:

Perform any 10 (Ten) Laboratory Practicals.

Volumetric and Gravimetric analysis:

1 Preparation of standard solution of oxalic acid or potassium permanganate.

2 To determine strength of given sodium hydroxide solution by titrating against standard oxalic
acid solution using phenolphthalein indicator.

3 Standardization of $KMnO_4$ solution using standard oxalic acid and Determine the percentage of
iron present in given Hematite ore by $KMnO_4$ solution.

4 Iodometric estimation of copper in the copper pyrite ore.

5 Volumetric estimation of total acid number (TAN) of given oil.

6 Volumetric estimation of

a) Total hardness of given water sample using standard EDTA solution.

b) Alkalinity of given water sample using 0.01M sulphuric acid

7 Proximate analysis of coal

a) Gravimetric estimation moisture in given coal sample

b) Gravimetric estimation ash in given coal sample

Instrumental analysis

8. Determine the conductivity of given water sample.
9. Determination of the Iron content in given cement sample using colorimeter.
10. Determination of calorific value of solid or liquid fuel using bomb calorimeter.
11. Determination of viscosity of lubricating oil using Redwood viscometer.

12. Determination of flash and fire point of lubricating oil using Able's flash point apparatus.
13. To verify the first law of electrolysis of copper sulfate using copper electrode.
14. Construction and measurement of emf of elector chemical cell (Daniel cell).
15. To study the effect of dissimilar metal combination.

Teachers should use the following strategies to achieve the various outcomes of the course.

- Different methods of teaching and media to be used to attain classroom attention.
- Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
- 15-20% of the topics which are relatively simpler of descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations.
- Micro-projects may be given to group of students for hand-on experiences
- Encouraging students to visit to sites such as Railway station and research establishment around the institution.

Reference Books:

✓ Applied Chemistry by Dr. Anju Rawlley (Download from https://ekumbh.aicte-india.org/dbook.php)
✓ Text Book of Chemistry for Class XI & XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
✓ Dr. G. H. Hugar and Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
✓ Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.
✓ Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.

Applied Physics-II

Course Code- TH 2

(Common to 2nd Sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course Outcome:

After completion of course the student will be able to:

1) Explain various parameters of longitudinal & transverse wave motion, derive expression for various parameters of SHM and explain methods of control of sound wave for acoustics of building and uses of ultrasonic wave in various medical and Engineering application.
2) Explain basic optical laws , various optical phenomena and uses of optical instruments.
3) Apply the fundamental electrostatic laws to calculate electric field intensity, electric potential & potential difference of straight charged conductor.
4) Classify magnetic materials (Dia, Para, Ferro) & calculate magnetic field intensity, Magnetic force produced by current carrying conductor.
5) Distinguish solid materials based on conductivity & Energy band gap and explain various engineering and medical application of LASERs, Fiber optics and Nano Technology.

Course Content

UNIT - 1: Wave motion and its applications

Wave motion, transverse and longitudinal waves with examples, definitions of wave velocity, frequency and wave length and their relationship, Sound and light waves and their properties, wave equation (y = r sin⍰t) amplitude, phase, phase difference, principle of superposition of waves and beat formation.

Simple Harmonic Motion (SHM): definition, expression for displacement, velocity, acceleration, time period, frequency etc. Simple harmonic progressive wave and energy transfer, study of vibration of cantilever and determination of its time period, Free, forced and resonant vibrations with examples.

Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications, Ultrasonic waves – Introduction and properties, engineering and medical applications of ultrasonic.

UNIT - 2: Optics

Basic optical laws; reflection and refraction, refractive index, Images and image formation by mirrors, lens and thin lenses, lens formula, power of lens, magnification and defects. Total internal reflection, Critical angle and conditions for total internal reflection, applications of total internal reflection in optical fiber.

Optical Instruments; simple and compound microscope, astronomical telescope in normal adjustment, magnifying power, resolving power, uses of microscope and telescope, optical projection systems.

UNIT - 3: Electrostatics

Coulombs law, unit of charge, Electric field, Electric lines of force and their properties, Electric flux, Electric potential and potential difference, Gauss law: Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet and charged sphere.

Capacitor and its working, Types of capacitors, Capacitance and its units. Capacitance of a parallel plate capacitor, Series and parallel combination of capacitors (related numerical), dielectric and its effect on capacitance, dielectric break down.

UNIT - 4: Current Electricity

Electric Current and its units, Direct and alternating current, Resistance and its units, Specific resistance, Conductance, Specific conductance, Series and parallel combination of resistances. Factors affecting resistance of a wire, carbon resistances and colour coding.

Ohm's law and its verification, Kirchhoff's laws, Wheatstone bridge and its applications (slide wire bridge only), Concept of terminal potential difference and Electromotive force (EMF)

Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy.

UNIT - 5: Electromagnetism

Types of magnetic materials; dia, para and ferromagnetic with their properties, Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and units, magnetization.

Concept of electromagnetic induction, Faraday's Laws, Lorentz force (force on moving charge in magnetic field). Force on current carrying conductor, force on rectangular coil placed in magnetic field.

Moving coil galvanometer; principle, construction and working, Conversion of a galvanometer into ammeter and voltmeter.

UNIT - 6: Semiconductor Physics

Energy bands in solids, Types of materials (insulator, semi-conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction, junction diode and V-I characteristics, types of junction diodes. Diode as rectifier – half wave and full wave rectifier (centre taped).

Transistor; description and three terminals, Types- pnp and npn, some electronic applications (list only).

Photocells, Solar cells; working principle and engineering applications.

UNIT - 7: Modern Physics

Lasers: Energy levels, ionization and excitation potentials; spontaneous and stimulated emission; population inversion, pumping methods, optical feedback, Types of lasers; Ruby, He-Ne and semiconductor, laser characteristics, engineering and medical applications of lasers.

Fiber Optics: Introduction to optical fibers, light propagation, acceptance angle and numerical aperture, fiber types, applications in; telecommunication, medical and sensors.

Nanoscience and Nanotechnology: Introduction, nanoparticles and nanomaterials, properties at nanoscale, nanotechnology, nanotechnology based devices and applications.

References:

1. Applied Physics-I by Prof. Vinod Kumar Yadav (Download from https://ekumbh.aicte-india.org/dbook.php)
2. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
3. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
4. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
5. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi.
6. Modern approach to Applied Physics-I and II, AS Vasudeva, Modern Publishers.
7. A Textbook of Optics, N Subramanyam, Brij Lal, MN Avahanulu, S Chand and Company Ltd.
8. Introduction to Fiber Optics, Ajoy Ghatak and K Thyagarajan, Cambridge University Press India Pvt. Ltd, New Delhi.
9. Nanoscience and Nanotechnology, KK Choudhary, Narosa Publishing House, Pvt. Ltd. New Delhi.
10. Nanotechnology: Importance and Applications, M.H. Fulekar, IK International Publishing House Pvt. Ltd, New Delhi.
11. e-books/e-tools/ learning physics software/websites etc.

Mathematics- II

Course Code- TH 3

(Common to 2nd sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course Outcomes:

At the end of the course, the students will be able to:

(i) Apply the concept of Determinants and Matrices on 3rd order system of equations to find the unknown parameters and simple programming using MATLAB.

(ii) Apply Integral calculus to obtain area and volume of solid.

(iii) Connect algebra and geometry through graphs of lines and curves.

(iv) Differentiate between a resultant and a concurrent force through vector algebra.

(v) To model simple physical problems in the form of a differential equation, analyze and interpret its solutions.

Course Content:

UNIT - I: Determinants and Matrices

Elementary properties of determinants up to 3rd order, consistency of equations, Crammer's rule. Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.

UNIT - II: Integral Calculus

Integration as inverse operation of differentiation. Simple integration by substitution, by parts and by partial fractions (for linear factors only). Use of formulas $\int_0^{\frac{\pi}{2}} \sin^n x\, dx$, $\int_0^{\frac{\pi}{2}} \cos^n x\, dx$ and $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x\, dx$ for solving problems Where m and n are positive integers.

Applications of integration for i. Simple problem on evaluation of area bounded by a curve and axes. ii. Calculation of Volume of a solid formed by revolution of an area about axes. (Simple problems).

UNIT - III: Co-Ordinate Geometry

Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula.

General equation of a circle and its characteristics. To find the equation of a circle, given:

ii. Centre and radius,

iii. Three points lying on it and

iv. Coordinates of end points of a diameter;

Definition of conics (Parabola, Ellipse, Hyperbola) their standard equations without proof. Problems on conics when their foci, directories or vertices are given.

UNIT - IV: Vector Algebra

Definition notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar
and vector products of 2 vectors. Simple problems related to work, moment and angular velocity.

UNIT-V: Differential Equations

Solution of first order and first degree differential equation by variable separation method (simple
problems). MATLAB – Simple Introduction.

References:

- ✓ Mathematics-II by Dr. Garima Singh (Download from https://ekumbh.aicte-india.org/dbook.php)
- ✓ B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
- ✓ G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
- ✓ S.S. Sabharwal, Sunita Jain, Eagle Parkashan, Applied Mathematics, Vol. I & II, Jalandhar.
- ✓ Comprehensive Mathematics, Vol. I & II by Laxmi Publications, Delhi.
- ✓ Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

Applied Physics-II Lab

Course Code-PR 2

(Common to 2nd sem)

Period per week:	2	Sessional:	25 Marks
Total Period:	30	End Sem Exam:	25 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	1

Course Outcome:

List of Practicals/Activities: (To perform minimum 10 Practicals)

1. To determine and verify the time period of a cantilever.
2. To determine velocity of ultrasonic in different liquids using ultrasonic interferometer.
3. To verify laws of reflection from a plane mirror/ interface.
4. To verify laws of refraction (Snell's law) using a glass slab.
5. To determine focal length and magnifying power of a convex lens.
6. To verify Ohm's law by plotting graph between current and potential difference.
7. To verify laws of resistances in series and parallel combination.
8. To find the frequency of AC main using electrical vibrator.
9. To verify Kirchhoff's law using electric circuits.
10. To study the dependence of capacitance of a parallel plate capacitor on various factors and determines permittivity of air at a place.
11. To find resistance of a galvanometer by half deflection method.
12. To convert a galvanometer into an ammeter.
13. To convert a galvanometer into a voltmeter.
14. To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee volt- age.
15. To verify inverse square law of radiations using a photo-electric cell.
16. To measure wavelength of a He-Ne/diode laser using a diffraction grating.
17. To measure numerical aperture (NA) of an optical fiber.
18. Study of an optical projection system (OHP/LCD) - project report.

Suggested Student Activities & Strategies

Apart from classroom and laboratory learning following are the suggested student related activities which can be undertaken to accelerate the attainment of various outcomes of the course.

a. Make survey of different physical products and compare the following points
   - Measurements of dimensions
   - Properties
   - Applications
b. Library survey regarding engineering materials/products used in different industries
c. Seminar on any relevant topic.

Teachers should use the following strategies to achieve the various outcomes of the course.

- Different methods of teaching and media to be used to attain classroom attention.
- Massive open online courses (MOOCs) may be used to teach various topics/sub topics.

- 15-20% of the topics which are relatively simpler or descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations/projects.
- Micro-projects on relevant may be given to group of students for hand-on experiences.

Recommended Books:

1. Applied Physics-I by Prof. Vinod Kumar Yadav (Download from https://ekumbh.aicte-india.org/dbook.php)
1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
3. Practical Physics by C. L. Arora, S. Chand & Company Ltd.
4. e-books/e-tools/ learning physics software/you Tube videos/ websites etc.

1ST & 2ND SEMESTER ELECTRICAL ENGINEERING

SUB:-Fundamental of Electrical & Electronics Engineering Lab [PR4(a)]

SL NO	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QUANTITY NO.
1	Determine the permeability of magnetic material by plotting its B-H curve	1. Magnetic Specimen 2. Magnetic Coil(Primary Winding) 3. Search Coil (Secondary Winding) 4. DC Power Supply 5. Rheostat 6. Ammeter 7. Volt Meter 8.DPST Switch 9. Measuring Tape 10. Connecting Wire	01 01 01 01 01 01 01 01 01 As Per Reqd.
2	Measure voltage, current and power in 1-phase circuit with resistive load	1. Single Phase AC Supply 2. Resistive Load 3. Volt Meter 4. Ammeter 5. Watt Meter 6. Switch/MCB 7. Connecting Wire	01 01 01 01 01 01 As Reqd.
3	Measure voltage, current and power in R-L series circuit	1. Single Phase AC Supply 2. Resistive Load 3. Volt Meter 4. Ammeter 5. Watt Meter 6. Switch/MCB 7. Inductive Load 8. Connecting Wire	01 01 01 01 01 01 01 As Reqd.
4	Determine the transformation ratio(K) of 1-phase transformer	1. Single Phase Transformer 2. Variac 3. Volt Meter 4. Ammeter 5. Switch/MCB 6. Connecting Wire	01 01 01 01 01 As Per Reqd.
5	Connect single phase transformer and measure input and output quantities	1. Single Phase Transformer 2. Rheostat 3. Volt Meter 4. Ammeter 5. Switch/MCB 6. Connecting Wire 7. Power Supply	01 01 01 01 01 As Per Reqd. 01
6	Make Star and Delta connection in starter to run induction motor	1. Three Phase Induction Motor 2. Switch/MCB 3. Indicator Lamp 4.Relay 5. Connecting Wire 6. Power Supply	01 01 01 01 As Per Reqd. 01
7	Identify various passive and active electronics components	1. Digital Multimeter 2. Capacitor 3. I.C. 4. Inductors	01 01 01 01

		5.Various Resistances	As Per Reqd.
8	Connect resistors in series and parallel combination and measure its value using digital multimeter	1. Digital Multimeter 2. Volt Meter 3. Ammeter 4. Resistor 5. Watt Meter 6. Connecting Wire 7. Power Supply	01 01 01 01 01 As Per Reqd. 01
9	Connect capacitors in series and parallel combination and measure its value using multimeter	1. Digital Multimeter 2. Volt Meter 3. Ammeter 4. Capacitor 5. Watt Meter 6. Connecting Wire 7. Power Supply	01 01 01 01 01 As Per Reqd. 01
10	Use multimeter to measure the value of given resistor and determine the value to confirm with colour code	1. Digital Multimeter 2. Resistor	01 As Per Reqd.
11	Test the PN-junction diode and LED using digital multimeter	1. Multimeter 2. PN Junction Diode 3. Transistors 4. L.E.D. 5.Power Supply 6. Connecting Wire	01 01 01 01 01 As Per Reqd.
12	Test the performance of PN-junction diode	1. Multimeter 2. PN Junction Diode 3. Transistors 4.Power Supply 5. Connecting Wire	01 01 01 01 As Per Reqd.
13	Test the performance of Zener diode	1. Multimeter 2. Zener Diode 3. Transistors 4.Power Supply 5. Connecting Wire	01 01 01 01 As Per Reqd.
14	Identify three terminals of a transistor using digital multimeter	1.Multimeter 2. Transistors	01 As Per Reqd.
15	Test the performance of NPN transistor	1. Multimeter 2.. NPN Transistors 3..Power Supply 4. Connecting Wire	01 01 01 As Per Reqd.

1st & 2nd SEMESTER ALL BRANCHES

Sub:- Introduction to IT Systems Lab- (PR-1(b))

SL. NO.	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QUANTITY
1	Browser features, browsing, using various search engines, writing search queries	Computer or Laptop, internet connection(Wi-Fi/ Ethernet/LAN),Web browser(Google chrome/ Mozilla Firefox/ Microsoft Edge), Operating system (Windows/ Linux), Keyboard & mouse	
2	Visit various e-governance/Digital India portals, understand their features, services offered	Computer, internet connection(Wi-Fi/ Ethernet/LAN),Web browser(Google chrome/ Mozilla Firefox/ Microsoft Edge), Operating system (Windows/ Linux), Keyboard & mouse	
3	Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognize various ports/interfaces and related cables, etc.	Desktop, Operating system (Windows/ Linux), Keyboard & mouse, Printer/Scanner, connecting cables, computer laboratory	
4	Install Linux and Windows operating system on identified lab machines, explore Various options, do it multiple times.	Desktop, Linux Os(Ubuntu), Windows OS(Windows 10/11 ISO), Bootable USB drive, internet connection, BIOS/UEFI access, hard disk/SSD, keyboard, mouse, monitor	
5	Connect various peripherals (printer, scanner, etc.) to computer, explore various Features of peripheral and their device driver software.	Desktop, Intel can, serial devices(RS-232,Rs-485,USB-to-serial converter), connecting cables(USB ,serial), device driver software, Operating System, power supply for external devices , computer laboratory setup	
6	Practice HTML commands, try them with various values, make your own Webpage	Desktop, keyboard, mouse, operating system(windows), text editor(notepad/ notepad++), Web browser(Google chrome/Mozilla Firefox/Edge), HTML File	
7	Explore features of Open Office tools, create documents using these features, do it Multiple times.	Desktop, Operating System, Document Editing Software(MS Word), Mouse, Keyboard ,Web browser, internet connection	
8	Explore security features of Operating Systems and Tools, try using them and See what happens.	Computer, Operating system , virtual machine software, ISO, Security testing tools, security monitoring tools, network connection, command line interface, keyboard, mouse	

2nd SEMESTER ALL BRANCHES

Sub:- Applied Chemistry Lab- (PR-5(b))

SL. NO.	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QUANTITY
1	Preparation of standard solution of oxalic acid or potassium permanganate.	Burette (50 mL),Pipette (10 mL or 25 mL),Conical flask (250 mL),Volumetric flask (250 mL),Beaker (100 mL),Measuring cylinder, Burette stand, **Chemicals:-** Standard HCl or H_2SO_4 solution (N/50 or 0.02 N),Phenolphthalein indicator, Methyl orange indicator	
2	To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator	Burette (50 mL),Pipette (10mL or 25mL),Conical flask (250 mL),Volumetric flask (250 mL, 1000 mL),Beaker (250 mL),Measuring cylinder, Glass rod, Funnel **Chemicals:-** Oxalic acid, Sodium hydroxide,(NaOH),Phenolphthalein indicator	
3	Standardization of KMnO4 solution using standard oxalic acid and Determine the percentage of iron present in given Hematite ore by KMnO4 solution.	Burette (50 mL),Pipette (10 mL, 25 mL),Conical flask (250 mL),Volumetric flask (100 mL, 250 mL),Beaker (250mL),Heating plate, Funnel, White glazed tile, Glass rod, Wire gauze **Chemicals:-** Potassium permanganate, Standard oxalic acid, Distilled water, Sulphuric acid	
4	Iodometric estimation of copper in the copper pyrite ore.	Burette (50 mL),Pipette (10 mL or 25 mL),Conical flask (250 mL),Volumetric flask (250 mL),Beaker (250 mL) **Chemicals:-** Potassium dichromate($K_2Cr_2O_7$), Sodium Thiosulphate ($Na_2S_2O_3$) ,Dilute sulphuric acid (H_2SO_4), Copper sulphate ($CuSO_4$),Sodium Bicarbonate($NaHCO_3$), Sodium Hydroxide (NaOH),Acetic Acid (CH_3CHOOH),Potassium Iodide (KI),Ammonium Thiocyanate (NH_4SCN)	
5	Volumetric estimation of total acid number (TAN) of given oil.	Titrator(TL7000),Electrode, Cable, Watch glass, Beaker (100 mL, 250 mL) **Chemicals:-** Potassium hydroxide(KOH),Toluene, Isopropyl Alcohol, Distilled water	
6	Volumetric estimation of a) Total hardness of given water sample using standard EDTA solution. b) Alkalinity of given water sample using 0.01M sulphuric acid	Burette (50 mL),Pipettes (10 mL, 25 mL),Conical flask (250 mL),Volumetric flask (100 mL, 250 mL), Beaker (250 mL),Measuring cylinder, Glass Rod, Funnel, Wash bottle **Chemicals:-** Disodium EDTA (Ethylene diamine tetra acetic acid disodium salt), Eriochrome Black T (EBT) indicator, Ammonia buffer solution (NH_4Cl+NH_4OH),Ammonium chloride (NH_4Cl),	

		Ammonium hydroxide (NH_4OH),Sodium hydroxide (NaOH),Distilled water, Water sample (hard water)	
7	Proximate analysis of coal a) Gravimetric estimation moisture in given coal sample b) Gravimetric estimation ash in given coal sample	Conical flask (250 mL), Volumetric flask (100 mL, 250 mL),Beaker (250 mL, 500 mL),Measuring cylinder, Funnel, Mortar and pestle, Watch glass **Chemicals:-** Nitric acid(HNO_3), Hydrochloric acid (HCl), Sulphuric acid(H_2SO_4), Acetic acid(CH_3COOH),Ammonium hydroxide(NH_4OH),Sodium hydroxide (NaOH) solution	
8	Determine the conductivity of given water sample.	Conductive Meter with a probe, Beaker **Chemicals:-** Deionized water, Potassium chloride(KCl), Water	
9	Determination of the Iron content in given cement sample using colorimeter.	funnel (250 mL or 500 mL),Burette (50 mL),Pipette (10 mL, 25 mL), Conical flask (250 mL), Volumetric flask (100 mL, 250 mL),Beaker (250 mL), Heating mantle, Analytical balance, colorimeter **Chemicals:-** Cement, Ferrous, Ammonium thiocyanate	
10	Determination of calorific value of solid or liquid fuel using bomb calorimeter.	Water jacket, Bomb, Stirrer, Calorimeter vessel, Combined lid, Sensitive thermometer, Analytical balance with weight box, Oxygen cylinder with presser gauge, Fuse wire, Cotton thread, Firing unit, Regulation valve and crucible hand pellet press	
11	Determination of viscosity of lubricating oil using Redwood viscometer.	Redwood viscometer (Redwood No. 1 or Redwood No. 2),Water bath with temperature control, Thermometer (0–100◦C),Stopwatch, Beaker (100 mL) or conical flask (to collect oil),Measuring cylinder (50 mL),Funnel **Chemicals:-** Lubricating oil sample, Distilled water (for water bath),Cleaning solvent (kerosene or petroleum ether for cleaning)	
12	Determination of flash and fire point of lubricating oil using Able's flash point apparatus.	Pensky-Martens flash point apparatus (closed cup), Thermometer (suitable range: -5◦C to 400◦C),Gas burner or electric ignition source, Beaker (for oil sample), Measuring cylinder **Chemicals:-** Oil sample (petroleum product, lubricating oil, or fuel oil),Cleaning solvent (for apparatus cleaning), Safety equipment (fire extinguisher nearby)	
13	To verify the first law of electrolysis of copper sulphate using copper electrode.	Two copper strips(electrodes),Battery(6v,12v),Ammeter, Rheostat, Beaker (1000 mL, 250 mL), Switch, Stop clock, Digital balance, Emery paper **Chemicals:-** Acetone, Copper sulphate (0.5M), Distilled water	

14	Construction and measurement of emf of elector chemical cell (Daniel cell).	Beaker(1000ml), Connecting wires, Measuring cylinder (10 mL, 50 mL), Voltmeter , Sand paper ,Zinc strip ,Copper strip **Chemicals:-** Zinc sulphate ($ZuSO_4$), Copper sulphate ($CuSO_4$)	
15	To study the effect of dissimilar metal combination.	Laboratory coat/apron, Safety goggles, Gloves (latex or nitrile), First aid kit, Fire extinguisher, Fume hood (for experiments involving volatile/toxic chemicals), Wash basin with running water, Eyewash station, Chemical spill kit, Waste disposal containers (for chemical waste) **Chemicals:-** Distilled water, Concentrated acids: HCl, H_2SO_4, HNO_3, CH_3COOH, Concentrated bases: NaOH, KOH, NH_4OH, Common indicators: Phenolphthalein, Methyl orange, Methyl red, Starch, Common salts: NaCl, KCl, $CaCl_2$, $MgSO_4$	

BRANCH – COMMON TO ALL BRANCH YEAR – 1ST (1ST SEM & 2ND SEM)

EXPERIMENT WISE REQUIREMENTS

LAB – Communication Skills in English Lab

SL NO.	NAME OF THE EXPERIMENTS	APPARATUS REQUIRED	NO. OF QUANTITY
1	**Listening Skills** Listening Process and Practice : Introduction to recorded lectures, poems, interviews and speeches, listening tests	Language LAB (Computers with Pre-loaded Language Software, Headphones with Microphone)	61
2	**Introduction to Phonetics** : Sounds: Consonant, Vowel, Diphthongs, Transcription of Words (IPA), weak forms, syllable division, word stress, intonation, voice	Language LAB (Computers with Pre-loaded Language Software, Headphones with Microphone)	61
3	**Speaking Skills :** Standard and formal speech: Group Discussion, Oral Presentations, Public Speaking, Business Presentations, Conversation practice and Role play	Language LAB (Computers with Pre-loaded Language Software, Headphones with Microphone)	61

1ST SEMESTER ALL BRANCHES

Sub:- Engineering Mechanics Lab(PR-4(b))

SL. NO.	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QUANTITY
1	To study various equipments related to Engineering Mechanics.	Differential axel & wheel, rope, weight, Simple screw jack, ,Warm & warm wheel, rope, weight, Single purchase crab, Double purchases crab, Wormed geared pulley block, Polygon law force apparatus, Universal force table, Jib crane apparatus, Simple supported beam, Combined inclined plane & friction slide apparatus, Scale, pencil, graph, steel rule	
2	To find the M.A., V.R., Efficiency and law of machine for Differential Axle and Wheel.	Differential axel & wheel, rope, weight	
3	To find the M.A., V.R., Efficiency and law of machine for Simple Screw Jack.	Simple screw jack, rope , weight	
4	Derive Law of machine using Worm and worm wheel.	Warm & warm wheel, rope, weight	
5	Derive Law of machine using Single purchase crab.	Single purchase crab, rope	
6	Derive Law of machine using double purchase crab.	Double purchases crab	
7	Derive Law of machine using Weston's differential or wormed geared pulley block.	Wormed geared pulley block	
8	Determine resultant of concurrent force system applying Law of Polygon of forces using force table.	Polygon law force apparatus	
9	Determine resultant of concurrent force system graphically.	Polygon law force apparatus	
10	Determine resultant of parallel force system graphically.	Universal force table	
11	Verify Lami's theorem	Universal force table	

12	Study forces in various members of Jib crane.	Jib crane apparatus	
13	Determine support reactions for simply supported beam.	Simple supported beam	
14	Obtain support reactions of beam using graphical method.	Drawing board, graph sheet, scale, pencil, eraser, compass, protractor, set-squares , steel rule, calculator	
15	Determine coefficient of friction for motion on horizontal and inclined plane.	Combined inclined plane & friction slide apparatus	
16	Determine centroid of geometrical plane figures.	Scale, pencil, graph, steel rule	

1ST SEMESTER ALL BRANCHES

Sub:- Applied Physics Lab-1 (PR-2)

SL. NO.	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QUANTITY
1	To measure length, radius of a given cylinder, a test tube and a beaker using a Vernier caliper and find volume of each object.	1.Vernier Caliper 2.Cylinder 3.Test tube 4.Beaker 5.Scale	
2	To determine diameter of a wire, a solid ball and thickness of cardboard using a screw gauge.	1.Screwgauge 2.Solid Ball 3.Wire 4.Cardboard	
3	To determine radius of curvature of a convex and a concave mirror/surface using a spherometer.	1.Concave Mirror 2.Convex Mirror 3.Spherometer 4.Plane Glass Slab	
4	To verify triangle and parallelogram law of forces.	1.Gravesand's Apparatus 2.Slotted Weight with hanger 3.Cotton Thread 4.Drawing Pin 5.Mirror Strip	
5	To find the co-efficient of friction between wood and glass using a horizontal board.	1.Wooden Block with a hook 2.Horizontal Board attached with a frictionless pulley 3.Pan 4Thread 5.Spring Balance 6.Spirit Level 7.Weight Box 8.Weights of 100gm	
6	To determine force constant of a spring using Hook's Law.	1.Hooke's Law Apparatus 2.Slotted Weight 3.Spirit Level 4.Stopwatch 5.Helical Spring 6.Clamp Stand	
7	To verify law of conservation of mechanical energy (PE to KE).	1.Double Inclined Plane 2. Steel Ball 3.Vernier Caliper 4.Stopwatch 5.Support Stand	
8	To find the moment of inertia of a flywheel.	1.Flywheel Apparatus 2.Vernier Caliper 3.Slotted Weight 4.Stopwatch 5.String	
9	To find the viscosity of a given liquid (Glycerin) by Stoke's law.	1.Transparent Glass Tube 2.Glycerin 3.Ball 4.Rubber Band 5.Stopwatch 6.Thermometer	

10	To find the coefficient of linear expansion of the material of a rod.	1.LinearExpansion Apparatus 2.Metal Rod 3.Steam Heater 4.Thermometer 5.Screwgauge 6.Meter Scale 7.Beaker 8.Hotplate 9.Power Supply	
11	To determine atmospheric pressure at a place using Fortin's barometer	1.Fortin's Barometer 2.Glass Tube 3.Reservoir 4.Vernier Scale	
12	To measure room temperature and temperature of a hot bath using mercury thermometer and convert it into different scales.	1.Hot Plate 2.Mercury Thermometer 3.Beaker 4.Stopwatch 5.Clamp Stand 6.Castor Oil	

2nd SEMESTER ALL BRANCHES

Sub:- Applied Physics Lab-II (PR-2)

SL. NO.	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QUANTITY
1	To determine and verify the time period of a cantilever.	1.Cantilever Beam 2.Stopwatch 3.Clamp 4.Slotted Masses	
2	To determine velocity of ultrasonic in different liquids using ultrasonic Interferometer.	1.Ultrasonic Interferometer setup 2.Screwgauge 3.Ammeter 4.Distilled Water	
3	To verify laws of reflection from a plane mirror/ interface.	1.Soft Board 2.White Paper Sheet 3.Push Pin 4.Plane Mirror	
4	To verify laws of refraction (Snell's law) using a glass slab.	1.Soft Board 2.White Paper Sheet 3.Push Pin 4.Glass Slab	
5	To determine focal length and magnifying power of a convex lens.	1.Optical Bench 2.Convex Lens 3.Lens Holder 4.Optical Needle	
6	To verify Ohm's law by plotting graph between current and potential difference.	1.Variable DC Power Supply(0-10V) 2.Ammeter(0-1A) 3.Voltmeter(0-10V) 4.Rheostat(500ohm) 5.Key 6.Resistance Wire 1meter	
7	To verify laws of resistances in series and parallel combination.	1.Variable DC Power Supply(0-10V) 2.Ammeter(0-1A) 3.Voltmeter(0-10V) 4.Rheostat(500ohm) 5.Key 6.Resistance Wire 1meter	
8	To find the frequency of AC main using electrical vibrator.	1.Electrical Vibrator 2.String 3.Pan 4.Weight Box 5.Stand with clamp 6.Pulley 7.Meter Scale	
9	To verify Kirchhoff's law using electric circuits.	1.Variable DC Power Supply(0-10V) 2.Ammeter(0-1A) 3.Voltmeter(0-10V) 4.Key 5.Resistance Wire 1meter 6.Resistances 100ohm,220ohm,330ohm,1000ohm,2200ohm,3300ohm	

10	To study the dependence of capacitance of a parallel plate capacitor on various Factors and determines permittivity of air at a place.	1.Variable Parallel Plate Capacitor 2.LCR Meter 3.Screwgauge 4.Measuring Tape 5.Connecting Wires 6.Clamp Stand	
11	To find resistance of a galvanometer by half deflection method.	1..Moving coil Galvanometer 2.DC Power Supply(0-10V) 3.Resistance Box(0-10kohm) 4.Resistance Box(0-200ohm) 5.One Way Key	
12	To convert a galvanometer into an ammeter.	1.Galvanometer 2.Shunt Resistance 3.DC Power Supply(0-10V) and connecting wire 4.Ammeter(0-1A) 5.Rheostat and a key	
13	To convert a galvanometer into a voltmeter.	1.Galvanometer 2.High Resistance 3.DC Power Supply(0-10V) and connecting wire 4.Voltmeter(0-10V) 5.Rheostat and a key	
14	To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its Knee voltage.	1.DC Power Supply(0-10V) 2.Voltmeter(0-10V),Ammeter(0-100MA) 3.Resistor(100ohm,1Kohm),Wire	
15	To verify inverse square law of radiations using a photo-electric cell.	1.DC Power Supply(0-10V) 2.Photo cell 3.Ammeter(0-100MicroA) 4.Connecting Wire	
16	To measure wavelength of a He-Ne/diode laser using a diffraction grating.	1.Diffraction Grating Of different grating element(100,300,600lines/mm) 2.Grating Stand 3.Meter Scale 4.Helium Neon/Diode Laser	
17	To measure numerical aperture (NA) of an optical fibre.	1.Optical Fibre 2.Wooden Stand 3.Helium Laser	
18	Study of an optical projection system (OHP/LCD)- project report.	1.OHP Unit 2.Fresnel Lens 3.Projection Head 4.Colling Fan 5.Projector	

1ST & 2nd SEMESTER ALL BRANCHES

Sub:- Engineering Workshop Practice(PR-3(b))

SL. NO.	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QUANTITY
1	**Carpentry: i)** Demonstration of different wood working tools / machines**.** **ii)**Demonstration of different wood working processes, like plaining, marking,chiseling, grooving, turning of wood etc. **iii)** One simple job involving any one joint like mortise and tenon dovetail, bridle, half lap etc.	i)Carpenter vice, steel rule, jack plane, try square, marking gauge, 25 firmer chisel, 6mm mortise chisel, cross-cut saw, scriber, mallet ii)Carpenter vice, steel rule, jack plane, try square, marking gauge, 25 firmer chisel, , cross-cut saw, scriber, mallet	
2	**Fitting: i)** Demonstration of different fitting tools and drilling machines and power tools **ii)** Demonstration of different operations like chipping, filing, drilling, tapping, sawing, cutting etc**.** **iii)** One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc	**i)**Bench Vice, Flat File, try squire, steel rule, Scriber, dot punch, Smooth file, hack saw & blade, drilling machine, drill bite, tops with wrench, Die with stock **ii)** Bench Vice, Flat File, flat bastard, second cut file, file, half round file, triangular bar, hack saw with blade, surface plate, scriber, centre punch, ball peer, hammer, drilling machine with machine vice, H.S.S Drill bite, sparing divider, chisel flat	
3	**Welding: i)** Demonstration of different welding tools / machines. **ii)** Demonstration on Arc Welding, Gas Welding, MIG, MAG welding, gas cutting and rebuilding of broken parts with welding**.** **iii)** One simple job involving butt and lap joint	i)Welding torch, welding razzle on tips, pressure regulator, hose pipe & fittings, goggles, gloves, spark lighter, oxygen gas cylinder with regulator, wire brush ii)arc welding transformation, electrodes, electrodes holders, cable & cable connecters , chipping hammer, wire brush, welding screen or helmet, apron, gloves, pedestal grinding machine	
4	**Sheet Metal Working: i)** Demonstration of different sheet metal tools / machines. **ii)** Demonstration of different sheet metal operations like sheet cutting, bending, edging, end curling, lancing, soldering, brazing, and riveting. **iii)** One simple job involving sheet metal operations and soldering and riveting.	i) steel rule, folding rule, straight edge, try square scriber, divider, punch, chisel, ball peer hammer, strip, soldering iron, mallet ii) steel rule, folding rule, straight edge, try square scriber, divider, punch, chisel, ball peer hammer, strip, soldering iron, mallet	
5	**Electrical House Wiring: Practice on simple lamp circuits (i)** one lamp controlled by one switch by surface conduit wiring, **(ii)** Lamp circuits- connection of lamp and socket by separate switches, **(iii)** Connection of Fluorescent lamp/tube light,	Flexible wire, earthing ware, pvc pipe, bands, elbows, couplers, junction box, inspection box, switch, socket outlet , plug tops, bell push switch, fan regulator, main switch, distribution board, MCB , RCCB, RCBO, Screwdriver set, lime tester, cutter, insulation tap, multimeter, hammer & drill machine	

	(iv)simple lamp circuits-in- stall bedroom lighting. And **(v)** Simple lamp circuits- install stair case wiring		
6	**Demonstration: i)** Demonstration of measurement of Current, Voltage, Power and Energy. **ii)** Demonstration of advance power tools, pneumatic tools, electrical wiring tools and accessories. **iii)** Tools for Cutting and drilling	bell push switch, fan regulator, main switch, distribution board, MCB , RCCB, RCBO, Screwdriver set, lime tester, cutter, insulation tap, multimeter, hammer & drill machine	

Final

DIPLOMA CURRICULUM OF CIVIL ENGINEERING (SECOND YEAR) (3rd Semester)

(To be implemented from 2025-26)

Prepared by;

National Institute of Technical Teachers' Training & Research Kolkata
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Vetted by:
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State Council for Technical Education & Vocational Training
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PROGRAMME TITLE: CIVIL ENGINEERING

SEMESTER - III

SL. No	Category of Course	Code No	Course Title	Teaching Scheme				Evaluation Scheme				Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory		Practical			
					L	T	P	End Exam	Progressive Assessment	End Exam	Progressive Assessment		
1	**Programme core**	CEPC201 TH:1	Building Construction		3	0	0	70	30	-	- -	100	3
2		CEPC203 TH:2	Transportation Engineering		3	0	0	70	30	-	- -	100	3
3		CEPC205 TH:3	Mechanics of Material		3	0	0	70	30	-	- -	100	3
4		CEPC207 TH:4	Geotechnical Engineering		3	0	0	70	30	-	- -	100	3
5		CEPC209 TH:5	Building Material & Concrete Technology		3	0	0	70	30	-	- -	100	3
6		CEPC211 PR:1	Transportation Engineering Lab		0	0	4	–		15	35	50	2
7		CEPC213 PR:2	Mechanics of Materials Lab.		0	0	4	–		15	35	50	2
8		CEPC215 PR:3	Geotechnical Engineering Lab.		0	0	4	-		15	35	50	2
9		CEPC217 PR:4	Building Materials & Concrete Technology Lab.		0	0	4	-		15	35	50	2
10	**Summer Internship**	SI201	Summer internship – I*		0	0	0	-		15	35	50	2
TOTAL					**15**	**0**	**16**	**350**	**150**	**75**	**175**	**750**	**25**

*3 to 4-weeks after 2nd Semester

***The best of 2 IA conducted in a subject out of 20 marks to be considered. Assignment/ quiz etc. of 10 marks to be treated as part of IA. Besides this, Monthly Test to be conducted for each subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester. Club/Innovation/ Idea Tinkering Activities etc. shall be encouraged to be performed by students beyond the above stipulated hours.**

SEMESTER - III COURSES

TH:1- BUILDING CONSTRUCTION

L	T	P		Course Code: CEPC 201
3	0	0		
Total Contact Hours			**Total Marks: 100**	**Theory Assessment**
Theory		: 45Hrs		End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PC

RATIONALE

This course has been designed for the students to know the properties of different materials for use and quality control in construction works as per IS code of practice. Further, practical input has been given for augmenting the learning by the students.

LEARNING OUTCOMES

After completion of this course, the students will be able to

- Explain different components of building, types of foundation and their significance.
- Compare different types of masonry and their construction.
- Explain different construction technique
- Explain the importance of communications in building planning.

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
UNIT-I	**Overview of Building Components** • Classification of Buildings as per National Building Code Group A to I, as per Types of Constructions- Load Bearing Structure, Framed Structure, Composite Structure. • Building Components – Functions of Building Components, substructure – Foundation, Plinth. • Superstructure – Walls, Partition wall, Cavity wall, Sill, Lintel, Doors and Windows, Floor, Mezzanine floor, Roof, Columns, Beams, Parapet.	**4**
UNIT-II	**Construction of Substructure** • Job Layout: Site Clearance, Layout for Load Bearing Structure and Framed Structure by Center Line and Face Line Method, Precautions. • Earthwork: Excavation for Foundation, Timbering and Strutting, Earthwork for embankment, Material for plinth Filling, Tools and plants used for earthwork.	**8**

	• Foundation: Functions of foundation, • Types of foundation – Shallow Foundation, Stepped Footing, Wall Footing, Column Footing, Isolated and Combined Column Footing, Raft Foundation, Grillage Foundation. • Deep Foundation – Pile Foundation, Well foundation and Caissons, Pumping Methods of Dewatering, Deep wells, Well points, Cofferdams (Introduction only).	
UNIT-III	**Construction of Superstructure** • **Stone Masonry:** Terms used in stone masonry- facing, backing, hearting, through stone, corner stone, cornice. Types of stone masonry: Rubble masonry, Ashlar Masonry and their types. Joints in stone masonry and their purpose. Selection of Stone Masonry, Precautions to be taken in Stone Masonry Construction. • **Brick masonry:** Terms used in brick masonry- header, stretcher, closer, quoins, course, face, back, hearting, bat bond, joints, lap, frog line, level and plumb. Bonds in brick masonry- header bond, stretcher bond, English bond and Flemish bond. Requirements of good brick masonry. Junctions in brick masonry and their purpose and procedure. Precautions to be observed in Brick Masonry Construction. Comparison between stone and Brick Masonry. Tools and plants required for construction of stone and brick masonry. Hollow concrete block masonry and composite masonry. • **Scaffolding and Shoring:** Purpose, Types of Scaffolding, Process of Erection and Dismantling. Purpose and Types of Shoring, Underpinning. Formwork: Definition of Formwork, Requirements of Formwork, Materials used in Formwork, Types of Formwork, Removal offormwork.	**12**
UNIT-IV	**Building Communication and Ventilation** • **Horizontal Communication: Doors** –Components of Doors, Full Paneled Doors, Part ly Paneled and Glazed Doors, Flush Doors, Collapsible Doors, Rolling Shutters, Revolving Doors, Glazed Doors. Sizes of Door recommended by BIS. • **Windows:** Component of windows, Types of Windows – Full Paneled, Partly Paneled and Glazed, wooden, Steel, Aluminum windows, Sliding Windows, Louvered Window, Bay win- dow, Corner window, clear storey window, Gable and Dormer window, Skylight. Sizes of Windows recommended by BIS. Ventilators. • Fixtures and fastenings for doors and windows • Material used and functions of Window Sill and Lintels, Shed / Chajja. **Vertical Communication:** Means of Vertical Communication- Stair Case,Ramps,Lift, Elevators and Escalators. Terms used in staircase steps, tread, riser, nosing, soffit, waist slab, baluster, balustrade, scotia, hand rails,	**8**

	newel post, landing, headroom, winder. Types of staircase (On the basis of shape): Straight, dog-legged, open well, Spiral, quarter turn, bifurcated, Three quarter turn and Half turn, (On the basis of Material): Stone, Brick, R.C.C., wooden and Metal.	
UNIT-V	**Building Finishes** • **Floors and Roofs**: Types of Floor Finishes and its suitability- Kota, Marble, Granite, Ceramic Tiles, Vitrified, Chequered Tiles, Paver Blocks, Concrete Floors, wooden Flooring, Skirting and Dado. Process of Laying and Construction, Finishing and Polishing of Floors, Roofing Ma terials- RCC, Mangalore Tiles, AC Sheets, G.I. sheets, Corrugated G.I. Sheets, Plastic and Fibre Sheets. Types of Roof: Flat roof, Pitched Roof- King Post truss, Queen Post Truss, terms used in roofs. • **Wall Finishes:** Plastering – Necessity of Plastering, Procedure of Plastering, Single Coat Plaster, Double Coat Plaster, Rough finish, Neeru Finishing and Plaster of Paris (POP). Special Plasters- Stucco plaster, sponge finish, pebble finish. Plaster Board and Wall Claddings. Precautions to be taken in plastering, defects in plastering. Painting – Necessity, Types of painting and procedure of Painting. Painting –Necessity, Surface Preparation for painting, Methods of Application.	**13**
	Total	**45**

SUGGESTED LEARNING RESOURCES:

1. Ghose, D. N., Construction Materials, Tata McGraw Hill, New Delhi.
2. S.K. Sharma, Civil Engineering Construction Materials, Khanna Publishing House, Delhi
3. Varghese, P.C. , Building Materials, PHI learning, New Delhi.
4. Rangwala, S.C., Engineering Materials, Charator publisher, Ahemdabad.
5. Somayaji, Shan, Civil Engineering Materials, Pearson education, New Delhi.
6. Rajput, R.K, Engineering Materials, S. Chand and Co., New Delhi.
7. Sood H., Laboratory Manual on Testing of Engineering Materials, New Age Publishers, NewDelhi.
8. Sharma C. P., Engineering Materials, PHI Learning, New Delhi.
9. Duggal, S. K, Building Materials, New International, New Delhi.
10. S. P. Arora and Bindra., Building Construction, Dhanpat Rai Publication, Delhi.
11. Sushil Kumar., Building Construction, Standard Publication.
12. Rangawala, S. C., Building Construction, Charotar Publication, Anand.
13. Punmia B. C., and Jain A. K., Building Construction ,Firewall Media.

14. Sharma S. K., Building Construction, S. Chand and Co. Pvt. Ltd., New Delhi.
15. Janardan Zha , Building Construction, Khanna Publication.
16. Bhavikatti S. S., Building Construction, Vikas Publication House Pvt. Ltd., Delhi.
17. Mantri S., A to Z Building Construction, Satya Prakashan, New Delhi.

TH:2- TRANSPORTATION ENGINEERING

L	T	P	Total Marks: 100	Course Code: CEPC 203
3	0	0		
Total Contact Hours				**Theory Assessment**
Theory		: 45 Hrs		End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PC

RATIONALE

Airport Engineering and Railways, as specialized topics of Civil Engineering constitute important components of Transportation Engineering. Many–a-times diploma holders are involved in the construction and/or maintenance of airports, and railways. At the same time a state may not have many airports or the facility of railways. In such a case the subject may be offered as an elective to a student who plans carrier in line with the subject matter.

LEARNING OUTCOME

After completing this course, student will be able to:

- Identify the types of roads as per IRC recommendations.
- Implement the geometrical design features of different highways.
- Perform different tests on road materials.
- Identify the components of railway tracks.
- Identify the defects in railway tracks.

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
UNIT –I	**Overview of Highway Engineering** • Role of transportation in the development of nation, Scope and Importance of roads in India and its' Characteristics. • Different modes of transportation – land way, waterway, airway. Merits and demerits ofroadway and railway; • General classification of roads. • Selection and factors affecting road alignment.	**5**
UNIT –II	**Geometric Design of Highway** • Camber: Definition, purpose, types as per IRC – recommendations. • Kerbs: Road margin, road formation, right of way. • Design speed and various factors affecting design speed as per IRC – recommendations.	**10**

	• Gradient: Definition, types as per IRC – Recommendations. • Sight distance (SSD): Definition, types IRC – recommendations, simple numerical. • Curves: Necessity, types: Horizontal, vertical curves. • Extra widening of roads: numerical examples. • Super elevation: Definition, formula for calculating minimum and maximum Super elevation and method of providing super-elevation. • Standards cross-sections of national highway in embankment and cutting.	
UNIT –III	**Construction of Road Pavements** • Types of road materials and their Tests – Test on aggregates-Flakiness and Elongation In- dex tests, Angularity Number test, test on Bitumen- penetration, Ductility, Flash and Fire point test and Softening point test. • Pavement – Definition, Types, Structural Components of pavement and their functions • Construction of WBM road. Merits and demerits of WBM & WMM road. • Construction of Flexible pavement / Bituminous Road, Types of Bitumen and its proper- ties, Emulsion, Cutback, Tar, Terms used in BR-prime coat, tack coat, seal coat, Merits andDemerits of BR. • Cement concrete road -methods of construction, Alternate and Continuous Bay Method, Construction joints, filler and sealers, merits and demerits of concrete roads. Types of joints.	**10**
UNIT –IV	**Basics of Railway Engineering** • Classification of Indian Railways, zones of Indian Railways • Permanent way: Ideal requirement, Components; Rail Gauge, types, factors affecting selection of a gauge. • Rail, Rail Joints - requirements, types. • Creep of rail: causes and prevention. • Sleepers - functions and Requirement, types - concrete sleepers and their density • Ballast - function and types, suitability. • Rail fixtures and fastenings – fish plate, spikes, bolts, keys, bearing plates, chairs-types of anchors and anti-creepers.	**10**

UNIT - V	**Track geometrics, Construction and Maintenance** • Alignment- Factors governing rail alignment. • Track Cross sections – standard cross section of single and double line in cutting and embankment. Important terms-permanent land, formation width, side drains, • Railway Track Geometrics: Gradient, curves- types and factors affecting, grade compensation, super elevation, limits of Super elevation on curves, cant deficiency, negative cant, coning of wheel, tilting of rail. • Branching of Tracks, Points and crossings, Turn out- types, components, functions and inspection. Track junctions: crossovers, scissor cross over, diamond crossing, track triangle. • Station -Purpose, requirement of railway station, important technical terms, types of rail- way station, factors affecting site selection for railway station. • Station yard: Classification- Passenger, goods, locomotive and marshalling yards. Function & drawbacks of marshalling yards. • Track Maintenance- Necessity, Classification, Tools required for track maintenance with their functions, Organisation of track maintenance, Duties of permanent way inspector, gangmate and key man.	**10**
		45

SUGGESTED LEARNING RESOURCES:

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., Delhi (ISBN: 978-93-82609-858) Edition 2018
2. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Broth-ers, Roorkee.
3. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg , Standard Book House, New Delhi.
6. Sharma, S.K., Principles, Practice and Design of Highway Engineering,, S. Chand Publication,New Delhi.
7. Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age Interna-tional (P) Limited, Publishers, New Delhi.
8. Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications,Hyderabad.

TH:3- MECHANICS OF MATERIAL

L	T	P		
3	0	0		**Course Code: CEPC 205**
Total Contact Hours				**Theory Assessment**
Theory		: 45 Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PC

RATIONALE

Mechanics of Materials deals with the internal behavior of variously loaded solid bodies, such as; shafts, bars, beams, plates, and columns, as well as structures and machines that are assemblies of these components. Mechanics of materials focuses primarily on mechanical properties of materials, analysis of stress, strain and evaluation of deformations. The aim of this course is to develop background of students for taking up engineering subjects like Theory and Design of Structures, Design of Machines etc.

LEARNING OUTCOME

After completion of this course, the students will be able to

- Describe the Mechanical properties of important Engineering materials.
- Determine stresses, strains and deformations in elastic bodies of different shapes under different loading conditions for engineering applications
- Determine load carrying capacity of different types of members
- Calculate the design load to design the column

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
UNIT-I	**Centre of Gravity and Moment of Inertia** ● Definition of centre of gravity -Centre of gravity of of Symmetrical shapes (solid / hollow square, rectangular, circular, I Sections) • Moment of inertia (M.I.): Definition, M.I. of plane lamina, Radius of gyration, section mod- ulus, Parallel and Perpendicular axes theorems (without derivations), M.I. of rectangle, square, circle, semicircle, quarter circle and triangle section (without derivations). • M.I. of symmetrical and unsymmetrical I-section, Channel section, T-section, Angle section, Hollow sections and built up sections about centroidal axes and any other referenceaxis.	**8**

	• Polar Moment of Inertia of solid circular sections.	
UNIT-II	**Simple Stresses and Strains** • Definition of rigid, elastic and plastic bodies, deformation of elastic body under various forces, Definition of stress, strain, elasticity, Hook's law, Elastic limit, Modulus of elastic-ity. • Type of Stresses-Normal, Direct, Bending and Shear and nature of stresses i.e. Tensile and Compressive stresses. • Standard stress strain curve for tor steel bar under tension, Yield stress, Proof stress, Ultimate stress, Strain at various critical points, Percentage elongation and Factor of safety. • Deformation of body due to axial force, forces applied at intermediate sections, Maximum and minimum stress induced, Composite section under axial loading. • Concept of temperature stresses and strain, Stress and strain developed due to temperature variation in homogeneous simple bar (no composite section) • Longitudinal and lateral strain, Modulus of Rigidity, Poisson's ratio, Biaxial and tri-axial stresses, volumetric strain, change in volume, Bulk modulus (Introduction only). Relation between modulus of elasticity, modulus of rigidity and bulk modulus (without derivation). **COMPLEX STRESSES AND STRAINS** **Principal stresses and strains:** Occurrence of normal and tangential stresses - Concept of Principal stress and Principal Planes – major and minor principal stresses and their orientations – stresses on a given plane –shear and normal stress components on any inclined plane – Mohr's circle and its use in solving problems on complex stresses - Numerical problems	**12**
UNIT-III	**Shear Force and Bending Moment** • Types of supports, beams and loads. ▪ Concept and definition of shear force and bending moment, Relation between load, shear force and bending moment (without derivation). • Shear force and bending moment diagram for cantilever and simply supported beams subjected to point loads, uniformly distributed loads and couple (combination of any two types of loading), point of contra flexure.	**10**

UNIT-IV	**Bending and Shear Stresses in beams** • Concept and theory of pure bending, assumptions, flexural equation (without derivation), bending stresses and their nature, bending stress distribution diagram. • Concept of moment of resistance and simple numerical problems using flexural equation. Shear stress equation (without derivation), relation between maximum and average shear stress for rectangular and circular section, shear stress distribution diagram. ▪ Shear stress distribution for square, rectangular, circle, hollow, square, rectangular, circular, angle sections, channel section, I-section, T section. Simple numerical problems based on shear equation.	**9**
UNIT-V	**Columns** • Concept of compression member, short and long column, Effective length, Radius of gy- ration, Slenderness ratio, Types of end condition for columns, Buckling of axially loaded columns. • Euler's theory, assumptions made in Euler's theory and its limitations, Application of Eu- ler's equation to calculate buckling load. • Rankine' s formula and its application to calculate crippling load. • Concept of working load/safe load, design load and factor of safety.	**6**
	Total	**45**

SUGGESTED LEARNING RESOURCES:

1. Bedi D.S. , Strength of Materials, Khanna Publishing House, Delhi, Ed. 2018
2. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
3. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi.
4. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
5. Punmia B C, Strength of Materials, Laxmi Publications (p) Ltd. New Delhi.
6. Rattan S.S., Strength of Materials, McGraw Hill Education; New Delhi.
7. Bansal R K, Strength of Materials, Laxmi Publications.
8. Subramaniam R, Strength of Materials, Oxford University Press.

TH:4- GEOTECHNICAL ENGINEERING

L	T	P		**Course Code: CEPC 207**
3	0	0		
Total Contact Hours			**Total Marks: 100**	**Theory Assessment**
Theory		: 45 Hrs		End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PC

RATIONALE

The knowledge and skills of Geo-Technical Engineering help the Practicing Civil Engineers in Civil Engineering Construction Works, especially in the design and construction of building foundation.

LEARNING OUTCOME

After completion of this course, the students will be able to

- Determine physical and index properties and classification of soil
- Estimate permeability and shear strength of soil
- Identify the load bearing capacity of soil
- Explain various soil stabilization and compaction methods
- Use IS codes for different soil testing

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
UNIT-I	**Overview of Geology and Geotechnical Engineering** • Introduction of Geology, Branches of Geology, Importance of Geology for civil engineering structure and composition of earth, • Definition of a rock: Classification based on their genesis (mode of origin), formation. Classification and engineering uses of igneous, sedimentary and metamorphic rocks. (Concepts only) • Importance of soil as construction material in Civil engineering structures and as foundation bed for structures. (Concepts only) • Field application of geotechnical engineering for foundation design, pavement design, design of earth retaining structures, design of earthen dam. (Concepts only)	**5**
UNIT-II	**Physical and Index Properties of Soil** • Soil as a three phase system, water content, determination of water content by oven drying method as per BIS code, void ratio, porosity and degree of	**8**

	saturation, density index., air Content,Percentage of air voids, Relation between the parameters. • Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight. Determination of bulk unit weight and dry unit weight by core cutter and sand replacement method, Determination of specific gravity by pycnometer. • Consistency of soil, Atterberg limits of consistency: Liquid limit, plastic limit and shrinkage limit. Plasticity index. • Particle size distribution test and plotting of curve, Determination of effective diameter of soil, well graded and uniformly graded soils, BIS classification of soil.	
UNIT-III	**Permeability and Seepage** • Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (Concepts only No numerical problems).Effective stress,quick Sand	**8**
UNIT-IV	**Compaction,Consolidation and stabilization of soil** Concept of compaction, Standard and Modified proctor test as per IS code, Plotting of Compaction curve for determining: Optimum moisture content (OMC), maximum dry density (MDD), Zero air voids line. Factors affecting compaction, field methods of compaction – rolling, ramming and vibration. ● Consoildation,Difference between compaction and consolidation.Terzaghi's Model analogy of compression/springs showing the process of consolidation,Field implications • Concept of soil stabilization, necessity of soil stabilization, different methods of soil stabiliza tion. California bearing ratio (CBR) test - Meaning and Utilization in Pavement Construction • Necessity of site investigation and soil exploration: Types of exploration, criteria for decidingthe location and number of test pits and bores. Field identification of soil – dry • strength test, dilatancy test and toughness test.	**8**
UNIT-V	**Shear Strength of Soil** • Shear failure of soil-General, local and punching shear, concept of shear strength of soil. • Components of shearing resistance of soil – cohesion, internal friction. Mohr-Coulomb failure theory, Strength envelope, strength equation for purely cohesive and cohesion less soils. Direct shear, triaxial and vane shear test laboratory methods.	**8**

UNIT-VI	**Bearing Capacity of Soil and Foundation** • Bearing capacity and theory of earth pressure. Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure. Introduction to Terzaghi's analysis and assumptions, effect of water table on bearing capacity. • Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. Test procedures as per IS:1888 & IS:2131. Definition of earth pressure, Active and Passive earth pressure for no surcharge condition, coefficient of earth pressure, Rankine's theory and assumptions made for non- cohesive Soils. ● Type of foundations-shallow,deep foundation	**8**
		45

SUGGESTED LEARNING RESOURCES:

1. Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publication, Delhi.
2. Murthy, V.N.S., A text book of soil mechanics and foundation Engineering, CBS Publishers & Distributors Pvt. Ltd., New Delhi.
3. Ramamurthy, T.N. & Sitharam,T.G., Geotechnical Engineering(Soil Mechanics), S Chand andCompany LTD., New Delhi.
4. Raj, P. Purushothama, Soil Mechanics and Foundation Engineering, Pearson India, New Delhi.
5. Kasamalkar, B. J., Geotechnical Engineering, Pune Vidyarthi Griha Prakashan, Pune.
6. Arora K R, Soil Mechanics and Foundation Engineering, Standard Publisher.

TH:5- BUILDING MATERIAL & CONCRETE TECHNOLOGY

L	T	P	Total Marks: 100	Course Code: CEPC209
3	0	0		
Total Contact Hours				**Theory Assessment**
Theory		: 45 Hrs		End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PC

RATIONALE

The course relates to the fundamentals related to building material, concrete and concrete material, besides dealing with masonry, reinforcement, etc. The course includes what concrete is, what are the processes involved in formation of concrete, various materials that are used in concrete formation, properties of each ingredient of concrete, standard tests to be applied to concrete and concrete ingredients.

LEARNING OUTCOME

After completion of this course, the students will be able to

- Describe the properties of cement, aggregate and water used in concrete.
- Identify the suitable construction material
- Illustrate role of admixtures in concrete.
- Explain the properties of fresh and harden concrete
- Use of code for concrete mix design
- Follow the different procedure of concreting operations

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
UNIT-I	**Overview of Construction Materials** • Scope of construction materials in Building Construction, Transportation Engineering, Environmental Engineering, and Irrigation Engineering (applications only). • Selection of materials for different civil engineering structures on the basis of strength, durability, Eco friendly and economy. Broad classification of materials –, Natural, Artificial, special, finishing and recycled.	**2**
UNIT-II	• **Natural Construction Materials-**Requirements of good building stone; general characteristics of stone; quarrying anddressing methods and tools for stone.	**5**

	• Structure of timber, general properties and uses of good timber, different methods of seasoning for preservation of timber, defects in timber, use of bamboo in construction. • Asphalt, bitumen and tar used in construction, properties and uses. • Properties of lime, its types and uses. • Types of soil and its suitability in construction. • Properties of sand and uses Classification of coarse aggregate according to size	
UNIT-III	**Artificial Construction Materials** • Constituents of brick earth, Conventional / Traditional bricks, Modular and Standard bricks, Special bricks –fly ash bricks, Characteristics of good brick, Field tests on Bricks, Classification of burnt clay bricks and their suitability, Manufacturing process of burnt clay brick, fly ash bricks, Aerated concrete blocks. • Flooring tiles – Types, uses • Pre-cast concrete blocks- hollow, solid, pavement blocks, and their uses. • Plywood, particle board, Veneers, laminated board and their uses. • Types of glass: soda lime glass, lead glass and borosilicate glass and their uses. • Ferrous and non-ferrous metals and their uses.	**5**
UNIT-IV	**Cement, Aggregates , Water and Admixture** ● Composition of Cement • Manufacturing process of Cement – dry and wet (only flow chart), types of cement and its uses. Field tests on cement. • Physical properties of OPC and PPC: fineness, standard consistency, setting time, soundness, compressive strength. Different grades of OPC and relevant BIS codes. • Testing of cement: Laboratory tests-fineness, standard consistency, setting time, soundness, compressive strength. Storage of cement and effect of storage on properties of cement. • BIS Specifications and field applications of different types	**10**

	of cements: Rapid hardening, Lowheat, Portland pozzolana, Sulphate resisting, Blast furnace slag, High Alumina and White cement. • Aggregates: Requirements of good aggregate, Classification according to size and shape. • Fine aggregates: Properties, size, specific gravity, bulk density, water absorption and bulking, fineness modulus and grading zone of sand, silt content and their specification as per IS 383.Concept of crushed Sand. • Coarse aggregates: Properties, size, shape, surface texture, water absorption, soundness, specific gravity and bulk density, fineness modulus of coarse aggregate, grading of coarse aggregates, crushing value, impact value and abrasion value of coarse aggregates with specifications. • Water: Quality of water, impurities in mixing water and permissible limits for solids as per IS: 456. ▪ Admixtures in concrete: Purpose, properties and application for different types of admixturesuch as accelerating admixtures, retarding admixtures, water reducing admixtures, air entraining admixtures and super plasticizers. (concepts only)	
UNIT-V	**Concrete** • Concrete: Different grades of concrete, provisions of IS 456 (Latest). • Duff Abraham water cement (w/c) ratio law, significance of w/c ratio, selection of w/c ratio for different grades, maximum w/c ratio for different grades of concrete for different expo- sure conditions as per IS 456. • Properties of fresh concrete: Workability: Factors affecting workability of concrete. Determination of workability of concrete by slump cone, compaction factor, Vee-Bee Consistometer. Value of workability requirement for different types of concrete works. Segregation, bleeding and preventive measures. • Properties of Hardened concrete: Strength, Durability, Impermeability.	**8**
UNIT-VI	**Concrete Mix Design and Testing of Concrete** • Concrete mix design: Objectives, methods of mix design, study of mix design as per IS 10262 (only procedural steps). • Non- destructive testing of concrete: Rebound hammer test, working principle of rebound hammer and factor affecting the rebound index, Ultrasonic pulse velocity test as per IS13311 (part 1 and 2), Importance of NDT tests.	**5**

UNIT-VII	**Quality Control of Concrete** • Concreting Operations: Batching, Mixing, Transportation, Placing, Compaction, Curing and Finishing of concrete. Forms for concreting: Different types of form works for beams, slabs, columns, materials used for form work, requirement of good form work. Stripping time for removal of form works perIS 456. • Waterproofing: Importance and need of waterproofing, methods of waterproofing and mate rials used for waterproofing. • Joints in concrete construction: Types of joints, methods for joining old and new concrete, materials used for filling joints.	**5**
UNIT-VIII	**Special Concrete and Extreme Weather concreting** ▪ Special Concrete: Properties, advantages and limitation of following types of Special concrete: Ready mix Concrete, Fiber Reinforced Concrete, High performance Concrete, Self-com pacting concrete and light weight concrete. ▪ Cold weather concreting: effect of cold weather on concrete, precautions to be taken while concreting in cold weather condition. (only concepts) • Hot weather concreting: effect of hot weather on concrete, precautions to be taken while concreting in hot weather condition. (only concepts)	**5**
	Total=	**45**

SUGGESTED LEARNING RESOURCES:

2. Gambhir, M.L., Concrete Technology, Tata McGraw Hill Publishing Co. Ltd., Delhi.
3. Shetty, M.S., Concrete Technology, S. Chand and Co. Pvt. Ltd., Ram Nagar, Delhi.
4. Santhakumar, A. R., Concrete Technology, Oxford University Press, New Delhi.
5. Neville, A. M. and Brooks, J.J., Concrete Technology, Pearson Education Pvt. Ltd.
6. Sood, H., Kulkarni P. D., Mittal L. N., Laboratory Manual in Concrete Technology, CBS Publishers, New Delhi.

PR:1- TRANSPORTATION ENGINEERING LAB

L	T	P		
0	0	4		**Course Code: CEPC 211**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 50**	End Term Exam 15
				Progressive Assessment : 35
Pre Requisite		**: Nil**		
Credit		**2**		Category of Course : PC

RATIONALE

This course intends to train the students understand and apply the types of roads as per IRC recommendations, geometrical design features of different highways.

LEARNING OUTCOME

After completing this course, student will be able to:

- Identify the types of roads as per IRC recommendations.
- Implement the geometrical design features of different highways.
- Perform different tests on road materials.
- Select the suitable material for road construction

COURSE CONTENT DETAILS

LIST OF PRACTICALS TO BE PERFORMED

1. Flakiness and Elongation Index of aggregates.
2. Determination of Crushing strength, of Aggregates
3. Determination of Impact of Aggregates
4. Determination of Abrasion value of Aggregates
5. Angularity Number of aggregates.
6. Softening point test of bitumen.
7. Penetration test of bitumen.
8. Flash and Fire Point test of bitumen.
9. Ductility test of Bitumen.
10. Determination of Viscosity of bitumen
11. Determination of bitumen content using centrifuging extractor.
12. Determination of stability and flow of bitumen using Marshal stability apparatus.
13. Visit the constructed road for visual inspection to identify defects and suggest remedial measures.
14. Visit the road of any one type (flexible or rigid) to know the drainage condition.
15. CBR Test of aggregates

SUGGESTED LEARNING RESOURCES:

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., New Delhi (ISBN:978-93-82609-858) Edition 2018
2. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering,

Nem Chand and Broth-ers, Roorkee.

3. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg , Standard Book House, Delhi.
6. Sharma, S.K., Principles, Practice and Design of Highway Engineering,, S. Chand
7. Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age International (P) Limited, Publishers, New Delhi.
8. Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications,Hyderabad.

PR:2- MECHANICS OF MATERIAL LAB.

L	T	P		
0	0	4		**Course Code: CEPC 213**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 50**	End Term Exam 15
				Progressive Assessment : 35
Pre Requisite		**: Nil**		
Credit		**2**		Category of Course : PC

RATIONALE

This course will enable the students to apply mechanics of materials theory on real specimens and learn the practical testing procedures and concepts.

LEARNING OUTCOME

After completion of this course, the students will be able to

- Apply the procedure for the conduct of tensile and compressive strength.
- Demonstrate the concept of stress and strain through testing of different materials.
- Determine shear force, bending moment and their corresponding stresses.
- Determine flexural strength and abrasive properties of floor tiles.

COURSE CONTENT DETAILS

LIST OF PRACTICALS TO BE PERFORMED:

- Study and understand the use and components of Universal Testing Machine (UTM).
- Perform Tension test on mild steel as per IS:432(1) and bend rebend test on mild steel
- Perform tension test on Tor steel as per IS:1608, IS:1139 and bend -rebend test on Tor Steel
- Conduct compression test on Concrete cube using Compression Testing Machine.
- Conduct Izod Impact test on three metals. e.g. mild steel/ brass/aluminum/ copper /castiron etc. as per IS:1598.
- Conduct Charpy Impact test on three metals. e.g. mild steel/ brass/aluminum/ copper /castiron etc. as per IS:1757.
- Determine Water Absorption on bricks per IS:3495 (part II), IS:1077 or tile IS:1237.
- Determine Compressive strength of dry and wet bricks as per IS:3495(part I), IS:1077.
- Conduct Flexural test on concrete beam on rectangular section as per Indian Standards.
- Abrasion test of floor tiles
- Flexural test of floor tiles/roof tile

SUGGESTED LEARNING RESOURCES:

1. Bedi D.S., Strength of Materials, Khanna Publishing House, New Delhi (Edition 2018)
2. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
3. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi.
4. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
5. Punmia B C, Strength of Materials, Laxmi Publications (p) Ltd. New Delhi.
6. Rattan S.S., Strength of Materials, McGraw Hill Education; New Delhi.
7. Bansal R K, Strength of Materials, Laxmi Publications.
8. Subramaniam R, Strength of Materials, Oxford University Press.

PR:3- GEOTECHNICAL ENGINEERING LAB

L	T	P		
0	0	4		**Course Code: CEPC 215**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 50**	End Term Exam 15
				Progressive Assessment : 35
Pre Requisite		**: Nil**		
Credit		**2**		Category of Course : PC

RATIONALE

Determination of soil conditions is the most significant task in every civil engineering activity. Properties of the soil can be determined by both field and laboratory test methods. This course intends to train the students to evaluate various soil properties and explore the experimental procedures to identify the behaviour of soil for particular loading and able to understand results.

LEARNING OUTCOME

After completion of this course, the students will be able to

- Determine physical and index properties of soil.
- Estimate the permeability and shear strength of soil.
- Demonstrate the procedure for performing C.B.R test.
- Demonstrate various compaction methods for soil stabilization.

COURSE CONTENT DETAILS

LIST OF PRACTICALS TO BE PERFORMED:

1. Determine water content of given soil sample by oven drying method as per IS: 2720 (Part-II).
2. Determine specific gravity of soil by pycnometer method as per IS 2720 (Part-III).
3. Determine dry unit weight of soil in field by core cutter method as per IS 2720 (Part- XXIX).
4. Determine dry unit weight of soil in field by sand replacement method as per IS 2720 (Part-XXVIII).
5. Determine Plastic and Liquid Limit along with Plasticity Index of given soil sample as per IS 2720 (Part- V).
6. Determine Shrinkage limit of given soil sample as per IS 2720 (Part- V).
7. Determine grain size distribution of given soil sample by mechanical sieve analysis as per IS2720 (Part- IV).
8. Use different types of soil to identify and classify soil by conducting field tests-through Visual inspection, Dry strength test, Dilatancy test and Toughness test.
9. Determine coefficient of permeability by constant head test as per IS 2720 (Part- XVII).
10. Determine coefficient of permeability by falling head test as per IS 2720 (Part-

XVII).

11. Determine shear strength of soil by direct shear test as per IS 2720 (Part-XIII).
12. Determine shear strength of soil by vane shear and triaxial shear test as per IS 2720 (Part-XXX).
13. Determine MDD and OMC by standard proctor test and modified proctor test of given soil sample as per IS 2720 (Part-VII).
14. Determination of CBR value on the field as per IS2720 (Part - XVI).

SUGGESTED LEARNING RESOURCES:

1. Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publication
2. Murthy, V.N.S., A text book of soil mechanics and foundation Engineering, CBS Publishers & Distributors Pvt. Ltd., New Delhi.
3. Ramamurthy, T.N. & Sitharam,T.G., Geotechnical Engineering(Soil Mechanics), S Chand andCompany LTD., New Delhi.
4. Raj, P. Purushothama, Soil Mechanics and Foundation Engineering, Pearson India
5. Kasamalkar, B. J., Geotechnical Engineering, Pune Vidyarthi Griha Prakashan, Pune.
6. Arora K R, Soil Mechanics and Foundation Engineering, Standard Publisher.

PR:4- BUILDING MATERIALS & CONCRETE TECHNOLOGY LAB.

L	T	P		
0	0	4		**Course Code: CEPC 217**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 50**	End Term Exam **15**
				Progressive Assessment **: 35**
Pre Requisite		**: Nil**		
Credit		**2**		Category of Course : PC

RATIONALE

This course enables the students to have a clear understanding on structural functions and role of construction and concrete materials to achieve that. It helps understanding the concept of building construction and process. The lab course will put the theoretical data into practical concepts by site visits.

LEARNING OUTCOME

After completion of this course, the students will be able to

- Describe various construction materials, and their relevant characteristics.
- Select the suitable construction material
- Identify different types of cement by performing laboratory tests.
- Illustrate physical properties of fine and coarse aggregates.
- Prepare concrete of required specification.
- Maintain the quality of concrete applying scientific principles.
- Use relevant admixtures for improving the workability of concrete.

COURSE CONTENT DETAILS

LIST OF PRACTICAL TO BE PERFORMED:

i. Identify various sizes of available coarse aggregates from sample of 10 kg in laboratory and prepare report (60,40, 20,10 mm)

ii. Identify various layers and types of soil in foundation pit by visiting at least 3 construction sites in different locations of city and prepare report consisting photographs and samples.

iii. Select first class, second class and third-class bricks from the stake of bricks and prepare report based on its properties.

iv. Measure dimensions of 10 bricks and find average dimension and weight. Perform field tests - dropping, striking and scratching by nail and correlate the results obtained.

v. Identify different types of flooring tiles such as vitrified tiles, ceramic tiles, glazed tiles, mosaic tiles, anti- skid tiles, chequered tiles, paving blocks and prepare report about the specifications.

vi. Apply two or more coats of selected paint on the prepared base of a given wall surface for the area of 1m x 1m using suitable brush/rollers adopting safe practices.

vii. Prepare the cement mortar of proportion 1:3 or 1:6 using cement and sand only.

viii. Determine fineness of cement by Blaine's air permeability apparatus Or by sieving.

ix. Determine specific gravity, standard consistency, initial and final setting times of cement.

x. Determine compressive strength of cement.

xi. Determine bulking of sand.

xii. Determine bulk density of fine and coarse aggregates.

xiii. Determine water absorption of fine and coarse aggregates.

xiv. Determine Fineness modulus of fine aggregate by sieve analysis.

xv. Determine workability of concrete by slump cone test.

xvi. Determine workability of concrete by compaction factor test.

xvii. To prepare concrete mix of a particular grade as per IS 10262:2019 and determine compressive strength of Concrete for 7 and 28 days.

xviii. Demonstration of NDT equipment

SUGGESTED LEARNING RESOURCES:

1. Ghose, D. N., Construction Materials , Tata McGraw Hill, New Delhi.
2. S.K. Sharma, Civil Engineering Construction Materials, Khanna Publishing House, New Delhi
3. Varghese, P.C. , Building Materials, PHI learning, New Delhi.
4. Rangwala, S.C., Engineering Materials, Charator publisher, Ahemdabad.
5. Somayaji, Shan, Civil Engineering Materials, Pearson education, New Delhi.
6. Rajput, R.K, Engineering Materials, S. Chand and Co., New Delhi.
7. Materials, New Age Publishers, NewDelhi.
8. Sharma C. P., Engineering Materials, PHI Learning, New Delhi.
9. Duggal, S. K, Building Materials, New International, New Delhi.
10. Gambhir, M.L., Concrete Technology, Tata McGraw Hill Publishing Co. Ltd., Delhi.
11. Shetty, M.S., Concrete Technology, S. Chand and Co. Pvt. Ltd., Ram Nagar, Delhi.

12. Santhakumar, A. R., Concrete Technology, Oxford University Press, New Delhi.
13. Neville, A. M., Concrete Technology, Pearson Education Pvt. Ltd., New Delhi.
14. Sood, H., Kulkarni P. D., Mittal L. N., Laboratory Manual in Concrete Technology, CBS Publishers, New Delhi.

SUMMER INTERNSHIP - I

L	T	P		Course Code: SI 201	
0	0	0			
Total Contact Hours			**Total Marks: 50**	**Internship Assessment**	
Practical		:		End Term Exam	15
				Progressive Assessment	35
Pre-Requisite		**: Nil**			
Credit		**2**		Category of Course: SI	

RATIONALE:

The rationale for a summer internship is to offer a structured and practical learning experience that prepares individuals for their future careers, helps them make informed career choices, and equips them with the skills and knowledge necessary to succeed in their chosen field. This course provides opportunities to students for hand on industry experience.

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Apply theoretical knowledge gained in their academic coursework to real-world situations.
- Develop and refine specific skills relevant to the field.
- Gains hands-on experience in a professional network by interacting with mentors and industry professionals.
- Learn to manage their time effectively.
- Clarify career goals.

DETAILED COURSE CONTENTS:

Topic	Topic/Sub-Topic
I	**Orientation:** • Introduction to the organization's mission, values, and culture. • Familiarization with workplace policies, procedures, and safety guidelines. • Orientation to the team and organizational structure.
II	**Project-Based Learning:** • Description of the main project or tasks the intern will be working on during the internship. • Detailed project goals and objectives. • Training and guidance on project-specific tools, technologies, or • methodologies.
III	**Technical and Skill Development:** • Training sessions or workshops to enhance technical skills relevant to the internship role (e.g., programming languages, software tools, laboratory techniques).

	• Soft skills development, including communication, teamwork, problem solving, and time management
IV	**Mentorship and Supervision:** • Regular meetings with a designated mentor or supervisor for guidance, feedback, and support. • Mentorship objectives and expectations.
V	**Professional Development:** • Sessions on professional etiquette, networking, and building a personal brand • Resume writing and interview preparation workshops.
VI	**Industry and Field-Specific Knowledge:** • Lectures, seminars, or presentations on industry trends, best practices, and emerging technologies. • Guest speakers from the field to share insights and experiences.
VII	**Reporting and Documentation:** • Training on how to document project progress, results, and findings. • Practice in creating reports, presentations, or other deliverables.
VIII	**Ethics and Professionalism:** • Discussions on ethical considerations within the field. • Scenarios and case studies related to ethical decision-making
IX	**Feedback and Evaluation:** • Regular performance evaluations and feedback sessions. • Self-assessment and goal-setting exercises.
X	**Networking and Industry Exposure:** • Opportunities to attend industry conferences, webinars, or networking events. • Encouragement to connect with professionals in the field.

NOTE

As per AICTE guidelines, in Summer Internship-I, students are required to be involved in Inter/ Intra Institutional Activities viz;

- Training with higher Institutions;
- Soft skill training organized by Training and Placement Cell of the respective institutions;
- contribution at incubation/ innovation /entrepreneurship cell of the institute;
- participation in conferences/ workshops/ competitions etc.;
- Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop;

Working for consultancy/ research project within the institutes and Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

Suggested Online Link:

Web Links:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/12110600/

*****Progressive Assessment to be conducted for ensuring learning of students.

3rd semester Civil Engineering

Sub:- Pr:1 – TRANSPORTATION ENGINEERING LAB

SL. NO.	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QUANTITY NO.
1	Flakiness and Elongation Index of aggregates	1. Weighing Balance: A Balance of suitable capacity accurate to 0.1% of the mass of the weight of the test sample.	1
		2.Elongation and Flakiness index gauges	1
		3.Test Sieves: 63 mm, 50 mm, 40 mm, 31.5 mm, 25 mm, 20 mm, 16 mm, 12.5 mm, 10 mm, and 6.3 mm	1 SET
2	Determination of Crushing strength, of Aggregates	1. A steel cylinder of internal diameter 15.2 cm (Steel cylinder with open ends)	1
		2. A square base plate, plunger having a piston diameter of 15 cm	1
		3. A cylindrical measure of internal diameter of 11.5 cm and height 18 cm	1
		4. Steel tamping rod having diameter of 1.6 cm length 45 to 60 cm	1
		5. Balance of capacity 3 kg with accuracy up to 1 gm	1
		6. Compression testing machines capable of applying load of 40 tonnes at a loading rate of 4 tonnes per minute	1
		7.Test Sieves: 12.5mm, 10 mm& 2.36 mm	1
3	Determination of Impact of Aggregates	1. Impact Testing Machine: Impact testing machine conforming to IS: 2386 (Part IV) – 1963	1
		2. Metal Cylinder: cylindrical metal measure of 75 mm dia. and 50 mm depth.	1
		3. Test Sieves: IS Sieves of the sizes and apertures appropriate to the specification of the material to be tested, (Sieves of sizes–12.5 mm, 10 mm and 2.36 mm).	1
		4. A tamping rod of 10mm circular cross section and 230mm length, rounded at one end and Oven.	1
		5. Balance: A balance of capacity not less than 500 g, readable and accurate to 0.1g.	1
		6.Oven:A well-ventilated oven thermostatically controlled to maintain a temperature of 100 to 110ºC.	1
4	Determination of Abrasion value of Aggregates	1.LosAngeles machine with inside diameter 70cm and inside length of 50cm.	1

		2. Abrasive charges having diameter 8cm and weight 390 to 445 gm.	1
		3. I.S Sieve with 1.7 mm opening.	1
		4. Weighting Balance of 0.1gm accuracy.	1
		5. Metallic Tray	2
5	Angularity Number of aggregates	1.Cylindrical measure (metal for coarse, copper for fine)	1
		2.Tamping rod (for coarse) or funnel (for fine)	1
		3.Weighingbalance	1
		4.Spatula	2
		5.Glass plates	1
6	Softening point test of bitumen	1. Ring & Ball apparatus	1
		2. Water bath	1
		3. Stirrer	1
		4. Thermometer	1
		5. Beaker	1
		6. Heating device	1
7	Penetration test of bitumen	1. Penetrometer	1
		2. Sample cup	1
		3. Water bath for maintaining a temperature of 25˚C	1
		4. Thermometer	1
		5. Specified needle	1
		6. Stop watch	1
8	Flash and Fire Point test of bitumen	1. Pensky-Martens closed tester consisting of cup, lid, stirrer, shutter, flame exposure device	1 SET
		2. Thermometer (0-350o C) with sensitivity of 0.1o C	1
9	Ductility test of Bitumen	1. Ductility machine	1
		2. Briquette mould	1 SET
		3. Knife	2
10	Determination of Viscosity of bitumen	1.Tar Viscometer with 4mm and 10mm orifices	1
		2.Cup	1
		3.Valve	1
		4.Water bath	1
		5.Sleeve	1
		6.Stirrer	1
		7.Receiver	1
		8.Thermometer	1
11	Determination of bitumen content using centrifuging extractor	1. Centrifuge	1
		2. Balance of capacity 500 gram and sensitivity 0.01grams	1
		3. Thermostatically controlled oven with capacity up to 2500C	1

		4.Beaker for collecting extracted material.	1
12	Determination of stability and flow of bitumen using Marshal stability apparatus	1. Specimen mould assembly	1
		2. Specimen extractor	1
		3. Compaction hammer	1
		4. Compaction pedestal	1
		5. Breaking head	1
		6. Loading machine	1
		7. Flow meter	1
		8. Oven or hot plates	1
		9. Mixing apparatus	1
		10. Thermostatically control water bath	1
		11. Thermometers of range 0-360 oC with 1 oC sensitivity	1
13	CBR Test of aggregates	1. CBR mold with detachable perforated base plate	1
		2. Spacer disc with a removable handle (to be placed inside the mold)	1
		3. Collar of 50 mm high	1
		4. Penetration plunger of 50 mm diameter	1
		5. One annular and a few slotted surcharge masses of 2.5 kg each	1
		6. Rammer (2.6 kg with 310 mm drop for standard Proctor results) and (4.89 kg with 450 mm drop for modified Proctor results)	1
		7. Straight cutting edge	1
		8. Loading machine of 50 kN capacity fitted with a calibrated proving ring to which the plunger has to be attached	1
		9. Penetration measuring dial gauge of 0.01 mm accuracy	1
		10. Soaking tank	1
		11. Swelling gauge consisting of perforated plate with adjustable extension stem	1

3rd semester Civil Engineering

Sub:- PR:3- GEOTECHNICAL ENGINEERING LAB

SL. NO.	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QUANTITY NO.
1	Determine water content of given soil sample by oven drying method as per IS: 2720 (Part-II)	1.Thermostatically controlled oven maintained at a temperature of 110 ± 5oC	1
		2.Weighing balance, with an accuracy of 0.04% of the weight of the soil taken	1
		3.Air-tight container made of non-corrodible material with lid	1
		4. Tongs	2
2	Determine specific gravity ofsoil by pycnometer method as per IS 2720 (PartIII).	1.Pycnometer with a conical cap screwed at its top	1 SET
		2.Balance, sensitive to 0.2 g	1
		3.Wash bottle with deaired, distilled water	1
		4.Glass rod, about 150 mm and 3 mm diameter	1
		5.Thermometer with 0 - 50oC range and accurate to 1Oc	1
		6.Thermostaticallycontrolled oven	1
3	Determine dry unit weight ofsoil in field by core cutter method as per IS 2720 (Part- XXIX)	1. Cylindrical core cutter of steel, 127.4 mm long and 100 mm internal diameter with a wall thickness of 3 mm, bevelled at one end	1
		2. Steel dolly, 25 mm high and 100 mm internal diameter with a wall thickness of 7.5 mm, with a lip to enable it to be fitted on the top of the core-cutter	1
		3. Steel rammer	1
		4. Knife	2
		5. Grafting tool or pickaxe or spade	2
		6. Straight edge	2
		7. Balance accurate to 1g	1
		8.Containers for water content determination	1
		9.Thermostatically controlled hot air oven	1
4	Determine dry unit weight ofsoil in field by sand replacement method as per IS 2720 (Part-XXVIII)	1. Sand pouring cylinder with a pouring cone at its bottom separated from it by a shutter	1
		2. Cylindrical calibrating container, 100 mm internal diameter and 150 mm internal depth, with a flange	1

		3. Glass plate, about 45cm square and 1cm thick	1
		4. Metal tray with a central circular hole of diameter equal to the diameter of the sand pouring cone at its outlet	1
		5. Tools for excavating the hole	2
		6. Balance accurate to 1g	1
		7.Containers for water content determination	1
		8.Thermostatically controlled hot air oven	1
		9. Clean, uniformly graded natural sand passing the 600 micron IS sieve and retained on the 300 micron IS sieve	1
5	Determine Plastic and Liquid Limit along with Plasticity Index of given soil sample as per IS 2720 (Part- V)	**For Plastic Limit** 1.Flat glass plate, 10 mm thick and about 45 cm square	1
		2. Spatula	1
		3. Balance, sensitive to 0.01 g	1
		4. Thermostatically controlled oven	1
		5. Airtight and non-corrodible containers for moisture content determination	1
		6. Wash bottle containing distilled water	2
		7. 425 mircon IS sieve	2
		8. 3 mm diameter rod of about 10 cm length	1
		For Liquid Limit 1. Casagrande liquid limit apparatus	1
		2. Casagrande grooving tool of standard dimensions (Type A)	1 1
		3. Glass plate, 10 mm thick and about 45 cm square	1
		4. Spatula	2
		5. Balance, sensitive to 0.01 g	1
		6. Thermostatically controlled hot air oven	1
		7. Airtight and non-corrodible containers for moisture content determination	1
		8.Wash bottle containing distilled water	1
		9. 425 micron IS sieve	1
6	Determine Shrinkage limit of given soil sample as per IS 2720 (Part- V)	1. Evaporating dish of porcelain, about 12 cm in dia with a pour out and flat bottom	1
		2. Shrinkage dish with a flat bottom, 45 mm in dia and 15 mm height	1

		internally.	
		3. Glass cup of 50 mm dia and 24 mm height	1
		4. Plain glass plate of dimensions 75 mm x 75 mm x 3 mm	1
		5. Pronged glass plate of dimensions 75 mm x 75 mm x 3 mm with three prongs fixed to the plate at 1200 from each other and spacing of 30 mm center to center	1
		6. spatula	2
		7. straight edge	2
		8. 425 micron IS sieve	1
		9. Balance, sensitive to 0.1 g to 0.01 g.	1
		10. Thermostatically controlled hot air oven	1
		11. Wash bottle containing distilled water	1
		12. Desiccator	1
		13. Mercury	AS PER REQUIREMENT
7	Determine grain size distribution of given soil sample by mechanical sieve analysis as per IS2720 (Part- IV)	1. Set of IS sieves: 4.75mm, 2mm, 1mm, 600 micron, 425 micron, 300 micron, 212 micron, 150 micron, 106 micron, 75 micron	1 SET
		2. Brushes to clean the sieves	2
		3. Mechanical sieve shaker	1
		4. Balance	1
		5. Trays	2
		6. Thermostatically controlled hot air oven	1
8	Use different types ofsoil to identify and classify soil by conducting field teststhrough Visual inspection, Dry strength test, Dilatancy test and Toughness test	1.Glass beaker/test tube (for dispersion test)	1
9	Determine coefficient of permeability by constant head test as per IS 2720 (Part- XVII)	1. Permeameter with all accessories	1
		2. De-aired water	1
		3. Balance, sensitive to l g.	1
		4. Mixing pan	1
		5. Stop watch	1
		6. Graduated measuring cylinder	2
		7. Thermometer with 0o – 50oC range and accurate to 1oC.	1
		8. Trimming knife	2
		9. 4.75mm and 2mm IS sieves	1
10	Determine coefficient of permeability by falling head test as per IS 2720 (Part26 XVII)	1. Permeameter with all accessories	1
		2. De-aired water	1
		3. Balance, sensitive to l g.	1
		4. Mixing pan	1

		5. Stop watch	1
		6. Graduated measuring cylinder	2
		7. Thermometer with 0o – 50oC range and accurate to 1oC.	1
		8. Trimming knife	2
		9. 4.75mm and 2mm IS sieves	1
11	Determine shear strength ofsoil by direct shear test as per IS 2720 (Part-XIII)	1.Shear box assembly consisting of -Upper and lower parts of shear box coupled together with two pins or clamping screws. - Container for shear box -Grid plates – two pairs -Base plate with cross grooves on its top face to fit into the shear box. -Loading pad with a steel ball on its top which distributes the load over the specimen, normal to the shear plane	1
		2. Loading frame	1
		3. Calibrated weights	1
		4.Proving ring with dial gauge to measure shear force	1 1
		5. Balance with weights	
		6. Dial gauge	1
		7.Spatula	1
		8. Straight edge	1
		9.Sample trimmer	1
12	Determine shear strength ofsoil by vane shear and triaxial shear test as per IS 2720 (Part-XXX)	1. Laboratory vane shear apparatus	1
		2. Marble plate or glass plate	1
		3. Spatula	2
		4. Balance	1
		5. Thermostatically controlled hot air oven	1
		6. Containers for moisture content determination	1
		7. Wash bottle containing distilled water	2
		8. 425 micron IS sieve	1
13	Determine MDD and OMC by standard proctor test and modified proctor test of given soil sample as per IS 2720 (Part-VII)	1. A cylindrical metal mould of capacity 1000 cm3 , with an internal diameter of 100 mm and an internal affective height of 127.3 mm. The mould is fitted with a detachable base plate and a removable extension collar approximately 60 mm high	1
		2. A metal rammer of 50 mm diameter with a circular face and mass 2.6 kg with a free fall of 310	1

		mm	
		3. A steel straight edge about 30 cm in length and with one beveled edge	1
		4. 4.75 mm I.S. sieve	1
		5. Balance – (a) with a capacity of 10 kg and accuracy of 1 g (b) with a capacity of 200 g and accuracy of 0.01 g	1
		6. Thermostatically controlled hot air oven	1
		7. Airtight and non-corrodible containers for water content determination	1
		8. Tray	1
		9.Trowel	1
		10.Spatula	1
14	Determination ofCBR value on the field as per IS2720 (Part - XVI)	1. CBR mould with detachable perforated base plate	1 SET
		2. Spacer disc with a removable handle (to be placed inside the mould)	1
		3. Collar of 50mm high	1
		4. Penetration plunger of 50 mm diameter	1
		5. One annular and a few slotted surcharge masses 2.5 kg each	1
		6. Rammer (2.6 kg with 310mm drop for standard proctor results) and (4.89 kg with 450mm drop for modified proctor results)	1
		7. Straight cutting edge	1
		8. Loading machine of 50 kN capacity fitted with a calibrated proving ring to which plunger has to be attached	1
		9. Penetration measuring dial gauge of 0.01mm accuracy	1
		10. Soaking tank	1
		11. Swelling gauge consisting of a perforated plate with adjustable extension stem	1

3rd semester Civil Engineering

Sub:- PR:4- BUILDING MATERIALS & CONCRETE TECHNOLOGY LAB

SL. NO.	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QUANTITY NO.
1	Determine fineness of cement byBlaine's air permeability apparatus Or **by sieving**	1.IS-90 micron sieve conforming to IS: 460 (Part 1-3)-1985	1
		2.Weighing balance	1
		3.Gauging trowel	1
		4.Brush	1
2	Determine specific gravity, standard consistency, initial and final setting times of cement	**Specific Gravity test Equipment's** 1.Le Chaterliers flask	1
		2.weighing balance	1
		3.kerosene (free from water)	AS PER REQUIREMENT
		standard consistency, initial and final setting times of cement 1.Vicat apparatus with vicat's mould	1
		2.vicat plunger and needles	1
		3.Gauging trowel	1
		4.measuring jar	1
		5.weighing balance	1
		6.stop watch	1
		7.Rubber glove	1
		8.Glass plate	1
3	Determine compressive strength of cement	1.Universal testing machine or compressive testing machine	1
		2.Cube mould (7.16 cm side)	3
		3.Vibrating machine	1
		4.Measuring cylinder	1
		5.Trowels	2
		6.Non-porous plate	1
		7.Balance with weight box	1
4	Determine bulking ofsand	1.Beaker	1
		2.1000ml measuring jar	1
		3.Brush	1
		4.Scale	1
		5.Mixing tray	1
5	Determine bulk density of fine and coarse aggregates	1.Weighing balance	1
		2.Cylindrical metal measure (size depends on aggregate)	1
		3. Tamping rod	1
		4. Straight edge	1
6	Determine water absorption of fine and coarse aggregates	1.Pycnometer	1
		2.1000-mlmeasuringcylinder	1

		3.Thermostatically controlled oven	1
		4.Taping rod 5.Filter papers	1 AS PER REUIREMENT
		6.Funnel	1
		7.Balance of capacity 5kg weight	1
		8.Box wire basket 200mm in diameter	1
		9.Water container for immersing the wire basket	1
		10.Absorbent cloth for surface drying of the sample	2
		11.Thermos static drying oven	1
7	Determine Fineness modulus of fine aggregate by sieve analysis	1.Set of IS sieve - 4.75 mm, 2.36 mm, 1.18 mm, 0.60 mm, 0.30 mm, and 0.15 mm (150 microns)	1 SET
		2.Weighing balance	1
		3.Trays	3
		4.Mechanical sieve-shaker	1
8	Determine workability of concrete by slump cone test	1.Slump cone	1
		2.Concrete mixing pan	1
		3.Weighing balance	1
		4.Trays	2
		5.Spatula	2
		6.Trowels	2
		7.Tamping rod	1
		8.Graduated cylinder	1
9	Determine workability of concrete by compaction factor test	1.Compaction factor apparatus	1
		2.Concrete mixing pan	1
		3.Weighing balance	1
		4.Trays	2
		5.Spatula	2
		6.Trowels	2
		7.Tamping rod	1
		8.Graduated cylinder	1
10	To prepare concrete mix of a particular grade as per IS 10262:2019 and determine compressive strength of Concrete for 7 and 28 days	1.Moulds for the test cubes	3
		2.Tamping rod	1
		3.Metallic sheet	1
		4.Compressive testing machine	1
11	Demonstration of NDT equipment	1.Rebound hammer	1

Final

DIPLOMA CURRICULUM OF
CIVIL ENGINEERING
(SECOND YEAR)
(4th Semester)

(To be implemented from 2025-26)

Prepared by;

National Institute of Technical Teachers' Training & Research Kolkata
Block – FC, Sector – III, Salt Lake City, Kolkata – 700106

Vetted by:
Domain experts from Polytechnics of Odisha

State Council for Technical Education & Vocational Training
Near Raj Bhawan, Unit-VIII, Bhubaneswar, Odisha

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PROGRAMME TITLE: CIVIL ENGINEERING

SEMESTER - IV

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme				Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory		Practical			
					L	T	P	End Exam	Progressive Assessment	End Exam	Progressive Assessment		
1	Programme core	CEPC202 TH:1	Hydraulics & Irrigation Engineering		3	0	0	70	30	-	-	100	3
2		CEPC204 TH:2	Theory of Structure		3	0	0	70	30	-		100	3
3		CEPC206 TH:3	Estimating, Costing & Valuation		3	0	0	70	30	-		100	3
4		CEPC208 PR:1	Hydraulics & Irrigation Engg Lab.		0	0	4	-		15	35	50	2
5		CEPC210 PR:2	Estimating and Costing Lab		0	0	4	-		15	35	50	2
6		CEPC212 PR:3	Building planning & drawing Lab-1		0	0	4	-		15	35	50	2
7	Programme elective	CEPE202 (Any one) Elective 1 TH:4	A) Precast and Prestressed Concrete B) Construction Management C) Rural Construction Technology		3	0	0	70	30	-		100	3
8		CEPE204 (Any one) Elective 2 TH:5	A) Repairs and Maintenance of Structures B) Solid Waste Management C) Design of Steel Structures		3	0	0	70	30	-		100	3
9	Minor Project	PR202 PR:4	MINOR PROJECT		0	0	4	-		30	70	100	2
10	Mandatory	AU202	Essence of Indian knowledge and tradition		**2**	**0**	**0**	**0**		**0**		**0**	**0**
TOTAL					**17**	**0**	**16**	**350**	**150**	**75**	**175**	750	**23**

The best of 2 IA conducted in a subject out of 20 marks to be considered. Assignment/ quiz etc. of 10 marks to be treated as part of IA. Besides this, Monthly Test to be conducted for each subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester. Club/Innovation/ Idea Tinkering Activities etc. shall be encouraged to be performed by students beyond the above stipulated hours.

SEMESTER - IV COURSES

TH:1- HYDRAULICS & IRRIGATION ENGINEERING

L	T	P		
3	0	0		**Course Code: CEPC 202**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE

This course deals with behaviour of fluid at rest and in motion. The Civil Engineering profession is much concerned with subjects like water supply, Sanitary Engineering and Irrigation Engineering, which need a sound knowledge of Hydraulics. Additionally, the course aims to train the student in methods of developing water supplies and to briefly describe the means to treat water for consumptive use. It helps them to understand water demand of crops and provisions to meet the same. It also includes planning of reservoirs / dams and design of irrigation projects, canals and other diversion works

LEARNING OUTCOMES

After completion of this course, the students will be able to

- Explain the different types of flow
- Describe the parameters associated with fluid flow and hydrostatic pressure.
- Explain head loss and water hammer in fluid flowing through pipes.
- Illustrate different types of pumps and their uses
- Measure the discharge using different equation
- Estimate hydrological parameters.
- Estimate crop water requirements of a command area and capacity of canals.
- Execute Minor and Micro Irrigation Schemes.
- Select the relevant Cross Drainage works for the specific site conditions.
- Design simple irrigation regulatory structures

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
UNIT –I	**Pressure measurement and Hydrostatic pressure** • Technical terms used in Hydraulics –fluid, fluid mechanics, hydraulics, hydrostatics and hydrodynamics - ideal and real fluid, application of hydraulics. • Physical properties of fluid – density-specific volume,	**2**

	specific gravity, surface tension, capillarity, viscosity-Newton's law of viscosity. • Various types of pressure – Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure. Concept of Pressure head and its unit, Pascal's law of fluid pressure and its uses. • Measurement of differential Pressure by different methods. • Variation of pressure with depth, Pressure diagram, hydrostatic pressure and center of pressure on immersed surfaces and on tank walls. • Determination of total pressure and center of pressure on sides and bottom of water tanks, sides and bottom of tanks containing two liquids, vertical surface in contact with liquid on either side	
UNIT –II	**Fluid Flow Parameters** • Types of flow – Gravity and pressure flow, Laminar, Turbulent, Uniform, Non-uniform, Steady, Unsteady flow. Reynolds number. • Discharge and its unit, continuity equation of flow. • Energy of flowing liquid: potential, kinetic and pressure energy. • Bernoulli's theorem : statement, assumptions, equation.	**2**
UNIT –III	**Flow through pipes** • Major head loss in pipe: Frictional loss and its computation by Darcy's Weisbach equation, • Minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement andfittings. • Flow through pipes in series, pipes in parallel and Dupuit's equation for equivalent pipe. • Hydraulic gradient line and total energy line. • Discharge measuring device for pipe flow: Venturi meter - construction and working. • Discharge measurement-using Orifice, Hydraulic Coefficients of Orifice.	**8**
UNIT –IV	**Flow through Open Channel** • Geometrical properties of channel section: Wetted area, wetted perimeter, hydraulic radius for rectangular and trapezoidal channel section. • Determination of discharge by Chezy's equation and Manning's equation. • Conditions for most economical rectangular and trapezoidal channel section. • Discharge measuring devices: Triangular and rectangular Notches. • Velocity measurement devices: current meter, floats and Pitot's tube. • Specific energy diagram, Froudes' Number	**7**

UNIT –V	**Hydraulic Pumps** • Concept of pump, Types of pump - centrifugal, reciprocating, submersible. • Centrifugal pump: components and working • Reciprocating pump: single acting and double acting, components and working. • Suction head, delivery head, static head, Manometric head • Power of centrifugal pump. • Selection and choice of pump.	**5**
UNIT –VI	**Introduction to Hydrology** • Hydrology: Definition and Hydrological cycle • Rain Gauge: Symons rain gauge, automatic rain gauge, • Methods of calculating average rainfall: Arithmetic mean, Isohyetal, and Theissen polygon method. • Runoff, Factors affecting Run off, Computation of run–off. • Maximum Flood Discharge measurement: Rational and empirical methods, Simple numerical problems. • Yield and Dependable yield of a catchment, determination of dependable yield.	**5**
UNIT –VII	**Crop water requirement and Reservoir Planning** • Irrigation and its classification. • Crop Water requirement: Cropping seasons, Crop period, base period, Duty, Delta, CCA, GCA, intensity of irrigation, factors affecting duty, Problems on water requirement and capacity of canal. • Methods of application of irrigation water and its assessment. • Area capacity curve. • Silting of reservoir, Rate of silting, factors affecting silting and control measures. • Control levels in reservoir, Simple numerical problems on Fixing Control levels.	**5**
UNIT –VIII	**Dams and Spillways** • Dams and its classification: Earthen dams and Gravity dams (masonry and concrete). • Earthen Dams – Components with function, typical cross section, seepage through embankment and foundation and its control. • Methods of construction of earthen dam, types of failure of earthen dam and preventive measures. • Gravity Dams – Forces acting on dam, Theoretical and practical profile, typical cross section, drainage gallery, joints in gravity dam, concept of high dam and low dam. • Spillways-Definition, function, location, types and components, Energy dissipaters.	**5**

UNIT –IX	**Diversion Head Works & Canals** • Weirs – components, parts, types, K.T. weir – components and construction • Diversion head works – Layout, components and their function. • Barrages – components and their functions. Difference between weir and Barrage. • Canals – Classification according to alignment and position in the canal network, Cross section of canal in embankment and cutting, partial embankment and cutting, balancing depth, Canal lining - Purpose, material used and its properties, advantages. • Cross Drainage works- Aqueduct, siphon aqueduct, super passage, level crossing. • Canal regulators- Head regulator, Cross regulator, Escape, Falls and Outlets	**6**
	Total=	**45**

SUGGESTED LEARNING RESOURCES:

1. Modi, P. N.and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2. S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Publishing Co., New Delhi
3. Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat RaiPublishing Company, New Delhi.
4. Khurmi R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S. Chand Publishers
5. Rajput, R K, Fluid Mechanics, S Chand, New Delhi.
1. Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford Uni- versity Press, New Delhi. Punmia, B.C., Pande, B, Lal, Irrigation and Water Power Engineering, Laxmi Publications
2. Subramanayan, Engineering Hydrology, McGraw Hill.
3. Mutreja K N, Applied Hydrology, McGraw Hill
4. Sharma, R.K. and Sharma, T.K., Irrigation Engineering, S.Chand
5. Basak, N.N., Irrigation Engineering, McGraw Hill Education
6. Asawa, G.L., Irrigation and water resource Engineering, New Age
7. Dahigaonkar, J.G., Irrigation Engineering, Asian Book Pvt. Ltd., New Delhi.
8. Garg, S K, Irrigation and Hydraulic Structures, Khanna Publishers, Delhi.
9. Priyani V.B., Irrigation Engineering, Charotar Book Stall, Anand.

TH:2- THEORY OF STRUCTURE

L	T	P		
3	0	0		**Course Code: CEPC 204**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE

The Theory of Structures is vital for Civil Engineering diploma holders. This course teaches students to solve problems related to beams, assess the stability of dams and retaining walls, analyze trusses, and apply deflection formulas. It also covers the behavior of reinforced concrete beams and cracks. The course aims to equip students with a strong understanding of structural behavior, enabling them to confidently supervise construction projects, perform maintenance, and analyze simple structures. By understanding the principles of structural behavior and failure, students will be better prepared to make informed decisions in construction and maintenance tasks.

COURSE OUTCOME

After competing this course, student will be able to:

- Analyze stresses induced in vertical member subjected to direct and bending loads.
- Analyze slope and Deflection in fixed and continuous beams.
- Analyze continuous beam under different loading conditions using the principles of Three Moments.
- Analyze continuous beam using Moment Distribution Method under different loading conditions.
- Evaluate axial forces in the members of simple truss.

COURSE CONTENT DETAILS

UNIT NO & TITLE	CONTENT	LECTURE HOURS
UNIT –I	**Direct and Bending Stresses in vertical members** • Introduction to axial and eccentric loads, eccentricity about one principal axis only, nature of stresses, Maximum and minimum stresses, resultant stresses and distribution diagram. • Condition for no tension or zero stress at extreme fiber, Limit of eccentricity, core of section for rectangular and circular cross sections, Middle third rule. • Chimneys of circular cross section subjected to wind pressure, Maximum and minimum stresses, resultant stresses and distribution diagram at base. • Analysis of dams subjected to horizontal water pressure, conditions of stability, Maximum and minimum stresses,	**8**

	resultant stresses and distribution diagram at base.	
UNIT –II	**Slope and Deflection** • Concept of slope and deflection, stiffness of beams, Relation among bending moment, slope, deflection and radius of curvature, (no derivation). • Double integration method to find slope and deflection of cantilever and simply supported beams subjected to concentrated load and uniformly distributed load on entire span. • Macaulay's method for slope and deflection, application to cantilever and simply supported beam subjected to concentrated and uniformly distributed load on entire span.	**8**
UNIT –III	**Determinate and Indeterminate structures (Fixed and Continuous Beam)** • Concept of Determinate and Indeterminate structures • Concept of fixity, effect of fixity, advantages and disadvantages of fixed beam over simply supported beam. • Principle of superposition, Fixed end moments from first principle for beam subjected to point load, UDL over entire span. • Application of standard formulae in finding end moments, end reactions and drawing S.F. and B.M. diagrams for a fixed beam. • Definition, effect of continuity, nature of moments induced due to continuity, concept of deflected shape, practical examples. • Clapeyron's theorem of three moment (no derivation), Application of Clapeyron's theorem maximum up to three spans and two unknown support moment only, Support at same level spans having same and uniform moment of inertia subjected to concentrated loads and uniformly distributed loads over entire span. • Concept of influence line diagram (ILD)	**10**
UNIT –IV	**Moment distribution method** • Introduction to moment distribution method, sign convention, Carry over factor, stiffness factor, distribution factor. • Application of moment distribution method to various types of continuous beams subjected to concentrated loads and uniformly distributed load over entire span having same or different moment of inertia, supports at same level, up to three spans and two unknown support moments only. • Introduction to portal frames – Symmetrical and unsymmetrical portal frames with the concept of Bays and stories.	**10**

UNIT –V	**Simple trusses** • Types of trusses (Simple, Fink, compound fink, French truss, pratt truss, Howe truss, North light truss, King post and Queen post truss) • Calculate support reactions for trusses subjected to point loads at joints • Calculate forces in members of truss using Method of joints and Method of sections.	**9**
		45

SUGGESTED LEARNING RESOURCES:

1. Ramamrutham.S, Theory of structures, Dhanpatrai & Sons.
2. Khurmi, R. S. , Theory of Structures S. Chand and Co., New Delhi.
3. Bhavikatti, S S , Structural Analysis Vol-1, ,Vikas Publishing House Pvt Ltd.New Delhi.
4. Junnarkar, S. B. , Mechanics of structures, Volume-I and II Charotar Publishing House, Anand.
5. Pandit, G.S. and Gupta, S.P., Theory of Structures, Tata McGraw Hill, New Delhi.
6. Agor R, Structural Analysis, Khanna Publishing House, Delhi.

TH:3- ESTIMATING COSTING AND VALUATION

L	T	P		
3	0	0		**Course Code: CEPC 206**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE

The subject of estimating costing and valuation is very important for the diploma holders in Civil Engineering. In order to construct any item, pertaining to Civil Engineering, one should have knowledge of resource required for the works as also the money required for completion of the job.

COURSE OUTCOME

After competing this course, student will be able to:

- Select modes of measurements for different items of works.
- Prepare approximate estimate of a civil engineering works.
- Prepare detailed estimate of a civil engineering works.
- Use relevant software for estimating the quantities and cost of items of works.
- Justify rate for given items of work using rate analysis techniques.

COURSE CONTENT DETAILS

UNIT NO & TITLE	CONTENT	LECTURE HOURS
UNIT –I	**Fundamentals of Estimating and Costing** ▪ Estimating and Costing – Meaning, purpose, administrative approval, Technical Sanction and ▪ Types of methods of estimates – Approximate and Detailed estimate. ▪ Roles and responsibility of Engineers at different positions/levels, administrative set ups and heirarchy of Engineering Dept. in State Govt./Central Govt./PSUs ▪ Standard formats of Measurement sheet, Abstract sheet, ▪ Modes of measurement and desired accuracy in measurements for different items of work as per IS:1200. ▪ Rules for deduction in different category of work as per IS:1200. ▪ Description / specification of items of building work as per OPWD /DSR. /CPWD/Railways	**8**

UNIT –II	**Detailed Estimate** ▪ Detailed Estimate- Definition and Purpose, Data required for detailed estimate - Civil cost, GST, Contingencies, Supervision charges, Procedure for preparation of detailed estimate ▪ Long wall and Short wall method, Centre line method. ▪ Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements ▪ Provisions in detailed estimate: contingencies, work charged establishent, percentage charges, water supply	**15**
	and sanitary Charges and electrification charges etc. ▪ Prime cost, Provisional sum, Provisional quantities, Bill of quantities, Spot items or Site items. ▪ Detailed estimate of residential buildings using long wall short wall and centre line method	
UNIT –III	**Estimate for Civil Engineering Works** ▪ Earthwork - Quantities for roads, Embankment and canal by – Mid sectional area method, mean sectional area method, Prismoidal and trapezoidal formula method. ▪ Detailed estimate for septic tank, ▪ Estimate of RCC culvert, drainage syphon and vertical fall ▪ Estimate of Bituminous Road	**12**
UNIT –IV	**Rate Analysis** ▪ Rate Analysis: Definition, purpose and importance. ▪ Lead (Standard and Extra), lift, overhead charges, water charges and contractors' profit, procedure for rate analysis. ▪ Task work- Definition, types. Task work of different skilled labour for different items. ▪ Categories of labours, their daily wages, types and number of labours for different items of work. ▪ Transportation charges of materials - Lead and Lift, Hire charges of machineries and equipment. ▪ Preparing rate analysis of different items of work pertaining to buildings and roads. (Different items of work like PCC, Plastering, Flooring, and Brick work)	**10**
	Total	**45**
*****Latest analysis of rate and Schedule of rate of Govt. of Odisha may be allowed during end semester examination.		

SUGGESTED LEARNING RESOURCES:

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors Pvt. Ltd. New Delhi.
2. Peurifoy,Robert L. Oberlender,Garold, Estimating construction cost (fifth edition), McGraw Hill Education, , New Delhi.
3. Rangwala,S.C., Estimating and Costing, Charotar Publishing House PVT. LTD., Anand. Birdie,G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. New Delhi.
4. Patil,B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.

5. Chakraborti,M., Estimating and costing, specification and valuation in civil engineering, Monojit Chakraborti, Kolkata.
6. PWD Schedule of Rates. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.
7. Manual of Specifications and Standards for DBFOT projects, EPC works.

PR:1- HYDRAULICS & IRRIGATION ENGINEERING LAB

L	T	P		
0	0	4		**Course Code: CEPC 208**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 50**	End Exam 15
				Progressive Assessment : 35
Pre-Requisite		**: Nil**		
Credit		**2**		Category of Course: PC

RATIONALE

This course provides the student with an opportunity to explore the fundamental principles of fluid mechanics through experimentation. This course aims to enable the students to learn estimation of hydrological parameters. How to plan and design irrigation projects, canals and other diversion works.

LEARNING OUTCOME

After completing this course, student will be able to:

- Measure pressure and total hydrostatic pressure for different conditions.
- Determine head loss of fluid flow through pipes.
- Find the fluid flow parameters in open channels.
- Select relevant hydraulic pumps for different applications
- Estimate hydrological parameters.
- Estimate crop water requirements of a command area and capacity of canals.
- Execute Minor and Micro Irrigation Schemes.
- Select relevant Cross Drainage works for the specific site conditions.
- Design, construct and maintain simple irrigation regulatory structures

COURSE CONTENT DETAILS

LIST OF PRACTICALS TO BE PERFORMED:(Minimum 15 experiments to be performed.)

1. Use piezometer to measure pressure at a given point.
2. Use U tube differential manometer to measure pressure difference between two given points.
3. Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit of varying cross sections.
4. Use Friction factor Apparatus to determine friction factor for a given pipe.
5. Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement.
6. Determine minor losses in pipe fitting due to Bend and Elbow.
7. Calibrate Venturi meter to find out the discharge in a pipe.
8. Calibrate the Orifice to find out the discharge through a tank
9. Use Current meter to measure the velocity of flow of water in open channel.
10. Use Pitot tube to measure the velocity of flow of water in open channel.
11. Use triangular/rectangular notch to measure the discharge through open channel.
12. Calculate average rainfall for the given area using arithmetic mean method/isohyetal/ Theissen polygon method.

13. Compute the yield of the Catchment area demarcated in **Sr.No.12.**

14. Estimate crop water requirement for the given data.

15. Estimate capacity of the canal for the given data.

16. Calculate reservoir capacity from the given data.

Draw a labeled sketch of the given masonry/earthen dam section.

17. Draw the theoretical and practical profile of the given gravity dam section.

18. Prepare a model of any irrigation structure using suitable material in your area, based on field visit.

19. Draw a labeled sketch of the given diversion head works and Cross Drainage works.

SUGGESTED LEARNING RESOURCES:

1. Punmia, B.C., Pande, B, Lal, Irrigation and water power engineering, Laxmi Publications
2. Subramanayan, Engineering Hydrology, McGraw Hill.
3. Mutreja K N, Applied Hydrology, McGraw Hill
4. Sharma, R.K. and Sharma, T.K., Irrigation Engineering, S.Chand and Company
5. Basak, N.N., Irrigation Engineering, McGraw Hill Education India Pvt. Ltd.
6. Asawa, G.L., Irrigation and water resource Engineering, New Age International(P)
7. Dahigaonkar, J.G., Irrigation Engineering, Asian Book Pvt. Ltd., New Delhi.
8. Garg, S K, Irrigation and Hydraulic structures, Khanna Publishers, Delhi.
9. Priyani V.B., Irrigation Engineering, Charotar Book Stall, Anand.

1. Modi, P. N. and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2. S.S. Rattan, Fluid Mechanics and Hydraulic Machines, Khanna Publishing House, Delhi
3. Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing Company, New Delhi.
4. Khurmi, R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S Chand Publishers, New Delhi.
5. Rajput, R K, Fluid Mechanics, S Chand, New Delhi.
6. Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford University Press, New Delhi.

PR:2- ESTIMATION COSTING & VALUATION LAB

L	T	P		
0	0	4		**Course Code: CEPC 210**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 50**	End Exam 15
Pre-Requisite		**: NIL**		Progressive Assessment : 35
Credit		**2**		Category of Course: PC

RATIONALE

The subject of estimating is very important for the diploma holders in Civil Engineering. In order to construct any item, pertaining to Civil Engineering, one should have knowledge of resource required for the works as also the money required for completion of the job.

COURSE OUTCOME

After competing this course, student will be able to:

- Select modes of measurements for different items of works.
- Prepare approximate estimate of a civil engineering works.
- Prepare detailed estimate of a civil engineering works.
- Use relevant software for estimating the quantities and cost of items of works.
- Justify rate for given items of work using rate analysis techniques.

(Use of computer /softwares / programmes /MS Excel for detailed estimate Preparation of Civil Engineering Works.)

List of Practical to be performed:

1. Prepare the list of items to be executed with units for detailed estimate of a given structure from the given drawing.
2. Prepare a report on market rates for given material, labour wages, hire charges of tools & equipments required to construct the given structure as mentioned in at Serial number 1 above.
3. Study of items with specification given in the DSR (for any ten item)
4. Recording in Measurement Book (MB) for any four items
5. Prepare bill of quantities of given item from actual measurements. (Any four items).
6. Prepare approximate estimate for the given civil engineering works.
7. Calculate the reinforcement quantities from the given set of drawings for a room size of 3 m x 4 m with bar bending schedule (footing, column, beam, lintel with chajjah, slab)
8. Prepare rate analysis for the given five item of works.
9. Prepare detailed estimate of small Septic tank from the given set of drawings.
10. Prepare detailed estimate of a Road.
11. Prepare detailed estimate of a residential building.

SUGGESTED LEARNING RESOURCES:

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors
2. Peurifoy, Robert L. Oberlender,Garold, Estimating construction cost (fifth edition), McGrawHill Education, , New Delhi.
3. Rangwala,S.C., Estimating and Costing, Charotar Publishing House, Anand.

4. Birdie,G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. Delhi.
5. Patil,B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.
6. Chakraborti,M., Estimating and costing, specification and valuation in civil engineering,Monojit Chakraborti, Kolkata.
7. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.
8. Manual of Specifications and Standards for DBFOT projects, EPC works.

PR:3- BUILDING PLANNING & DRAWING LAB-1

L	T	P		
0	0	4		**Course Code: CEPC 212**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 50**	End Exam 15
				Progressive Assessment : 35
Pre-Requisite		**: Nil**		
Credit		**2**		Category of Course: PC

RATIONALE

The subject of building planning and drawing deals with different plan, layout of building and drawing of different part of building, sectional views etc. Therefore, building planning and drawing is a very important basic subject for students of civil engineering.

COURSE OUTCOME

After completing this course, student will be able to:

- Interpret the symbols, signs and conventions from the given drawing.
- Prepare line plans of residential and public buildings using principles of planning.
- Prepare submission and working drawing for the given requirement of Load Bearing Structure.
- Prepare submission and working drawing using CAD for the given requirement of Framed Structure.
- Draw two-point perspective drawing for given small objects.

COURSE CONTENT DETAILS

UNIT NO & TITLE	CONTENT	LECTURE HOURS
UNIT –I	**Introduction** • Draw various types of lines, graphical symbols for materials, doors and windows, symbols for sanitary, water supply and electrical installations and write abbreviations as per IS 962. • Write summary of observations of all technical details from the given drawing (One/Two BHK) obtained from the professional architect or civil engineer (Group activity in four students) • Draw line plans to suitable scale for any Five Public Buildings from the following (School Building, Primary Health Centre, Bank, Post Office, Hostel, Restaurant, Community Hall and Library).	**6**
UNIT –II	**Planning of Building** • Principles of planning for Residential and Public building- Aspect, Prospect, Orientation, Grouping, Privacy, Elegance, Flexibility, Circulation, Furniture requirements, Sanitation, Economy. • Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS 962.	**16**

	• Rules and bye-laws of sanctioning authorities for construction work. • Plot area, built up area, super built-up area, plinth area, carpet area, floor area and FAR (Floor Area Ratio). • Line plans for residential building of minimum three rooms including water closet (WC), bath and staircase as per principles of planning.	
UNIT –III	**Drawing of Load Bearing Structure** • Drawing of Single storey Load Bearing residential building (2 BHK) with staircase. • Data drawing –plan, elevation, section, site plan, schedule of openings, construction notes with specifications, area statement, Planning and design of staircase- Rise and Tread for residential and public building. • Working drawing – developed plan, elevation, section passing through staircase or WC and bath. • Foundation plan of Load bearing structure.	**16**
UNIT –IV	**Drawing of Framed Structure** • Drawing of Two storeyed Framed Structure (G+1), residential building (2 BHK) with staircase. • Data drawing – developed plan, elevation, section, site plan, schedule of openings, construction notes with specifications, area statement. Planning and design of staircase- Rise and Tread for residential and public building. • Working drawing of Framed structure – developed plan, elevation, section passing through staircase or WC and bath. • Foundation plan of Framed Structure. • Details of RCC footing, Column, Beam, Chajjas, Lintel, Staircase and slab.	**16**
UNIT –V	**Perspective Drawing** • Definition, Types of perspective, terms used in perspective drawing, principles used in perspective drawing • Two Point Perspective of small objects only such as steps, monuments, pedestals.	**6**
		60
All the drawings are tobe prepared using AutoCAD Software.		

SUGGESTED LEARNING RESOURCES:

1. Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, Mcgraw Hill Publishing company Ltd. New Delhi.
2. Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd New Asian Publishers, New Delhi.

3. M. G. Shah and C. M. Kale, Principles of Perspective Drawing, Mcgraw Hill Publishing company Ltd. New Delhi.
4. Swamy, Kumara; Rao, N, Kameshwara, A ., Building Planning and Drawing, Charotar Publication, Anand.
5. Bhavikatti, S. S., Building Construction, Vikas Publication House Pvt. Ltd., New Delhi.
6. Mantri, Sandip, A to Z Building Construction, Satya Prakashan, New Delhi.
7. Singh, Ajit, Working with Auto CAD 2000, Mcgraw Hill Publishing company Ltd. New Delhi.
8. Sane, Y.S., Planning and design of Building, Allied Publishers, New Delhi.

ELECTIVE - I : ANY ONE

TH:4(A)- PRECAST & PRESTRESSED CONCRETE

L	T	P	Total Marks: 100	Course Code: CEPE 202A
3	0	0		
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs		End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE

This course aims to introduce various types of precast and prefabricated concrete elements to the students. As a Civil Engineer, he will understand prestressing methods, systems for Reinforced Concrete members and issues involved in design of prestressing system and loss of prestressing.

LEARNING OUTCOME

After competing this course, student will be able to:

- Select the relevant precast concrete element for a given type of construction.
- Use relevant components for prefabricated structures.
- Justify the relevance of prestressed element in a given situation.
- Select relevant methods / systems for given construction work.
- Propose suitable cable profile for the given prestressed concrete members.

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
UNIT –I	**Precast concrete Elements** • Advantages and disadvantages of precast concrete members • Non-structural Precast elements - Paver blocks, Fencing Poles, Transmission Poles, Manhole Covers, Hollow and Solid Blocks, kerb stones as per relevant BIS specifications • Structural Precast elements – tunnel linings, Canal lining, Box culvert, bridge panels, foundation, sheet piles • Testing of Precast components as per BIS standards	**5**
UNIT –II	**Prefabricated building** • Precast Structural Building components such as slab panels, beams, columns, footings, walls, lintels and chajjas, staircase elements, • Prefabricated building using precast load bearing and non	**12**

	load bearing wall panels, floor systems - Material characteristics, Plans & Standard specifications • Modular co-ordination, modular grid, and finishes • Prefab systems and structural schemes and their classification including design considerations • Joints – requirements of structural joints and their design considerations • Manufacturing, storage, curing, transportation and erection of above elements, equipment needed	
UNIT –III	**Introduction to Prestressed Concrete** • Principles of pre-stressed concrete and basic terminology. • Applications, advantages and disadvantages of prestressed concrete • Materials used and their properties, Necessity of high-grade materials • Types of Pre-stressing steel -Wire, Cable, tendon, Merits-demerits and applications	**7**
UNIT –IV	**Methods and systems of prestressing** • Methods of prestressing – Internal and External pre-stressing, Pre and Post tensioning- applications • Systems for pre tensioning – process, applications, merits and demerits - Hoyer system • Systems for post-tensioning - process, applications, merits and demerits - Freyssinet system, Magnel Blaton system, Gifford Udall system. • Prestressing force in Cable, Loss of prestress during the tensioning process - loss due to friction, length effect, wobbling effect and curvature effect, (Simple Numerical problems to determine loss of pre-stress), Loss of pre- stress at the anchoring stage. • Loss of pre-stress occurring subsequently: losses due to shrinkage of concrete, creep of concrete, elastic shortening, and creep in steel, (Simple Numerical problems to determine loss of pre-stress). • BIS recommendations for percentage loss in case of Pre and Post tensioning.	**11**
UNIT –V	**Analysis and design of Prestressed rectangular beam section** • Basic assumptions in analysis of pre-stressed concrete beams. • Cable Profile in simply supported rectangular beam section – concentric, eccentric straight and parabolic • Effect of cable profile on maximum stresses at mid span and at support. • Numerical problems on determination of maximum	**10**

	stresses at mid spans with linear (concentric and eccentric) cable profiles only. • Simple steps involved in Design of simply supported rectangular beam section (No numerical problems)	
		45

SUGGESTED LEARNING RESOURCES

1. Krishna Raju, N., Pre-stressed Concrete, Tata McGraw Hill, New Delhi.

2. Shrikant B. Vanakudre, Prestressed Concrete, Khanna Publishing House, New Delhi

3. Marzuki, Nor Ashikin, Pre Cast and Pre Stress Technology: Process, Method and Future Technology, Createspace Independent Publication.

4. Indian Concrete Institute., Handbook on Precast Concrete buildings.

5. Elliott, Kim S., Precast Concrete Structures, CRC Press, New York.

6. Lin, T.Y., Design of Pre-Stressed Concrete Structures, John Wiley and Sons, New York Nagarajan, Pravin., Pre-stressed Concrete Structures, Pearson Education India

7. BIS, New Delhi. IS 12592 Precast Concrete Manhole Cover and Frame, BIS, New Delhi

8. BIS, New Delhi. IS 15658 Precast concrete blocks for paving - Code of Practice, BIS, New Delhi

9. BIS, New Delhi. IS 15916 Building Design and Erection Using Prefabricated Concrete - Code of Practice, BIS, New Delhi

10. BIS, New Delhi. IS 15917 Building Design and Erection Using Mixed/Composite Construction - Code of Practice, BIS, New Delhi

11. BIS, New Delhi. IS 458 Precast Concrete Pipes (with and without reinforcement) — Specification, BIS, New Delhi

TH:4(B)- CONSTRUCTION MANAGEMENT

L	T	P		
3	0	0		**Course Code: CEPC 202B**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE

This course enables the students to learn about professional service that provides a project's owner(s) with effective management of the project's schedule, cost, quality, safety, scope, and function.

LEARNING OUTCOME

After competing this course, student will be able to:

- Explain the contract management and associated labour laws.
- Prepare the nuances of executing the site layout.
- Prepare networks and bar charts for the given construction project.
- Explain the intricacies of disputes, related arbitration and settlement laws.
- Apply safety measures at construction projects.

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
UNIT –I	**Construction industry and management** • Organization-objectives, principles of organization, types of organization: government/public and private construction industry, Role of various personnel in construction organization Agencies associated with construction work- owner, promoter, builder, designer, architects. • Role of consultant for various activities: Preparation of Detailed Project Report (DPR), monitoring of progress and quality, settlement of disputes.	**6**
UNIT –II	**Site Layout** • Principles governing site layout. • Factors affecting site layout. • Preparation of site layout. • Land acquisition procedures and providing compensation.	**8**
UNIT –III	**Planning and scheduling**	**15**

	• Identifying broad activities in construction work & allotting time to it, Methods of Scheduling, Development of bar charts, Merits & limitations of bar chart. • Elements of Network: Event, activity, dummy activities, Precautions in drawing Network, Numbering the events. • CPM networks, activity time estimate, Event Times by forward & backward pass calculation, start and finish time of activity, project duration. Floats: Types of Floats- Free, independent and total floats, critical activities and critical path, • Purpose of crashing a network, Normal Time and Cost, Crash Time and Cost, Cost slope, Optimization of cost and duration. • Material Management- Ordering cost, inventory carrying cost, Economic Order Quantity • Store management, various records related to store management, inventory control by ABC technique, Introduction to material procurement through portals (e.g. www.inampro.nic.in).	
UNIT –IV	**Construction Contracts and Specifications** • Types of Construction contracts • Contract documents, specifications, general special conditions • Contract Management, procedures involved in arbitration and settlement (Introductiononly)	**8**
UNIT –V	**Safety in Construction** • Safety in Construction Industry—Causes of Accidents, Remedial and Preventive Measures. • Labour Laws and Acts pertaining to Civil construction activities (Introduction only)	**8**
		45

SUGGESTED LEARNING RESOURCES

1. Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Publishing, New Delhi
2. Gahlot,P.S. and Dhir, B.M Construction planning and management New Age International (P) Ltd. Publishers, New Delhi.
3. Shrivastava, U.K., Construction planning and management, Galgotia Publication Pvt Ltd. NewDelhi
4. Mantri, S., The A To Z of Practical Building Construction and its Management, Satya Prakashan New Delhi
5. Khanna, O.P. , Industrial Engineering and management, Dhanpat Rai New Delhi

6. Punmia, B.C. and Khandelwal, K.K., Project Planning and Controlling with PERT And CPM,
   Laxmi Publications (P)Ltd.
7. Sengupta, B., Guha H., Construction Management and Planning, Tata-McGraw Hill.
8. Harpal, Singh, Construction Management and accounts, Mc-Graw Hill.
9. Sharma, S.C., Industrial Engineering and Management, Khanna Publications, New Delhi

TH:4(C)- RURAL CONSTRUCTION TECHNOLOGY

L	T	P		
3	0	0		**Course Code: CEPC 202C**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE

This course enables the students to learn development and planning of low-cost housing infrastructure, different government schemes for rural development, techniques for rural road construction and watershed management in rural areas.

LEARNING OUTCOME

After competing this course, student will be able to:

- Plan low-cost housing using rural materials.
- Make use of relevant government schemes for construction of roads and housing.
- Use guidelines for rural road construction.
- Implement different irrigation systems for rural areas.
- Identify the need of watershed management in rural areas

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
UNIT –I	**Rural Development and Planning** • Scope; development plans; various approaches to rural development planning. • Significance of rural development. • Rural development programme/projects.	**5**
UNIT –II	**Rural Housing** • Low-cost construction material for housing • Composite material- ferro-cement & fly ash, autoclaved calcium silicate bricks and • soil-stabilized un-burnt brick; Plinth protection of mud walls. • Water-proof and fire-retardant roof treatment for thatch roofs. Pre-cast stone masonry, rattrap bond for walls; Panels for roof, ferro-cement flooring/roofing units. • Biomass - types of fuels such as firewood, agricultural residues, dung cakes. • Renewable energy and integrated rural energy program - Objectives, Key elements, Implementation, Financial provisions, sources of renewable energy. • Working of gobar gas and bio gas plants.	**10**

UNIT –III	**Water Supply and Sanitation for Rural Areas** • Sources of water: BIS & WHO water standards. • Quality, Storage and distribution for rural water supply works. • Hand pumps-types, installation, operation, and maintenance of hand pumps. • Conservation of water - rainwater harvesting, drainage in rural areas. • Construction of low cost latrines: Two pit pour flush water seal, septic tank etc. • Low cost community and individual Garbage disposal systems, Ferro-cement storage tanks.	**10**
UNIT –IV	**Low Cost Rural Roads** • Broad categories of Pavement Layers, types of Granular Sub-Bases and Bases. • Guidelines for Surfacing of Rural Road as per relevant IRC codes. • Pradhan Mantri Gram Sadak Yojna (PMGSY)- Highlights of Scheme.	**10**
UNIT –V	**Low Cost Irrigation** • Design consideration and construction of tube-well, drip & sprinkler irrigation systems. • Watershed and catchment area development –problems and features of watershed management. • Watershed management structures - K. T. weir, Gabian Structure, Cement Plug, Contour Bunding, Farm Pond, Bandhara system.	**10**
		45

SUGGESTED LEARNING RESOURCES

1. Madhov Rao A G, and Ramachandra Murthy, D S, Appropriate Technologies for low-cost Housing Oxford and IBH Publishing Co. Pvt. Ltd.

2. CBRI, Roorkee, Advances in Building Materials and Constriction.

3. Desai,Vasant , Rural Development in India: Past, Present and Future : a Challenge in the Crisis, Himalaya Publishing House, Delhi.

4. Rastogi, A.K.Rural Development Strategy, Wide Vision, Jaipur.

5. Singh, Katar, Rural Development Principles, Policies and Management, Sage Publications India Pvt Ltd.

6. Gaur, Keshav Dev, Dynamics of Rural Development, Mittal Publications, Delhi.

7. Document Published by Ministry of Rural development, Govt. of India, Ministry of Rural development

Professional elective 2

TH:5(A)- REPAIRS AND MAINTENANCE OF STRUCTURES

L	T	P	Total Marks: 100	Course Code: CEPE 204A
3	0	0		
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs		End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE:

The appropriate design, exact detailing, and construction in compliance with certain designs and specifications are requirements for a structure's safety and durability. Therefore, a civil engineering profesional should know the repair and maintenance of structures. Diploma holders must also assist designers, make recommendations for renovation and repair projects. The subject aims to cover the aforementioned aspects of civil engineering profession.

COURSE OBJECTIVES:

After competing this course, student will be able to

- Apply the different types of maintenance techniques
- Identify the causes of various types of damages the structures.
- Select the relevant materials for repairing the structures.
- Select the suitable methods of retrofitting for different structures.

COURSE CONTENT DETAILS

UNIT NO & TITLE	CONTENT	LECTURE HOURS
UNIT –I	**Basics of maintenance** • Types of Maintenances - repair, retrofitting, re- strengthening, rehabilitation and restoration. Necessity, objectives and importance of maintenance. • Approach of effective management for maintenance. Periodical maintenance: check list, maintenance manual containing building plan, reinforcement details, material sources, maintenance frequency, corrective maintenance procedures and sources. Pre- and post-monsoon maintenance.	8
UNIT-II	**Causes and detection of damages** • Causes of damages due to distress, earthquake, wind, flood, dampness, corrosion, fire, deterioration, termites, pollution and foundation settlement. Various aspects of visual observations for detection of damages. • Load test and non-destructive tests (brief description). NDT tests on damaged structure such as rebound hammer, ultrasonic pulse velocity, rebar locator, crack detection micro- scope, digital crack measuring gauge. • Chemical test - Chloride test, sulphate attack, carbonation test, pH	7

	measurement, resistivity method, Half-cell potential meter (Introduction and demonstration only).	
UNIT-III	**Materials for maintenance and repairs** • Types of repair material, material selection. • Essential parameters for maintenance and repair materials such as , bond with substrate, durability. Waterproofing materials based on polymer modified cement slurry, UV resistant acrylic polymer, ferro-cement. • Repairing materials for masonry: plastic/aluminum nipples, non-shrink cement, polyester putty or 1:3 cement sand mortar, galvanized steel wire fabrics and clamping rods, wire nails, ferro cement plates. • Repairing materials for RCC: epoxy resins, epoxy mortar, and cement mortar impregnated with polypropylene, silicon, polymer concrete composites, sealants, fiber reinforcement concrete, emulsions and paints.	10
UNIT-IV	**Maintenance and repair methods for masonry Construction** • Causes of cracks in walls - bulging of wall, shrinkage, bonding, shear, tensile, vegetation. Probable crack location: junction of main and cross wall, junction of slab and wall, cracks in masonry joints. • Repair methods based on crack type - For minor & medium cracks (width 0.5 mm to 5mm): grouting and for major cracks (width more than 5mm): fixing mesh across cracks, RCC band, installing ferro-cement plates at corners, dowel bars, propping of load bearing. • Remedial measures for dampness & efflorescence in wall.	10
UNIT-V	**Maintenance and repair methods for RCC Construction** • Repair stages such as concrete removal and surface preparation, fixing suitable formwork, bonding/passive coat and repair application, various methods of surface preparation. • Repair options such as grouting, patch repairs, carbonated concrete, cleaning the corroded steel, concrete overlays, latex concrete, and epoxy bonded mortar and concrete, polymer concrete, corrosion protection such as jacketing. • Building cracks and its prevention, common methods for dormant crack repairs such as Ep-oxy injection, grooving and sealing, stitching, grouting and guniting/ shotcreting. • Strengthening methods for live cracks such as addition of reinforcements, Jacketing, brackets, collars, supplementary members i.e. shoring, underpinning and propping of framed structure.	10
	Total	**45**

SUGGESTED LEARNING RESOURCES

1. Gahlot, P. S., Sharma, S., Building Repair and Maintenance Management, CBS Publishers & Distributors Pvt. Ltd., New Delhi

2. Guha, P. K., Maintenance and Repairs of Buildings, New Central Book Agencies

3. Hutchin Son, B. D., Maintenance and Repairs of Buildings, Newnes-Butterworth

4. Relevant BIS codes

TH:5(B)- SOLID WASTE MANAGEMENT

L	T	P		
3	0	0		**Course Code: CEPC 204B**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE

Urbanisation and industrialization are both accelerating day by day. Because of this, the production of solid waste is a significant issue in both urban and rural areas of the country, and it is getting worse every day. From this vantage point, managing solid waste is a crucial component of maintaining a healthy and safe environment. Therefore, a civil engineer with a diploma should be properly knowledgeable about managing solid waste, as the concepts of recycling, recovery, and reuse will result in proper disposal that is acceptable and economic.

COURSE OUTCOME

After competing this course, student will be able to:

- Identify the sources of solid waste.
- Select the relevant method of collection and transportation of solid waste
- Suggest an action plan for composting of solid waste.
- Devise suitable disposal technique for solid waste
- Use the relevant method for disposal of Bio-medical and E-waste.

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	LECTURE HOURS
UNIT –I	**Introduction** • Definition of solid waste, different solid waste – domestic Waste, commercial waste, industrial waste, market waste, agricultural waste, biomedical waste, E-waste, hazardous waste, institutional waste, etc. • Sources of solid waste, Classification of solid waste – hazardous and non- hazardous waste. • Physical and chemical characteristics of municipal solid waste.	**7**
UNIT –II	**Storage, Collection and Transportation of Municipal Solid Waste** • Collection, segregation, storage and transportation of solid waste. • Tools and Equipment: Litter Bin, Broom, Shovels, Handcarts, Mechanical Road sweepers, Community bin like movable and stationary bin. • Transportation vehicles with their working capacity -Animal carts, Auto vehicles, Tractors or Trailers, Trucks, Dumpers, Compactor vehicles. Transfer station- meaning, necessity,	**10**

	location. • Role of rag pickers and their utility for society	
UNIT –III	**Composting of Solid Waste** • Concept of composting of waste, Principles of composting process. Factors affecting the composting process. • Methods of composting – Manual Composting – Bangalore method, Indore Method, Mechanical Composting – Dano Process, Vermi composting	**10**
UNIT –IV	**Techniques for Disposal of Solid Waste** • Solid waste management techniques – solid waste management hierarchy, waste prevention and waste reduction techniques • Land filling technique, Factors to be considered for site selection, Land filling methods - Area method, Trench method and Ramp method, Leachate and its control, Biogas from landfill. • Advantages and disadvantages of landfill method, recycling of municipal solid waste • Incineration of waste: Introduction of incineration process, Types of incinerators - Flash, Multiple chamber Incinerators, Products of incineration process with their use, Pyrolysis of waste – Definition, Methods	**8**
UNIT –V	**Biomedical and E-waste management** • Definition of Bio medical Waste. • Sources and generation of Biomedical Waste and its classification • Bio medical waste Management technologies. • Definition, varieties and ill effects of E- waste, • Recycling and disposal of E- waste.	**10**
	Total	**45**

SUGGESTED LEARNING RESOURCES:

1. Gupta O.P, Elements of Solid Hazardous Waste Management, Khanna Book Publishing Co., Delhi Ed. 2018
2. Bhide, A. D., Solid Waste Management, Indian National Scientific Documentation Centre, New Delhi.
3. George Techobanoglous, Kreith, Frank., Solid Waste, McGraw Hill Publication, New Delhi.
4. Sasikumar, K., Solid Waste Management, PHI learning, Delhi.
5. Hosetti, B.B., Prospect and Perspectives of Solid Waste Management, New Age International Publisher.

TH:5(C)- DESIGN OF STEEL STRUCTURES

L	T	P		
3	0	0		**Course Code: CEPC 204C**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE:

The objective of this course is to make students conversant in designing steel structural elements as per Indian code provisions. This course covers topics like steel material properties, connections, tension/compression member design, beams, using limit state design methodology

COURSE OUTCOME

After completing this course, student will be able to:

- demonstrate the concepts involved in the design of riveted and welded connections.
- Explain the provisions of BIS code for design of built up sections.
- Analyze T and L shaped beam sections.
- Explain the concept for design of one way and two way slabs.
- Identify short and long columns and their design provisions.

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	LECTURE HOURS
UNIT –I	**Design of connections in steel structures** • Types of connection, bolted connection, Strength of bolted joints, • Design of bolted joints for axially loaded members. • Types of weld, welded connections, Permissible stresses in weld, Strength of weld. • Advantages and disadvantages of weld, Design of fillet weld and butt weld for axial load. •	**10**
UNIT-II	**Design of Steel Tension (Limit State Method)** • Types of sections used for Tension members. • Strength of tension member by- yielding of section, rupture of net cross-section and block shear. • Design of axially loaded single angle and double angle tension members with bolted and welded connections.	**10**
UNIT-III	**Design of Steel Compression Members (Limit State Method)** • Types of sections used as compression member, Calculation of effective length, Radius of gyration and slenderness ratio, Permissible values of slenderness ratio as per IS 800-2007, Design compressive stress,	**15**

	Design of column bases for axially loaded columns only.	
	• Introduction to built up sections, lacing and battening (Meaning and purpose), Diagrams of single and double lacing and battening system. (No numerical problems). • Design of axially loaded single and double angle struts connected by bolted and welded connections with gusset plate.	
UNIT-IV	**Design of Steel beams (Limit State Method)** • Standard beam sections, Bending stress calculations. • Design of simple I and channel section. • Check for shear as per IS 800 2007 • Simple and built up sections, • Introduction to plate girder: Components and functions (no numerical	**10**
	Total	**45**

SUGGESTED LEARNING RESOURCES:

1. Shah, V. L., and Gore, V., Limit State Design of Steel Structures, Structures Publications, Pune.
2. Dayarathnam, P., Design of Steel Structures, S. Chand and Company, New Delhi.
3. Subramanian N., Design of Steel Structures, Oxford University Press.
4. Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai, Delhi.
5.Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune.
6. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co.,
7. Krishna Raju, and N.Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
8. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill
9. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Private Limited, Delhi.

PR:4- MINOR PROJECT

L	T	P		
0	0	4		**Course Code: PR 202**
Total Contact Hours				**Project Assessment**
Theory		: 60Hrs	**Total Marks: 100**	End Exam 30
				Progressive Assessment 70
Pre-Requisite		**: Nil**		
Credit		**2**		Category of Course : Project

RATIONALE:

A Minor project is generally requires a larger amount of effort and more independent work than that involved in a normal assignment. It requires students to undertake their own fact-finding and analysis. The students will select the topic, perform and design work. Minor project is as preparation for the students to take on more responsibilities and bigger project in the future. It is a learning experience, which aims to provide students with the opportunity to synthesize knowledge from different areas of learning, and critically and creatively apply it to real life situations. The leadership quality, co-ordination of job and maintaining good communal harmony is an important factor of this type of activity.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Plan a Minor Project
- Execute a Minor Project with team.
- Implement hardware/software/analytical/numerical techniques, etc. based on project requirements.
- Optimize time related works through sharing of work responsibility
- Develop cost awareness and utilisation of fund.
- Prepare a technical report on the project.

GUIDELINES FOR MINOR PROJECT

Unit No.	Topic/Sub-Topic
I	o Minimum three and maximum five students can form a group for the minor project.
II	o Project type can include • Development of a simple prototype system/product. • Investigation of performance of some systems using experimental method • Analysis of components/systems/devices using suitable software • Investigation of optimum process/material for product development using market survey. • Solution for society/industry problems

III	o Project domain may not be limited to the specific area / discipline.
IV	o Project report to be prepared and submitted by the students with following components: 1. Title 2. Objectives 3. Relevance and significance 4. Methodology 5. Analysis-Simulation/experimentation/survey/testing etc. 6. Result and Discussion 7. Conclusion

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

L	T	P		Course Code: AU202	
2	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 30Hrs	**Total Marks: NIL**	End Term Exam	0
				Progressive Assessment*	0
Pre-Requisite		**: Nil**			
Credit		**0**		Category of Course: Mandatory	

RATIONALE:

Considering the need of protecting Indian knowledge and tradition, the diploma level students of Automobile Engineering should be facilitated the concepts Indian traditional knowledge and to make them understand the importance of roots of knowledge system and methods of application in today's life and how to protect traditional knowledge system. Interpretation of the concepts of Intellectual property to protect the traditional knowledge as well as importance of Traditional knowledge in Agriculture and Medicine must be known.

LEARNING OUTCOMES:

On successful completion of the course, students will be able to:

- Discuss the concepts of traditional Indian knowledge and roots of knowledge system and indigenous knowledge system
- Explain the technique of protection of traditional Indian knowledge
- Discuss legal frameworks of traditional knowledge
- State intellectual property rights
- State traditional knowledge in Different Sectors

DETAILED COURSE CONTENTS

UNIT	TOPIC/SUB-TOPIC	Allotted HRS.
1	Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge (Unani / Siddha/ Ayurveda), Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge of Odisha	07
2	Protection of traditional knowledge (TK): The need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.	07
3	Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.	06
4	Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, Geographical Indications (GI).	04
5	Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK	06

REFERENCE BOOKS:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. "Knowledge Traditions and Practices of India" Kapil Kapoor.
3. Madhya Himalayi Sanskriti mein Gyan, Vigyan evam Paravigyan by Prof PC Pandey.

Suggested Online Link:

Web Links:
1.https://www.youtube.com/watch?v=LZP1StpYEPM
2.http://nptel.ac.in/courses/12110600/

*****Progressive Assessment to be conducted for ensuring learning of students.

4th semester Civil Engineering

Sub:- PR:1- HYDRAULICS & IRRIGATION ENGINEERING LAB

SL. NO.	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QUANTITY NO.
1	Use piezometer to measure pressure at a given point	Piezometer tube	1
2	Use U tube differential manometer to measure pressure difference between two given points	U-tube differential manometer	1
3	Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit of varying cross sections	1.Hydraulic bench	1
		2.Stop watch	1
4	Use Friction factor Apparatus to determine friction factor for a given pipe	1.Friction factor apparatus	1
		2.Centrifugal pump	1
		3.Stopwatch	1
5	Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement	1.Hydraulic bench	1
		2.Stop watch	1
6	Determine minor losses in pipe fitting due to Bend and Elbow	1.Hydraulic bench	1
		2.Stop watch	1
7	Calibrate Venturi meter to find out the discharge in a pipe	1.Hydraulic bench	1
		2.Stop watch	1
8	Calibrate the Orifice to find out the discharge through a tank	1.Hydraulic bench	1
		2.Stop watch	1
9	Use Current meter to measure the velocity of flow of water in open channel	1.Current meter	1
		2.Measuring scale or staff gauge	1
		3.Stopwatch	1
10	Use Pitot tube to measure the velocity of flow of water in open channel	1.Hydraulic bench	1
		2.Stop watch	1
11	Use triangular/rectangular notch to measure the discharge through open channel	1.Hydraulic bench	1
		2.Stop watch	1
12	Calculate average rainfall for the given area using arithmetic mean method/isohyetal/ Theissen polygon method	1.Rainfall data from rain gauge stations	1
		2.Topographical map of the given area	1
		3.Drawing sheets	1
		4.Scale	1
		5.Ruler	1
13	Compute the yield of the Catchment area demarcated in Sr.No.12.	1.Topographical map of the given catchment area	1
		2.Rainfall data of the catchment	1
		3.Runoff coefficient data	1
		4.Planimeter 5.Scale	1

		6.Tracing paper	1
		7.Ruler	1
		8.Calculator	1
14	Estimate crop water requirement for the given data	1.Meteorological data (temperature, humidity, wind speed, sunshine hours, rainfall)	AS PER REQUIRED
		2.Crop data (type of crop, crop coefficient, growth stages)	AS PER REQUIRED
		3.Reference evapotranspiration data	AS PER REQUIRED
		4.Soil data (soil type and water-holding capacity)	AS PER REQUIRED
		5.Irrigation efficiency data	AS PER REQUIRED
		6.Calculator	1
		7.Data tables / charts	1
		8.Drawing sheets and scale	AS PER REQUIRED
15	Estimate capacity of the canal for the given data	1.Canal cross-section details (shape, dimensions)	AS PER REQUIRED
		2.Longitudinal slope data of the canal	AS PER REQUIRED
		3.Discharge data / design discharge	AS PER REQUIRED
		4.Velocity data or formulae (Manning's / Chezy's equation)	AS PER REQUIRED
		5.Calculator	1
		6.Drawing sheets	AS PER REQUIRED
		7.Scale	1
		8.Ruler	1
		9.Standard tables and charts	1

4th semester Civil Engineering

Sub:- PR:2- ESTIMATION COSTING & VALUATION LAB

SL. NO.	NAME OF THE EXPERIMENT	SOFTWARE REQUIRED	QUANTITY NO.
1	Prepare the list of items to be executed with units for detailed estimate of a given structure from the given drawing	MS Excel for detailed estimate Preparation	
2	Prepare a report on market rates for given material, labour wages, hire charges of tools & equipments required to construct the given structure as mentioned in at Serial number 1 above	MS Excel for detailed estimate Preparation	
3	Study of items with specification given in the DSR (for any ten item)		
4	Recording in Measurement Book (MB) for any four items		
5	Prepare bill of quantities of given item from actual measurements. (Any four items)	MS Excel for detailed estimate Preparation	
6	Prepare approximate estimate for the given civil engineering works	MS Excel for detailed estimate Preparation	
7	Calculate the reinforcement quantities from the given set of drawings for a room size of 3 m x 4 m with bar bending schedule (footing, column, beam, lintel with chajjah, slab)	MS Excel for detailed estimate Preparation	
8	Prepare rate analysis for the given five item of works	MS Excel for detailed estimate Preparation	
9	Prepare detailed estimate of small Septic tank from the given set of drawings	MS Excel for detailed estimate Preparation	
10	Prepare detailed estimate of a Road	MS Excel for detailed estimate Preparation	
11	Prepare detailed estimate of a residential building	MS Excel for detailed estimate Preparation	

4th semester Civil Engineering

Sub:- PR:3- BUILDING PLANNING & DRAWING LAB-1

SL. NO.	NAME OF THE EXPERIMENT	SOFTWARE REQUIRED	QUANTITY NO.
1	**Introduction** • Draw various types of lines, graphical symbols for materials, doors and windows, symbols for sanitary, water supply and electrical installations and write abbreviations as per IS 962.	AutoCAD Software	
	• Write summary of observations of all technical details from the given drawing (One/Two BHK) obtained from the professional architect or civil engineer (Group activity in four students)		
	• Draw line plans to suitable scale for any Five Public Buildings from the following (School Building, Primary Health Centre, Bank, Post Office, Hostel, Restaurant, Community Hall and Library).		
2	**Planning of Building**	AutoCAD Software	
	• Principles of planning for Residential and Public building- Aspect, Prospect, Orientation, Grouping, Privacy, Elegance, Flexibility, Circulation, Furniture requirements, Sanitation, Economy.		
	• Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS 962.		
	• Rules and bye-laws of sanctioning authorities for construction work.		
	• Plot area, built up area, super built-up area, plinth area, carpet area, floor area and FAR (Floor Area Ratio).		
	• Line plans for residential building of minimum three rooms including water closet (WC), bath and staircase as per principles of planning.		

3	**Drawing of Load Bearing Structure**	AutoCAD Software	
	• Drawing of Single storey Load Bearing residential building (2 BHK) with staircase.		
	• Data drawing –plan, elevation, section, site plan, schedule of openings, construction notes with specifications, area statement, Planning and design of staircase- Rise and Tread for residential and public building.		
	• Working drawing – developed plan, elevation, section passing through staircase or WC and bath.		
	• Foundation plan of Load bearing structure.		
4	**Drawing of Framed Structure**	AutoCAD Software	
	• Drawing of Two storeyed Framed Structure (G+1), residential building (2 BHK) with staircase.		
	• Data drawing – developed plan, elevation, section, site plan, schedule of openings, construction notes with specifications, area statement. Planning and design of staircase- Rise and Tread for residential and public building.		
	• Working drawing of Framed structure – developed plan, elevation, section passing through		
	staircase or WC and bath. • Foundation plan of Framed Structure.		
	• Details of RCC footing, Column, Beam, Chajjas, Lintel, Staircase and slab.		
5	**Perspective Drawing**	AutoCAD Software	
	• Definition, Types of perspective, terms used in perspective drawing, principles used in perspective drawing		
	• Two Point Perspective of small objects only such as steps, monuments, pedestals.		

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 5th Semester (Civil Engineering)(wef 2020-21)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Entrepreneurship and Management & Smart Technology	4		-	20	80	3	100
Th.2		Structural Design-II	4		-	20	80	3	100
Th.3		Railway & Bridge Engineering	4		-	20	80	3	100
Th.4		Water Supply & Waste Water Engineering	5			20	80	3	100
Th.5		Estimating & Cost Evaluation- II	4			20	80	3	100
		Total	21			100	400	-	500
		Practical							
Pr.1		Civil Engineering. Lab-II	-	-	6	50	100	3	150
Pr.2		Estimating Practice-II (Computer-Aided)	-	-	3	25	50	3	75
Pr.3		Project Phase-I	-	-	6	25	-	-	25
		Student Centred Activities(SCA)			3				
				-		-	-	-	-
		Total	-	-	*18*	*100*	*150*	-	*250*
		Grand Total	**21**	**-**	**18**	**200**	**550**	**-**	**750**

Abbreviations: L-Lecturer, T-Tutorial, P-Practical . Each class is of minimum 55 minutes duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM etc. ,Seminar and SCA shall be conducted in a section.

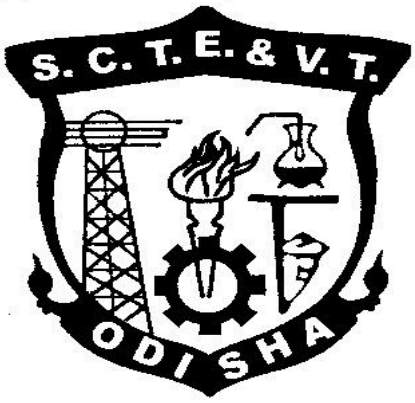
There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

CURRICULLUM OF 5TH SEMESTER

For

DIPLOMA IN CIVIL ENGINEERING

(Effective FROM 2020-21 Sessions)



STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

Th1. ENTREPRENEURSHIP and MANAGEMENT & SMART TECHNOLOGY

(Common to All Branches)

Theory	**4 Periods per week**	**Internal Assessment**	**20 Marks**
Total Periods	**60 Periods**	**End Sem Exam**	**80 Marks**
Examination	**3hours**	**Total Marks**	**100Marks**

Topic Wise Distribution of Periods

Sl No.	Topic	Periods
1	Entrepreneurship	10
2	Market Survey and Opportunity Identification(Business Planning)	8
3	Project report Preparation	4
4	Management Principles	5
5	Functional Areas of Management	10
6	Leadership and Motivation	6
7	Work Culture, TQM & Safety	5
8	Legislation	6
9	Smart Technology	6
	TOTAL	60

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students, so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mind set with managerial skill helps the student in the job market. The students can also be introduced with Startup and Smart Technology concept, which shall radically change the working environment in the coming days in the face of Industry 4.0

In this subject, the Students shall be introduced/ exposed to different concepts and Terminologies in brief only, so that he/she can have broad idea about different concepts/items taught in this subject. Solving numerical problem on any topic/item is beyond the scope of this subject.

OBJECTIVES

After undergoing this course, the students will be able to :

- Know about Entrepreneurship, Types of Industries and Startups
- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- know the management Principles and functional areas of management
- Inculcate leadership qualities to motivate self and others.
- Maintain and be a part of healthy work culture in an organisation.
- Use modern concepts like TQM
- Know the General Safety Rules
- Know about IOT and its Application in SMART Environment.

DETAILED CONTENTS

1. **Entrepreneurship**
   - Concept /Meaning of Entrepreneurship
   - Need of Entrepreneurship
   - Characteristics, Qualities and Types of entrepreneur, Functions
   - Barriers in entrepreneurship
   - Entrepreneurs vrs. Manager

- Forms of Business Ownership: Sole proprietorship, partnership forms and others
- Types of Industries, Concept of Start-ups
- Entrepreneurial support agencies at National, State, District Level(Sources): DIC, NSIC,OSIC, SIDBI, NABARD, Commercial Banks, KVIC etc.
- Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

2. **Market Survey and Opportunity Identification (Business Planning)**

- Business Planning
- SSI, Ancillary Units, Tiny Units, Service sector Units
- Time schedule Plan, Agencies to be contacted for Project Implementation
- Assessment of Demand and supply and Potential areas of Growth
- Identifying Business Opportunity
- Final Product selection

3. **Project report Preparation**

- Preliminary project report
- Detailed project report, Techno economic Feasibility
- Project Viability

4. **Management Principles**
- Definitions of management
- Principles of management
- Functions of management (planning, organising, staffing, directing and controlling etc.)
- Level of Management in an Organisation

5. **Functional Areas of Management**

a) Production management
   - Functions, Activities
   - Productivity
   - Quality control
   - Production Planning and control

b) Inventory Management
   - Need for Inventory management
   - Models/Techniques of Inventory management

c) Financial Management
   - Functions of Financial management
   - Management of Working capital
   - Costing (only concept)
   - Break even Analysis
   - Brief idea about Accounting Terminologies: Book Keeping, Journal entry, Petty Cash book, P&L Accounts, Balance Sheets(only Concepts)

d) Marketing Management
   - Concept of Marketing and Marketing Management
   - Marketing Techniques (only concepts)
   - Concept of 4P s (Price, Place, Product, Promotion)

e) Human Resource Management
- Functions of Personnel Management
- Manpower Planning, Recruitment, Sources of manpower, Selection process, Method of Testing, Methods of Training & Development, Payment of Wages

6. **Leadership and Motivation**

a) Leadership
- Definition and Need/Importance
- Qualities and functions of a leader
- Manager Vs Leader
- Style of Leadership (Autocratic, Democratic, Participative)

b) Motivation
- Definition and characteristics
- Importance of motivation
- Factors affecting motivation
- Theories of motivation (Maslow)
- Methods of Improving Motivation
- Importance of Communication in Business
- Types and Barriers of Communication

7. **Work Culture, TQM & Safety**
- Human relationship and Performance in Organization
- Relations with Peers, Superiors and Subordinates
- TQM concepts: Quality Policy, Quality Management, Quality system
- Accidents and Safety, Cause, preventive measures, General Safety Rules , Personal Protection Equipment(PPE)

8. **Legislation**

a) Intellectual Property Rights(IPR), Patents, Trademarks, Copyrights
b) Features of Factories Act 1948 with Amendment (only salient points)
c) Features of Payment of Wages Act 1936 (only salient points)

9. **Smart Technology**
- Concept of IOT, How IOT works
- Components of IOT, Characteristics of IOT, Categories of IOT
- Applications of IOT- Smart Cities, Smart Transportation, Smart Home, Smart Healthcare, Smart Industry, Smart Agriculture, Smart Energy Management etc.

Syllabus to be covered before IA: Chapter 1,2,3,4

RECOMMENDED BOOKS

1. Entrepreneurship Development and Management by R.K Singhal, Katson Books., New Delhi
2. Entrepreneurship Development and Management by U Saroj and V Mahendiratta, Abhishek Publications, Chandigarh
3. Entrepreneurship Development and Management by Vasant Desai, Himalaya Pub.House
4. Industrial Engineering and Management by O.P Khanna ,Dhanpat Rai and Sons
5. Industrial Engineering and Management by Banga and Sharma, Khanna Publications
6. Internet of Things by Jeeva Jose, Khanna Publications, New Delhi
7. Online Resource on Startups and other concepts
8. https://www.fundable.com/learn/resources/guides/startup

Th2. STRUCTURAL DESIGN– II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5th
Total Period:	60	Examination	3 hrs
Theory periods:	4P / week	Internal Assessment :	20
Maximum marks:	100	End Semester examination:	80

A. RATIONALE

The course aims at imparting skills to design structural members. This will enable the students to recognize the load conditions and possible failure locations so that student will be able to compute necessary dimensions to prevent failure.

B. COURSE OBJECTIVES

On completion of the course, a student will be able to-

1. Design simple steel structure such as tension members, compression members and simple beams.
2. Design timber structural elements
3. Design staircase, footings by limit method of design.
4. Draw the details of a steel roof truss.
5. Draw the reinforcement details of underground RCC water tank and RCC footings.
6. Use standards and design codes.

C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name of topics	Hours
1	Introduction:	5
2	Structural Steel Fasteners and Connections.	10
3	Design of Steel tension Members	10
4	Design of Steel Compression members.	10
5	Design of Steel beams:	10
6	Design of Tubular Steel Structures	6
7	Design of Masonry Structures	9

D. COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES

1 Introduction:

1.1 Common steel structures, Advantages & disadvantages of steel structures.
1.2 Types of steel, properties of structural steel.
1.3 Rolled steel sections, special considerations in steel design.
1.4 Loads and load combinations.
1.5 Structural analysis and design philosophy.
1.6 Brief review of Principles of Limit State design.

2 Structural Steel Fasteners and Connections.

2.1 Bolted Connections
2.1.1 Classification of bolts, advantages and disadvantages of bolted connections.

2.1.2 Different terminology, spacing and edge distance of bolt holes.
2.1.3 Types of bolted connections.
2.1.4 Types of action of fasteners, assumptions and principles of design.
2.1.5 Strength of plates in a joint, strength of bearing type bolts (shear capacity& bearing capacity), reduction factors, and shear capacity of HSFG bolts.
2.1.6 Analysis & design of Joints using bearing type and HSFG bolts (except eccentric load and prying forces)
2.1.7 Efficiency of a joint.
2.2 Welded Connections:
2.2.1 Advantages and Disadvantages of welded connection
2.2.2 Types of welded joints and specifications for welding
2.2.3 Design stresses in welds.
2.2.4 Strength of welded joints.

3 Design of Steel tension Members

3.1 Common shapes of tension members.
3.2 Maximum values of effective slenderness ratio.
3.4 Analysis and Design of tension members.(Considering strength only and concept of block shear failure.)

4 Design of Steel Compression members.

4.1 Common shapes of compression members.
4.2 Buckling class of cross sections, slenderness ratio
4.3 Design compressive stress and strength of compression members.
4.4 Analysis and Design of compression members (axial load only).

5 Design of Steel beams:

5.1 Common cross sections and their classification.
5.2 Deflection limits, web buckling and web crippling.
5.3 Design of laterally supported beams against bending and shear.

6 Design of Tubular Steel Structures:

6.1 Round Tubular Sections, Permissible Stresses
6.2 Tubular Compression & Tension Members
6.3 Joints in Tubular trusses

7 Design of Masonry Structures:

7.1 Design considerations for Masonry walls & Columns, Load Bearing & Non-Load Bearing walls, Permissible stresses, Slenderness Ratio, Effective Length, Height & Thickness.

E. **SYLLABUS COVERGE UPTO INTERNAL ASSESSMENT** Chapters 1,2,3,4

F. BOOKS RECOMMENDED

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	B.N.Duggal	Design of Steel Structures	McGraw Hill Education
2	Samal & Panigrahi	Elements of Steel ,Timber & Masonry Design	Kalyani Pbln
3	Samal & Panigrahi	Steel Tables	Kalyani Pbln
4	BIS.	1) I.S 800-Code of practice for General construction in steel	BIS

		2) SP-20 Hand book on masonry design and construction- BIS Publication. 3) IS 806: 1968 Code of practice for use of steel tubes in general building construction. 4) IS 1161: 1998 Steel Tubes for Structural Purposes – Specification	

Th3. RAILWAY & BRIDGE ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

The course will expose the students to the requirements posed by railways and bridges and how these requirements are different from roads. The course shall acquaint the students with common engineering terminology and prepares them to pursue higher courses in the aspect.

B. COURSE OBJECTIVES

On completion of the course, students will be able to

1. Explain railway terminology
2. Comprehend the track components and relate to the material or geometric aspects that can be used for these
3. Describe methods of laying and maintaining the track
4. State the requirements for an ideal bridge and describe types of foundation and substructures
5. Classify the bridges and identify the components
6. Select the bridge sites in context of hydrologic requirements

C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name of topics	Hours
1	Introduction	2
2	Permanent way	5
3	Track materials	10
4	Geometric for broad gauge	10
5	Points and crossings	4
6	Laying & maintenance of track	4
Section – B: BRIDGES		
1	Introduction to bridges	2
2	Bridge site investigation, hydrology & planning	5
3	Bridge foundation	8
4	Bridge substructure and approaches	5
5	Culvert & Cause Ways	5

D. COURSE CONTENTS:

Section – A: RAILWAYS

1 Introduction

1.1 Railway terminology
1.2 Advantages of railways
1.3 Classification of Indian Railways

2 Permanent way

2.1 Definition and components of a permanent way
2.2 Concept of gauge, different gauges prevalent in India, suitability of these gauges

under different conditions

3 Track materials

3.1 Rails
3.1.1 Functions and requirement of rails
3.1.2 Types of rail sections, length of rails
3.1.3 Rail joints – types, requirement of an ideal joint
3.1.4 Purpose of welding of rails & its advantages
3.1.5 Creep- definition, cause & prevention
3.2 Sleepers
3.2.1 Definition, function & requirements of sleepers
3.2.2 Classification of sleepers
3.2.3 Advantages & disadvantages of different types of sleepers
3.3 Ballast
3.3.1 Functions & requirements of ballast
3.3.2 Materials for ballast
3.4 Fixtures for Broad gauge
3.4.1 Connection of rails to rail-fishplate, fish bolts
3.4.2 Connection of rails to sleepers

4 Geometric for broad gauge

4.1Typical cross – sections of single & double broad gauge railway track in cutting and embankment
4.2 Permanent & temporary land width
4.3 Gradients for drainage
4.4 Super elevation – necessity & limiting valued

5 Points and crossings

5.1 Definition, necessity of Points and crossings
5.2 Types of points & crossings with tie diagrams

6 Laying & maintenance of track

6.1 Methods of Laying & maintenance of track
6.2 Duties of a permanent way inspector

Section – B: BRIDGES

1 Introduction to bridges

1.1 Definitions
1.2 Components of a bridge
1.3 Classification of bridges
1.4 Requirements of an ideal bridge

2 Bridge site investigation, hydrology & planning

2.1 Selection of bridge site, Alignment,
2.2 Determination of Flood Discharge
2.3 Waterway & economic span
2.4 Afflux, clearance & free board

3 Bridge foundation

3.1 Scour depth minimum depth of foundation
3.2 Types of bridge foundations – spread foundation, pile foundation- well foundation – sinking of wells, caission foundation

3.3 Coffer dams

4 **Bridge substructure and approaches**
4.1 Types of piers
4.2 Types of abutments
4.3 Types of wing walls
4.4 Approaches

5 **Culvert & Cause ways**
5.1 Types of culvers – brief description
5.2 Types of causeways – brief description

E. SYLLABUS COVERGE UPTO INTERNAL ASSESSMENT
Chapters 1,2,3,4 of Section A & Chapters 1,2 of Section B

F. Recommended Books

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	Chandra & Agrawal	Railway Engineering	Oxford Publication
3	S.C.Sexena & S.P.Arora	A Text book of Railway Engineering	Dhanpat Rai Publications
4	S. C. Rangwala	Railway Engineering	Charotar Publication
5	S.P. Bindra	Bridge Engineering	Dhanpat Rai Publications

Th4. WATER SUPPLY AND WASTE WATER ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5th
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

The course aims to expose the students to the current state of water supply and sewage disposal system. Through the course the principles, purposes and the methods are covered at different stages of the activity, thus laying foundation in students to think of meeting futuristic challenges.

B. COURSE OBECTIVES

On completion of the course, students will be able to

1. Compute water demand in terms of quantity and quality
2. Describe the water sources, conveyance and distribution system
3. Realize the necessity of treatment and comprehend the principle and purpose of different water treatment processes
4. Comprehend the terminology relating to sanitary engineering and compute quantity & quality of sewage
5. Describe the sewerage system and its components stating the purposes thereof
6. Comprehend the necessity and method of sewage treatment and disposal

C. **TOPIC WISE DISTRIBUTION OF PERIODS**

Chapter	Name of topics	Hours
	SECTION A:WATER SUPPLY	
1	Introduction to Water Supply, Quantity and Quality of water	10
2	Sources and Conveyance of water	8
3	Treatment of water	12
4	Distribution system and Appurtenance in distribution system	8
5	W/s plumbing in building	2
	SECTION B:WASTE WATER ENGINEERING	
6	Introduction	5
7	Quantity and Quality of sewage	7
8	Sewerage system	5
9	Sewer appurtenances and Sewage Disposal	7
10	Sewage treatment	8
11	Sanitary plumbing for building	3

D. COURSE CONTENTS:

SECTION A: WATER SUPPLY

1 Introduction to Water Supply, Quantity and Quality of water

1.1 Necessity of treated water supply
1.2 Per capita demand, variation in demand and factors affecting demand

1.3 Methods of forecasting population, Numerical problems using different methods
1.4 Impurities in water – organic and inorganic, Harmful effects of impurities
1.5 Analysis of water –physical, chemical and bacteriological
1.6 Water quality standards for different uses

2 Sources and Conveyance of water

2.1 Surface sources – Lake, stream, river and impounded reservoir
2.2 Underground sources – aquifer type & occurrence – Infiltration gallery, infiltration well, springs, well
2.3 Yield from well- method s of determination, Numerical problems using yield formulae (deduction excluded)
2.4 Intakes – types, description of river intake, reservoir intake, canal intake
2.5 Pumps for conveyance & distribution – types, selection, installation.
2.6 Pipe materials – necessity, suitability, merits & demerits of each type
2.7 Pipe joints – necessity, types of joints, suitability, methods of jointing
Laying of pipes – method

3 Treatment of water

Note:
1. Design of treatment units excluded.
2. Students may be asked to prepare detailed sketches of units, preferably from working drawing, as home assignment
3. Field visit to treatment plant, under practical should be arranged after covering this unit.

3.1 Flow diagram of conventional water treatment system
3.2 Treatment process / units :
3.2.1 Aeration ; Necessity
3.2.2 Plain Sedimentation : Necessity, working principles, Sedimentation tanks – types, essential features, operation & maintenance
3.2.3 Sedimentation with coagulation: Necessity, principles of coagulation, types of coagulants, Flash Mixer, Flocculator, Clarifier (Definition and concept only)
3.2.4 Filtration : Necessity, principles, types of filters
Slow Sand Filter, Rapid Sand Filter and Pressure Filter – essential features
3.2.5 Disinfection : Necessity, methods of disinfection
Chlorination – free and combined chlorine demand, available chlorine, residual chlorine, pre-chlorination, break point chlorination, super-chlorination
3.2.6 Softening of water – Necessity, Methods of softening – Lime soda process and Ion exchange method (Concept Only)

4 Distribution system And Appurtenance in distribution system:

4.1 General requirements, types of distribution system-gravity, direct and combined
4.2 Methods of supply – intermittent and continuous
4.3 Distribution system layout – types, comparison, suitability
4.4 Valves-types, features, uses, purpose-sluice valves, check valves, air valves, scour valves, Fire hydrants, Water meters

5 W/s plumbing in building :

5.1 Method of connection from water mains to building supply
5.2 General layout of plumbing arrangement for water supply in single storied and multi-storied building as per I.S. code.

SECTION B: WASTE WATER ENGINEERING

6 Introduction

6.1 Aims and objectives of sanitary engineering

6.2 Definition of terms related to sanitary engineering

6.3 Systems of collection of wastes– Conservancy and Water Carriage System – features, comparison, suitability

7 Quantity and Quality of sewage

7.1 Quantity of sanitary sewage – domestic & industrial sewage, variation in sewage flow, numerical problem on computation quantity of sanitary sewage.

7.2 Computation of size of sewer, application of Chazy's formula, Limiting velocities of flow : self-cleaning and scouring

7.3 General importance, strength of sewage, Characteristics of sewage-physical, chemical & biological

7.4 Concept of sewage-sampling, tests for – solids, pH, dissolved oxygen, BOD, COD

8 Sewerage system

8.1 Types of system-separate, combined, partially separate , features, comparison between the types, suitability

8.2 Shapes of sewer – rectangular, circular, avoid-features, suitability

8.3 Laying of sewer-setting out sewer alignment

9 Sewer appurtenances and Sewage Disposal:

9.1 Manholes and Lamp holes – types, features, location, function

9.2 Inlets, Grease & oil trap – features, location, function

9.3 Storm regulator, inverted siphon – features, location, function

9.4 Disposal on land – sewage farming, sewage application and dosing, sewage sickness-causes and remedies

9.5 Disposal by dilution – standards for disposal in different types of water bodies, self purification of stream

10 Sewage treatment :

(Note: 1.Design of treatment units excluded.

2.Students may be asked to prepare detailed sketches of units, preferably from working drawing, as home assignment.

3.Field visit to treatment plant, under practical should be arranged after covering this unit.)

10.1 Principles of treatment, flow diagram of conventional treatment

10.2 Primary treatment – necessity, principles, essential features, functions

10.3 Secondary treatment – necessity, principles, essential features, functions

11 Sanitary plumbing for building :

11.1 Requirements of building drainage, layout of lavatory blocks in residential buildings, layout of building drainage

11.2 Plumbing arrangement of single storied & multi storied building as per I.S. code practice

11.3 Sanitary fixtures – features, function, and maintenance and fixing of the fixtures – water closets, flushing cisterns, urinals, inspection chambers, traps, anti-syphonage pipe

E. SYLLABUS COVERGE UPTO INTERNAL ASSESSMENT

Chapters 1, 2, 3, 4 from Section A & Chapters 6,7,8 from Section B

F. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	G.S.Birdie	Text book on water supply and sanitary engineering	Dhanpat Rai Publications
2	S.K.Garg	Water Supply Engineering	Khanna Publishers
3	S.K.Garg	Waste Water Disposal Engg.	Khanna Publishers
4	By Ministry of Urban Development,Govt. of India.	CPHEEO manual Water supply	
5	By Ministry of Urban Development,Govt. of India.	CPHEC Mannual- Sewage & Sewage Treatment - by Ministry of Urban Development,Govt.of India.	

Th5. ESTIMATION & COST EVALUATION – II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

The course exposes the students to the techniques and best practices to prepare detailed estimates of roads, bridges, culverts, irrigation structures and PWD works.

B. COURSE OBJECTIVES

On completion of the course, students will be able to

1. Create detailed estimate of culverts and bridges
2. Prepare estimates of irrigation structures
3. Prepare estimates of a macadam road and a national highway in cutting and filling
4. Prepare detailed estimates for septic tank and soak pits
5. Prepare detailed estimates of miscellaneous works
6. Comprehend the management practices in Public Works Department
7. Interpret the building bylaws furnished by regulatory bodies

C. **TOPIC WISE DISTRIBUTION OF PERIODS**

Chapter	Name of topics	Hours
1.	Detailed estimate of culverts and bridges	12
2.	Estimate of irrigation structures	14
3.	Detailed estimate of roads	12
4.	Detailed estimates of miscellaneous works	12
5.	PWD accounts works	10

D. COURSE CONTENTS:

1. Detailed estimate of culverts and bridges

1.1 Detailed estimate of a RCC slab culvert with right angled wing walls with bar bending schedule.

1.2 RCC Hume pipe culvert with splayed angled wing wall

2. Estimate of irrigation structures

2.1 Detailed estimate of simple type of vertical fall to given specification

2.2 Detailed estimate of drainage siphon to given specification.

3. Detailed estimate of roads

3.1 Detail estimate of a water bound macadam road

3.2 Detailed estimate of a flexible pavement in cutting / filling

3.2 Detailed estimate of septic tank and soak pit for 50 users

4. Miscellaneous estimates

4.1 Tube well, Piles and Pile cap, Isolated and combined footings.

5. PWD Accounts works

5.1 Works

5.1.1 Classification of work-original, major, petty, repair work, annual repair, special repair, quadrantal repair.

5.1.2 Concept of Method of execution of works through the contractors and department, contract and agreement, work order, types of contract, piece work agreement.

5.2 Accounts of works –

5.2.1 Explanation of various terms

Administrative approval, technical sanction, tender, preparation of notice inviting tender, quotations, earnest money, E-tendering, security deposit, advance payment, intermediate payment, final payment, running bill, final bill, regular and temporary establishment, cash, major & subhead of account, temporary advance (imprest money),supervision charges, suspense account, debit, credit, book transfer, voucher and related accounts .

5.2.2 Measurement book use & maintenance, procedure of marking entries of measurement of work and supply of materials, labour employed, standard measurement books and common irregularity

5.2.3 Muster roll : Its preparation & use for making payment of pay & wages

5.2.4 Acquittance Roll : Its preparation & use for making payment of pay & wages

5.2.5 Labour & labour report, method of labour payment, use of forms and necessity of Submission

5.2.6 Classification of stores, receipt / issue statement on standard form, method of preparation of stock account, preparation and submission of returns, verification of stocks, shortage and excess

5.3 Building BYLAWS and REGULATORY Bodies, Development authorities, types and their levels, RERA etc.

E. SYLLABUS COVERGE UPTO INTERNAL ASSESSMENT

Chapters 1, 2, 3

F. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	M.Chakraborty.	Estimating,Costing,specification &Valuation in Civil Engineering	Published by author
2	B.N.Dutta.	Estimating &Costing	UBSPD
3	Birdi &Ahuja.	Estimating &Costing	Dhanpat Rai Publication
4	Latest Orissa PWD Schedule of Rates & Analysis of rates		Govt. of Odisha

Pr1. CIVIL ENGINEERING LABORATORY-II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5th
Total Period:	90	Examination	3 hrs
Practical periods:	6P/week	Sessional Marks:	50
Maximum marks:	150	Practical Examination:	100

A. RATIONALE

The course aims to develop competence in conduct of experiments in line with prescribed standards and interpret the results. The objective is to enable the students gathering professional skills in working at research and testing laboratories. In the course students are required to conduct at least fifteen experiments selecting minimum three from each of the section furnished in course contents.

B. COURSE OBJECTIVES

On completion of the course students will be able to

1. Prepare setups and specimens for experiments
2. Interpret the specimen specifications prescribed in standard test manuals and codes
3. Acquaint themselves with modern test equipment
4. Record the results in prescribed formats
5. Plot graphs and interpret the results
6. Analyze the results and predict possible trends

C. **TOPIC WISE DISTRIBUTION OF PERIODS**

Chapter	Name of topics	Hours
1.	TESTS ON SOIL	36
2.	HYRAULICS LABORATORY	18
3.	TRANSPORTATION LABORATORY	18
4.	PUBLIC HEALTH ENGINEERING LABORATORY	18

D. COURSE CONTENTS

1.0 TESTS ON SOIL :

1.1 Determination of Specific gravity of Soil by Pycnometer /Density bottle.

1.2 Determination of Field Density of Soil by Core Cutter Method.

1.3 Determination of Particle Size gradation of sand/Gravel by sieve analysis.

1.4 Wet mechanical analysis using pipette method for clay and silt.

1.5 (a)Determination of Liquid Limit by soil by Casagrande"s apparatus.
(b)Determination of Plastic limit of soil.

1.6 Determination of Shrinkage limit of soil.

1.7 Determination of MDD & OMC of soil by using modified Proctor Test.

1.8 Determination of CBR value using Laboratory CBR Testing device.

1.9 Determination of c and φ of soil by triaxial testing device.

1.10 Determination of coefficient of permeability of soil by constant head method.

2.0 HYRAULICS LABORATORY:

2.1 Verification of Bernoulli's Theorem

2.3 Determination of coefficient of Discharge of a rectangular notch fitted in open Channel.

2.3 Determination of coefficient of Discharge of a Venturimeter, Orificemeter fitted in a pipe

2.4 Determination of head Loss due to friction and coefficient of friction for flow through pipe.

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3.0 TRANSPORTATION LABORATORY:

3.1 Penetration Test of Bitumen.

3.2 Ductility Test of Bitumen.

3.3 Viscosity Test of Bitumen.

3.4 Bitumen content by centrifuge extractor.

4.0 PUBLIC HEALTH ENGINEERING LABORATORY:

4.1 Determination of Turbidity of water Sample using Turbidimeter/Nephlometer/Jackson's Candle Turbidimeter.

4.2 Determination of pH of Water sample using (a) pH – meter (b) colour Comparator.

4.3 Determination of Chloride content of a Water sample using method of titration.

4.4 Determination of Coagulant (Alum) dose requirement for a turbid water sample by Jar Test.

4.5 Determination of dissolved oxygen in a water sample.

4.6 Determination of bacteriological quality of water sample by Coliform test.

E. Recommended Books

1. Soil Testing -A. P. Mittal

2. Civil Engineering laboratory Practice-II - Dr. M.R. Samal, Kalyani Pbln

3. Highway material testing Laboratory manual -S.K.Khanna &C.E.G.Justo.

4. Laboratory manual in Highway material testing -Ajay K. Duggal,Vijaya p.

5. Laboratory work in Hydraulic Engineering -G.L.Asawa.

6. Experimental Hydraulics -S.N. Ghosh & S.C Talapatra.

7. Laboratory manual in Environmental Engineering -Prof.P.D.Kulkarni.

8. Experimental Hydraulics - S.N. Ghosh &S.C Talapatra,

9. Hydraulics Laboratory Manual - S.K.Likhi.

10. Priciples, Practice and design of Highway Engg. - S.K.Sharma – S.Chand

Pr2. ESTIMATING PRACTICE – II
(Computer -Aided)

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5th
Total Period:	45	Examination	3 hrs
Practical periods:	3P/week	Sessional Examination:	25
Maximum marks:	75	Practical Examination	50

Detailed estimate from working drawings / standard drawings as mentioned at Sl. No. 1, 2 , 3 & 4 of theory – 4 Estimation & Cost Evaluation – II)are to be taken in the practical classes using excel sheets.(Computer aided).

Learning Resources			
Text Books			
Sl. No	**Name of Authors**	**Titles of Book**	**Name of Publisher**
1	M.Chakraborty.	Estimating,Costing,specification &Valuation in Civil Engineering	Published by author
2	B.N.Dutta.	Estimating &Costing	UBSPD
3	Birdi &Ahuja.	Estimating &Costing	Dhanpat Rai Publications
4	Latest Orissa PWD Schedule of Rates & Analysis of rates		Govt. of Odisha

Pr 3. PROJECT WORK (Phase-I)

Name of the Course: Diploma in Civil			
Course code:		Semester	5th
Total Period:	60	Examination :	-
Theory periods:	4P / week	Sessional Marks	25
		TOTAL Marks	25

RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of civil engineering practices in real life situations, so as to participate and manage a large civil engineering projects in future.

Entire Project shall spread over 5th and 6th Semester. Part of the Project covered in 5th Semester shall be named as *Project Phase-I* and balance portion to be covered in 6th Semester shall be named as *Project Phase-II*.

OBJECTIVES

After undergoing the Project Work, the student will be able to:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real practical working environment, preferably in an industrial environment.
- Develop civil engineering knowledge and applications in implementing these for the actual needs of the community/industry.
- Explain the working of industrial environment and its work ethics.
- Explain what entrepreneurship is and how to become an entrepreneur.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.
- Field computing and to achieve real life experience in civil engineering planning, designing and execution.
- To develop the skill of writing Project Report

General Guidelines

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (right from beginning of 5th semester). Students should be allotted a problem of interest to him/her as a project work. It is also

essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 5 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

Following are the broad suggestive areas of project work

- ✓ Qualitative analysis of any one or more of the civil engineering materials by addition or alteration of one or more constituents to assess their suitability as construction materials.
- ✓ Characterization of one or more locally available/recently developed civil engineering materials
- ✓ Experimental investigation of behavior of structural elements.
- ✓ Preparation of innovative structural models by use of materials having close resemblance to real life structures.
- ✓ Qualitative and/or Quantitative analysis of Physio-chemical characteristics of water form one or more sources of water.
- ✓ Analysis, design and/or estimation of civil engineering structures. Use of software for execution of projects may be encouraged.
- ✓ Planning, testing and execution of construction project.
- ✓ Soil properties enhancement using different available materials.
- ✓ Development of Waste disposal system including e-waste.
- ✓ Application of different surveying techniques for solving real world problem.
- ✓ Traffic volume studies and congestion solution.
- ✓ Any other related area found worth.

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

Sl. No.	**Performance Criteria**
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9	Viva voce

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.
It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations to such an exhibition.

Project Phase-I and Phase-II

The Project work duration shall cover 2 semesters(5th and 6th sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 5th sem under Project Phase-I. The students may be allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work upto Design of the system have to be complete in Phase-I. Execution of work may begin in Phase-I depending on the Project. Project Milestones are to be set so that progress can be tracked . In Phase-II Execution of work and Documentation have to be complete. Project Report have to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable alteration in the components of Task and schedule.

At the end of Project Phase-I in 5th semester there shall be one presentation by each group to mark to progress and also to judge whether the Project is moving in right direction as per the objective of the Project.

CIVIL ENGINEERING LABORATORY – II (FOR A GROUP OF 30 STUDENTS)

Sl. No.	Name of the experiment	Name of apparatus required with detailed specification	Quantity required in No.
Soil Testing Equipments			
1	Determination of Water content of Soil by Oven drying method.	Metal Container or moisture can with lid(air tight non corrodible)suitable for 15 to 20g soil	5NOS
		Digital Weighing balance (0.01gm sensitivity) nearly 500gm capacity	2NOS
		Oven- Thermostatically controlled with interior of non–corroding material to maintain temperature at 110o ± 5°C.	1NO
		Descicators	1NO
		Tongs(One Pair)	5PAIRS
2	Determination of Specific gravity of Soil by Pycnometer/Density bottle.	Pycnometer	5NOS
		Density bottle	5NOS
		Vaccum descicators.	1NO
		Digital Weighing balance	2NOS
		Thermometer	1NO
		Glass rod	5NOS
		Sample divider of the multiple slot type (riffle box)	1 NO
3	Determination of Field Density of Soil by Core Cutter Method.	Cylindrical core cutter	4NOS
		Steel Rammer (with	4NOS
		Steel dolly	4NOS
		Digital Balance	2NOS
		Steel Rule.	4NOS
		Straight edge	4NOS
		Palette Knife	4NOS
4	Determination of Particle Size gradation of sand/Gravel by sieve analysis	(a) I.S.Sieves (GI, 450 mm dia.)-100mm,75mm,40mm,25mm,19mm,12.5mm,10mm,6.5 mm, 4.75mm)	2 SETS
		(b) I.S.Sieves (Brass, 200mm dia)2.00mm,850µ,600µ, 425 µ,300 µ,150 µ,75 µ with lid and pan.	2 SETS
		Digital Weighing balance	2NOS
		Rubber pestle and motar	
		Mechanical Sieve Shaker	2 SETS
		Mechanical Sieve Shaker	2 SETS
5	Wet mechanical analysis using pippette method for clay and silt.	Pippete	4 NOS
		Cylinder/jars	5 NOS
		Mechanical stirrer	6 NOS
		Glass weighing bottles	7 NOS
		Digital Balance-	NIL
		Thermometer	1
		Water bath -	2NOS
6	Determination of	Casagrande’s liquid limit device with grooving tools	5NOS

	Liquid Limit by soil by Casagrande"s apparatus	Moisture can with lid	5NOS
		Porcelain evaporating dish	5NOS
		Spatula –flexible ,with the blade	5NOS
7	Determination of Plastic limit of soil.	Ground glass plate	4NOS
		3 mm dia glass rod	4NOS
		425 µ I.S. sieve	1NO
8	Determination of Shrinkage limit of soil.	Steel shrinkage dish –	8NOS
		Glass cup	4NOS
		Prong plate	4NOS
		Plain plate	4NOS
		Spatula	4NOS
		Straight edge	4NOS
		Mercurry	2 KG
		Porcelain evaporating dishes	4NOS
9	Determination of Coefficient of permeability of course grained soils under constant head method.	Permeameter mould of non-corrodible material	One set consist of all the above items
		Accassories of permeameter mould detachable collor ,porous stones (2 No.), dummy base plate etc.	
		Compaction rammer	
		Whatman Filter paper	
		Beaker	
		Drying crucible.	
		GI tray	
		Stop watch.	
		Glass Measuring cylinder	
		Reservoir/Over head tank	
10	Determination of MDD & OMC of soil by using modified Proctor Test	(a) Compaction moulds – cylindrical mould of capacity 1000 cc, internal diameter 100 mm ,effective height 127.3mm	One set consist of all the above items
		(b) Cylindrical mould of - 2250cc, internal diameter 150 mm, effective height 127.3mm	
		Metal rammers – (a) for light compaction (face diameter 50mm mass of 2.6 kg ,free drop of 310 mm) (b) for heavy compaction (mass =4.89kg ,free fall 450 mm)	
		Mould accessories – (detachable base plate , removable collar)	
		I.S. Sieves- size 19 mm & 4.75 mm, Brass	
		GI tray - 02 No.	
		Drying crucibles-06 Nos.	
		Graduated jars (Glass)	
		Straight edge	
		Spatula	
11	Determination of C and Φ of Soil sample by Triaxial Test device.	Tri-axial test cell	
		Lateral pressure assembly for applying and maintaining desired pressure on the fluid within the cell	
		Loading frame	
		Proving ring of	

		Split mould of diameter and length to suit the specimen	One set consist of all the above items
		Trimming knife	
		Scale & vernier calliperse.	
		Dial gauge	
		Piano wire saw	
		Metal straight edge	
		Volume change burette 25 cc.	
		Air compressor	
		Metal scale	
		Non-corrodible metal or plastic end caps of the same diameter as the specimen ; the upper cap having a central spherical seating to receive the loading ram	
		Seam less rubber membrane	
		Membrane stretcher	
		Rubber rings	
12	Determination of CBR value using Laboratory CBR Testing device	C.B.R mould	One set consist of all the above items
		Steel cutting edge (collar) which a can fit flush with the mould.	
		Spacer disc	
		Surcharge weight	
		Dial gauge	
		Penetration plunger	
		Loading machine	
		Metal rammer	
		Expansion measuring apparatus – perforated plate with adjustable stem, metal tripod etc.	
Hydraulics Laboratory			
1	Verification of Bernoulli's Theorem	F1-10 hydraulics bench	One set consist of all the above items
		F1-15 Bernoulli's apparatus test equipment	
		A stopwatch for timing the flow measurement.	
2	Determination of coefficient of Discharge of a rectangular notch fitted in open Channel	Rectangular notch, Collecting tank, Constant head tank, Stop watch	One set consist of all the above items
3	Determination of coefficient of Discharge of a Venturimeter, Orificemeter fitted in a pipe	Venturimeter fitted in a horizontal pipe line with means of varying flow rate, U tube differential manometer.	Each One set consist of all the above items
		Orificemeter fitted in a horizontal pipeline with means of varying flow rate, U tube differential manometer.	

4	Determination of head Loss due to friction and coefficient of friction for flow through pipe	F1-10 hydraulics bench F1-18 pipe friction apparatus Stopwatch for timing the flow measurement Measuring cylinder for measuring very low flow rates Spirit level Thermometer	One set consist of all the above items
Transportation Laboratory			
1	Penetration Test of Bitumen	**Penetrometer** consisting of a needle assembly with a total weight of 100 gram and device for releasing and locking needle in any position.	One set consist of all the above items
2	Ductility Test of Bitumen	**Briquette mould:** It is made of brass. Circular holes are provided at ends called clips to grip the fixed and movable ends of the testing machine. **Water bath:** A bath maintained within 27.0° ±0.1 °C of the specified test temperature containing not less than 10 litres of water. **Testing machine**: For pulling the briquette of bituminous material apart, any apparatus may be used which is so constructed that the specimen will be continuously submerged in water while the two clips are being pulled apart horizontally at a uniform speed of 50 ± 2.5 mm per minute. **Thermometer**: Range 0-44°C and readable up to 0.2°C	One set consist of all the above items
3	Viscosity Test of Bitumen	Tar viscometer, cup, valve, receiver, thermometer	One set consist of all the above items
4	Bitumen content by centrifuge extractor	Centrifuge apparatus used for binder content test of bituminous mix	One set consist of all the above items
Public Health Engineering Laboratory			
1	Determination of Turbidity of water Sample using Turbidimeter/Nephlometer/Jackson's Candle Turbidimeter	W.H.O Nephelometric turbidity meter and test tubes	One set consist of all the above items

2	Determination of pH of Water sample using (a) pH – meter (b) colour Comparator	pH meter with electrode, Color comparator with discs	One set consist of all the above items
		Thermometer that can read 77±18oC to the nearest value of 0.1 degree Celsius	
		Glass stirring rod	
		Minimum capacity scale to read up to 1.1 lb	
3	Determination of Cloride content of a Water sample using method of titration	Burette Pipettes Flask Measuring Cylinder	One set consist of all the above items
4	Determination of Coagulant (Alum) dose requirement for a turbid water sample by Jar Test.	Jar test apparatus Glass beaker Pipette pH meter Nephelometer	One set consist of all the above items
5	Determination of dissolved oxygen in a water sample	300 ml capacity bottle with stopper Burette Pipette	One set consist of all the above items
6	Detremination of B.O.D of waste water sample by Coliform test	B.O.D. bottle 300ml capacity B.O.D. incubator Air compressor Measuring cylinder Burette pipette	One set consist of all the above items

5TH SEM CIVIL

CIVIL ENGINEERING LABORATORY – II (FOR A GROUP OF 30 STUDENTS)

Sl. No.	Name of the experiment	Name of apparatus required with detailed specification	Quantity required in No.
Soil Testing Equipments			
1	Determination of Water content of Soil by Oven drying method.	Metal Container or moisture can with lid(air tight non corrodible)suitable for 15 to 20g soil	5NOS
		Digital Weighing balance (0.01gm sensitivity) nearly 500gm capacity	2NOS
		Oven- Thermostatically controlled with interior of non–corroding material to maintain temperature at 110o ± 5°C.	1NO
		Descicators	1NO
		Tongs(One Pair)	5PAIRS
2	Determination of Specific gravity of Soil by Pycnometer/Density bottle.	Pycnometer	5NOS
		Density bottle	5NOS
		Vaccum descicators.	1NO
		Digital Weighing balance	2NOS
		Thermometer	1NO
		Glass rod	5NOS
		Sample divider of the multiple slot type (riffle box)	1 NO
3	Determination of Field Density of Soil by Core Cutter Method.	Cylindrical core cutter	4NOS
		Steel Rammer (with	4NOS
		Steel dolly	4NOS
		Digital Balance	2NOS
		Steel Rule.	4NOS
		Straight edge	4NOS
		Palette Knife	4NOS
4	Determination of Particle Size gradation of sand/Gravel by sieve analysis	(a) I.S.Sieves (GI, 450 mm dia.)-100mm,75mm,40mm,25mm,19mm,12.5mm,10mm,6.5 mm, 4.75mm)	2 SETS
		(b) I.S.Sieves (Brass, 200mm dia)2.00mm,850µ,600µ, 425 µ,300 µ,150 µ,75 µ with lid and pan.	2 SETS
		Digital Weighing balance	2NOS
		Rubber pestle and motar	
		Mechanical Sieve Shaker	2 SETS
		Mechanical Sieve Shaker	2 SETS
5	Wet mechanical analysis using pippette method for clay and silt.	Pippete	4 NOS
		Cylinder/jars	5 NOS
		Mechanical stirrer	6 NOS
		Glass weighing bottles	7 NOS
		Digital Balance-	NIL
		Thermometer	1
		Water bath -	2NOS
6	Determination of	Casagrande's liquid limit device with grooving tools	5NOS

	Liquid Limit by soil by Casagrande"s apparatus	Moisture can with lid	5NOS
		Porcelain evaporating dish	5NOS
		Spatula –flexible ,with the blade	5NOS
7	Determination of Plastic limit of soil.	Ground glass plate	4NOS
		3 mm dia glass rod	4NOS
		425 µ I.S. sieve	1NO
8	Determination of Shrinkage limit of soil.	Steel shrinkage dish –	8NOS
		Glass cup	4NOS
		Prong plate	4NOS
		Plain plate	4NOS
		Spatula	4NOS
		Straight edge	4NOS
		Mercurry	2 KG
		Porcelain evaporating dishes	4NOS
9	Determination of Coefficient of permeability of course grained soils under constant head method.	Permeameter mould of non-corrodible material	One set consist of all the above items
		Accassories of permeameter mould detachable collor ,porous stones (2 No.), dummy base plate etc.	
		Compaction rammer	
		Whatman Filter paper	
		Beaker	
		Drying crucible.	
		GI tray	
		Stop watch.	
		Glass Measuring cylinder	
		Reservoir/Over head tank	
10	Determination of MDD & OMC of soil by using modified Proctor Test	(a) Compaction moulds – cylindrical mould of capacity 1000 cc, internal diameter 100 mm ,effective height 127.3mm	One set consist of all the above items
		(b) Cylindrical mould of - 2250cc, internal diameter 150 mm, effective height 127.3mm	
		Metal rammers — (a) for light compaction (face diameter 50mm mass of 2.6 kg ,free drop of 310 mm) (b) for heavy compaction (mass =4.89kg ,free fall 450 mm)	
		Mould accessories – (detachable base plate , removable collar)	
		I.S. Sieves- size 19 mm & 4.75 mm, Brass	
		GI tray - 02 No.	
		Drying crucibles-06 Nos.	
		Graduated jars (Glass)	
		Straight edge	
		Spatula	
11	Determination of C and Φ of Soil sample by Triaxial Test device.	Tri-axial test cell	
		Lateral pressure assembly for applying and maintaining desired pressure on the fluid within the cell	
		Loading frame	
		Proving ring of	

		Split mould of diameter and length to suit the specimen	One set consist of all the above items
		Trimming knife	
		Scale & vernier calliperse.	
		Dial gauge	
		Piano wire saw	
		Metal straight edge	
		Volume change burette 25 cc.	
		Air compressor	
		Metal scale	
		Non-corrodible metal or plastic end caps of the same diameter as the specimen ; the upper cap having a central spherical seating to receive the loading ram	
		Seam less rubber membrane	
		Membrane stretcher	
		Rubber rings	
12	Determination of CBR value using Laboratory CBR Testing device	C.B.R mould	One set consist of all the above items
		Steel cutting edge (collar) which a can fit flush with the mould.	
		Spacer disc	
		Surcharge weight	
		Dial gauge	
		Penetration plunger	
		Loading machine	
		Metal rammer	
		Expansion measuring apparatus – perforated plate with adjustable stem, metal tripod etc.	
13	UNI U Universal Testing Machine	Digital Universal Testing Machine 40 Tone Capacity	0 One set
Hydraulics Laboratory			
1	Verification of Bernoulli's Theorem	F1-10 hydraulics bench	One set consist of all the above items
		F1-15 Bernoulli's apparatus test equipment	
		A stopwatch for timing the flow measurement.	

2	Determination of coefficient of Discharge of a rectangular notch fitted in open Channel	Rectangular notch, Collecting tank, Constant head tank, Stop watch	One set consist of all the above items
3	Determination of coefficient of Discharge of a Venturimeter, Orificemeter fitted in a pipe	Venturimeter fitted in a horizontal pipe line with means of varying flow rate, U tube differential manometer. Orificemeter fitted in a horizontal pipeline with means of varying flow rate, U tube differential manometer.	Each One set consist of all the above items
4	Determination of head Loss due to friction and coefficient of friction for flow through pipe	F1-10 hydraulics bench F1-18 pipe friction apparatus Stopwatch for timing the flow measurement Measuring cylinder for measuring very low flow rates Spirit level Thermometer	One set consist of all the above items
Transportation Laboratory			
1	Penetration Test of Bitumen	**Penetrometer** consisting of a needle assembly with a total weight of 100 gram and device for releasing and locking needle in any position.	One set consist of all the above items
2	Ductility Test of Bitumen	**Briquette mould:** It is made of brass. Circular holes are provided at ends called clips to grip the fixed and movable ends of the testing machine. **Water bath:** A bath maintained within 27.0° ±0.1 °C of the specified test temperature containing not less than 10 litres of water. **Testing machine**: For pulling the briquette of bituminous material apart, any apparatus may be used which is so constructed that the specimen will be continuously submerged in water while the two clips are being pulled apart horizontally at a uniform speed of 50 ± 2.5 mm per minute. **Thermometer**: Range 0-44°C and readable up to 0.2°C	One set consist of all the above items
3	Viscosity Test of Bitumen	Tar viscometer, cup, valve, receiver, thermometer	One set consist of all the above items

4	Bitumen content by centrifuge extractor	Centrifuge apparatus used for binder content test of bituminous mix	One set consist of all the above items
Public Health Engineering Laboratory			
1	Determination of Turbidity of water Sample using Turbidimeter/Nephlometer/Jackson's Candle Turbidimeter	W.H.O Nephelometric turbidity meter and test tubes	One set consist of all the above items
2	Determination of pH of Water sample using (a) pH — meter (b) colour Comparator	pH meter with electrode, Color comparator with discs	One set consist of all the above items
		Thermometer that can read 77±18oC to the nearest value of 0.1 degree Celsius	
		Glass stirring rod	
		Minimum capacity scale to read up to 1.1 lb	
3	Determination of Cloride content of a Water sample using method of titration	Burette Pipettes Flask Measuring Cylinder	One set consist of all the above items
4	Determination of Coagulant (Alum) dose requirement for a turbid water sample by Jar Test.	Jar test apparatus Glass beaker Pipette pH meter Nephelometer	One set consist of all the above items
5	Determination of dissolved oxygen in a water sample	300 ml capacity bottle with stopper Burette Pipette	One set consist of all the above items
6	Detremination of B.O.D of waste water sample by Coliform test	B.O.D. bottle 300ml capacity B.O.D. incubator Air compressor Measuring cylinder Burette pipette	One set consist of all the above items

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA									
TEACHING AND EVALUATION SCHEME FOR 6th Semester (Civil Engineering)(wef 2020-21)									
Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Land Survey-II	5		-	20	80	3	100
Th.2		Construction Management	4		-	20	80	3	100
Th.3		Advanced Construction Techniques & Equipment	4		-	20	80	3	100
Th.4		Electives: a. Concrete Technology, b.Disaster Management c. Architectural Practices & Interior Design	4			20	80	3	100
		Total	*17*			*80*	*320*	-	*400*
		Practical							
Pr.1		Construction Workshop Practice & MS Project	-	-	5	25	25		50
Pr.2		Land Survey Practice -II	-	-	5	25	50		75
Pr.3		CADD Lab and Design & Detailing Practice	-	-	3	25	25		50
Pr.4		Project Phase-II			5	50	100		150
Pr.5		Life Skill			2	25	-		25
		Student Centred Activities(SCA)		-	2	-	-	-	-
		Total	-	-	*22*	*150*	*200*	-	*350*
		Grand Total	**17**		**22**	**230**	**520**	**-**	**750**
Abbreviations: L-Lecturer, T-Tutorial, P-Practical . Each class is of minimum 55 minutes duration									
Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%									
SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM/ Idea Tinkering and Innovation Lab Practice etc. ,Seminar and SCA shall be conducted in a section.									
There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester									

CURRICULLUM OF 6TH SEMESTER

For

DIPLOMA IN CIVIL ENGINEERING

(Effective FROM 2020-21Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

Th 1. LAND SURVEY– II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

Modern survey techniques are heavily dependent on advanced instruments and image based data. The course enables students to acquaint themselves with necessary information and processing procedures.

B. COURSE OBJECTIVES

On completion of the subject a student will be able to –

1. Solve numerical problems in the segment off tacheometry
2. Comprehend concepts of curve ranging and solve simple numerical
3. Study and interpret maps
4. Acquaint themselves with modern surveying methods including use of digital theodolite and total station
5. Comprehend basics of GPS setup, data processing and export
6. Comprehend basics of GIS and prepare map using GIS data

C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	TACHEOMETRY: (Only concepts; applications without derivation)	09
2	CURVES	08
3	BASICS ON SCALE AND BASICS OF MAP:	08
4	SURVEY OF INDIA MAP SERIES:	10
5	BASICS OF AERIAL PHOTOGRAPHY, PHOTOGRAMMETRY, DEM AND ORTHO IMAGE GENERATION:	10
6	MODERN SURVEYING METHODS :	10
7	BASICS ON GPS & DGPS AND ETS:	10
8	BASICS OF GIS AND MAP PREPARATION USING GIS	10

D. COURSE CONTENTS:

1 TACHEOMETRY:
(Only concepts; applications without derivation)

1.1 Principles, stadia constants determination

1.2 Stadia tacheometry with staff held vertical and with line of collimation horizontal or inclined, numerical problems

1.3 Elevations and distances of staff stations – numerical problems

2 CURVES :

2.1 compound, reverse and transition curve, Purpose & use of different types of curves in field

2.2 Elements of circular curves, numerical problems
2.3 Preparation of curve table for setting out
2.4 Setting out of circular curve by chain and tape and by instrument angular methods (i) offsets from long chord, (ii) successive bisection of arc, (iii) offsets from tangents, (iv) offsets from chord produced, (v) Rankine's method of tangent angles (No derivation)
2.5 Obstacles in curve ranging – point of intersection inaccessible

3 BASICS ON SCALE AND BASICS OF MAP:

3.1 Fractional or Ratio Scale, Linear Scale, Graphical Scale
3.2 What is Map, Map Scale and Map Projections
3.3 How Maps Convey Location and Extent
3.4 How Maps Convey characteristics of features
3.5 How Maps Convey Spatial Relationship
3.5.1 Classification of Maps
- 3.5.1 Physical Map
- 3.5.2 Topographic Map
- 3.5.3 Road Map
- 3.5.4 Political Map
- 3.5.5 Economic & Resources Map
- 3.5.6 Thematic Map
- 3.5.7 Climate Map

4 SURVEY OF INDIA MAP SERIES:

- 4.1 Open Series map
- 4.2 Defense Series Map
- 4.3 Map Nomenclature
  - 4.3.1 Quadrangle Name
  - 4.3.2 Latitude, Longitude, UTM's
  - 4.3.4 Contour Lines
  - 4.3.5 Magnetic Declination
  - 4.3.6 Public Land Survey System
  - 4.3.7 Field Notes

5 BASICS OF AERIAL PHOTOGRAPHY, PHOTOGRAMMETRY, DEM AND ORTHO IMAGE GENERATION:

5.1 Aerial Photography:
- 5.1.1 Film, Focal Length, Scale
- 5.1.2 Types of Aerial Photographs (Oblique, Straight)

5.2 Photogrammetry:
- 5.2.1 Classification of Photogrammetry
- 5.2.2 Aerial Photogrammetry
- 5.2.3 Terrestrial Photogrammetry

5.3 Photogrammetry Process:
- 5.3.1 Acquisition of Imagery using aerial and satellite platform
- 5.3.2 Control Survey
- 5.3.3 Geometric Distortion in Imagery
  - Application of Imagery and its support data
  - Orientation and Triangulation
  - Stereoscopic Measurement
    - 19.9.1 X-parallax
    - 19.2.2 Y-parallax

5.4 DTM/DEM Generation
5.5 Ortho Image Generation

6 MODERN SURVEYING METHODS :

6.1 Principles, features and use of (i) Micro-optic theodolite, digital theodolite
6.2 Working principles of a Total Station (Set up and use of total station to measure angles, distances of points under survey from total station and the co-ordinates (X,Y & Z or northing, easting, and elevation) of surveyed points relative to Total Station position using trigonometry and triangulation.

7 BASICS ON GPS & DGPS AND ETS:

7.1 GPS: - Global Positioning
- 7.1.1 Working Principle of GPS,GPS Signals,
- 7.1.2 Errors of GPS,Positioning Methods

7.2 DGPS: - Differential Global Positioning System
- 7.2.1 Base Station Setup
- 7.2.2 Rover GPS Set up
- 7.2.3 Download, Post-Process and Export GPS data
- 7.2.4 Sequence to download GPS data from flashcards
- 7.2.5 Sequence to Post-Process GPS data
- 7.2.6 Sequence to export post process GPS data
- 7.2.7 Sequence to export GPS Time tags to file

7.3 ETS: - Electronic Total Station
- 7.3.1 Distance Measurement
- 7.3.2 Angle Measurement
- 7.3.3 Leveling
- 7.3.4 Determining position
- 7.3.5 Reference networks
- 7.3.6 Errors and Accuracy

8 BASICS OF GIS AND MAP PREPARATION USING GIS

8.1 Components of GIS, Integration of Spatial and Attribute Information
8.2 Three Views of Information System
- 8.2.1 Database or Table View, Map View and Model View

8.3 Spatial Data Model
8.4 Attribute Data Management and Metadata Concept
8.5 Prepare data and adding to Arc Map.
8.6 Organizing data as layers.
8.7 Editing the layers.
8.8 Switching to Layout View.
8.9 Change page orientation.
8.10 Removing Borders.
8.11 Adding and editing map information.
8.12 Finalize the map

E. COURSE COVERAGE UPTO INTERNAL ASSESSMENT

Chapters 1, 2, 3, 4, 5

F. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	D. Gaikwad	Advanced Surveying	S.Chand
2	B. C. Punmia	Surveying Vol. I, II, III	Laxmi Publication, Delhi – 06
3	R. Agor	A text book of surveying and leveling	Khanna Publishers, Delhi-6
4	N. N. Basak	Surveying and Levelling	Tata Mcgraw Hill

REFERENCE Materials

1. https://theconstructor.org/surveying/surveying-principles-methods-civil-engineering/13048/
2. https://www.novatel.com/an-introduction-to-gnss/chapter-2-basic-gnss-concepts/
3. http://gps.alaska.edu/jeff/Spatial_Reference/Freymueller_DOT_GPS.pdf
4. https://drive.google.com/file/d/0B7srsI9Fr4QdUzAzSlRwZnNRZ3M/view :-
5. Surveying and Levelling by N.N. Basak, 2nd Edition
6. **https://2018.foss4g-na.org/sites/default/files/slides/survey_resurvey_cadastral_layer_Odisha.pdf**
7. **http://www.lawsofindia.org/pdf/orissa/2012/2012OR5.pdf**
8. **http://revenueodisha.gov.in/sites/default/files/document/DILRMP/SOP_MRR_2016.pdf**
9. **http://revenueodisha.gov.in/sites/default/files/document/Govt_Land/22958_4_8_14.pdf**
10. **https://www.google.co.in/search?q=map+reading+and+interpretation+ppt&oq=Map+reading+and+&aqs=chrome.3.69i57j0l5.9755j0j7&sourceid=chrome&ie=UTF-8**
11. **Map Use: Reading, Analysis and Interpretation by Juliana O. Muehrcke and Philip Muehrcke**
12. **http://indiageospatialforum.org/2012/proceedings/ppt/P%20K%20parida.pdf**
13. **http://www.indiana.edu/~paleoind/Resources/Guide%20to%20Topographic%20Maps.pdf**
14. **http://www.dst.gov.in/sites/default/files/nationalmappolicy.pdf**
15. **Remote sensing and GIS / BasudebBhatta, 2nd edition, New Delhi, India, Oxford University Press, - Oxford higher education.**
16. **http://www.gisresources.com/basic-of-photogrammetry_2/**
17. **http://giswin.geo.tsukuba.ac.jp/sis/tutorial/Fundamentals_of_GIS_Estoque.pdf**
18. **Learning Material Approved by R&DM Deptt., Govt. of Odisha**

Th 2. CONSTRUCTION MANAGEMENT

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

The course aims to prepare students to be an effective team member in a construction organization setup. This necessitates managerial skills in managing materials, time and human resources. Also, the course helps the students to build concepts of disasters and explore about manmade disasters at national as well as international level with quality measuring indices and vulnerability atlas of India.. The course has been designed to cater to these needs.

B. COURSE OBJECTIVES

On completion of the course students will be able to-

1. Develop schedules for construction project
2. Realize significance of organizational behavior towards successful functioning
3. Explain the important terminology related to materials management, site management, equipment management and labor management
4. Understand construction quality indicators and their measurement
5. Apply methods to measure and monitor progress of work
6. Realize significance of safety requirement and regulations at workplace
7. Understand the importance and usage of the Vulnerability Atlas of India in construction Projects.

C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Introduction To Construction Management	04
2	Constructional Planning	07
3	Materials and Stores Management	04
4	Construction Site Management	05
5	Construction Organisation:	06
6	Construction Labour and Labour Management:	06
7	Equipment Management	06
8	Quality Control	05
9	Monitoring Progress	06
10	Safety Management In Construction	05
11	Role of Vulnerability Atlas of India in construction projects	06

D. COURSE CONTENTS:

1 Introduction To Construction Management

1.1 Aims and objectives of construction management.

1.2 Functions of construction management.

1.3 The construction team components- owner,engineer,architect,contractor-their functions and interrelationship and jurisdiction.

1.4 Resources for construction management-men,machines,materials,money

2 Constructional Planning

2.1 Importance of Construction Planning

2.2 Developing work breakdown structure for construction work

2.3 Construction Planning stages-Pre-tender stage, Post-tender stage.

2.4 Construction scheduling by Bar charts-preparation of Bar Charts for simple construction works.

2.5 Preparation of schedules for labour materials,machinery, finance for small works

2.6 Limitation of Bar charts

2.7 Construction scheduling by network techniques-defination of terms ,PERT and CPM techniques, advantages and disadvantages of two techniques, network analysis, estimation of time and critical path, application of PERT and CPM techniques in sample construction works.

3 Materials and Stores Management

3.1 Classification of Stores-storage of stock.

3.2 Issue of materials-indent , invoice, bin card

4 Construction Site Management

4.1 Job Lay out-Objectives, Review plans, specifications, Lay out of equipments.

4.2 Location of equipment, organizing labour at site.

4.3 Job lay out for different construction sites.

4.4 Principle of storing material at site.

5 Construction Organization:

5.1 Introduction – Characteristics, Structure, importance.

5.2 Organization types-line and staff, functions and their characteristics

5.3 Principles of organization- meaning and significance of terms- control, authority, responsibility, job & task.

5.4 Leadership-necessity, styles of leadership, role of leader

5.5 Human relations-relations with subordinates, peers, Supervisors, characteristics of group behavior, mob psychology, handling of grievances, absenteeism, labour welfare.

5.6 Conflicts in organization-genesis of conflicts, types-intrapersonal, interpersonal, intergroup, resolving conflicts.

6 Construction Labour and Labour Management:

6.1 Preparing Labour schedule

6.2 Essential steps for optimum labour output

6.3 Labour characteristics

6.4 Wages & their payment

6.5 Labour incentives

6.6 Motivation- Classification of motives, different approaches to motivation.

7 Equipment Management

7.1 Preparing the equipment schedule

7.2 Identification of different alternative equipment

7.3 Importance of Owning & operating costs in making decisions for hiring & purchase of equipment

7.4 Inspection and testing of equipment

7.5 Equipment maintenance

8 Quality Control

8.1 Concept of quality in construction

8.2 Quality Standards- during construction, after construction, destructive & non destructive methods.

9 Monitoring Progress

9.1 Programme and progress of work

9.2 Work study

9.3 Analysis and control of physical and financial progress corrective measures.

10 Safety Management In Construction

10.1 Importance of safety

10.2 causes and effects of accidents in construction works

10.3 Safety measures in worksites for excavation, scaffolding, formwork, fabrication and erection, demolition.

10.4 Development of safety consciousness

10.5 Safety legislation- Workman's compensation act, contract labour act.

11 Role of Vulnerability Atlas of India in construction projects

11.1 Introduction to Vulnerability Atlas of India, Concepts of natural hazards and disasters and vulnerability profile of India. Definition of disaster related terms.

11.2 Earthquake hazard and vulnerability, Magnitude and intensity scales of earthquake, seismic zones, earthquake hazard maps, types of structures and damage classification, effects in housing and resistant measures.

11.3 Wind / Cyclone hazard and vulnerability, wind speed and pressures, wind hazard and cyclone occurrence maps, storm surveys and cyclone resistant measures.

11.4 Flood hazard and vulnerability, Flood hazard and Flood prone areas of the country, General protection of habitants and flood resistant construction.

11.5 Landslides, Tsunamis and Thunderstorm hazards and vulnerability, Landslide & Thunderstorm incidence maps, Measures against Tsunami hazards.

11.6 Housing vulnerability risk tables and usage of vulnerability atlas of India, Inclusion of vulnerability atlas in Tender documents.

E. COURSE COVERAGE UPTO INTERNAL ASSESSMENT

Chapters 1, 2, 3, 4, 5

F. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	M. R. Samal & R.L. Sahoo	Construction Management	Kalyani Publication
2	PS Gahlot & B M Dhir	Construction planning and management	New age international Publishers
3	Robert L Peurifoy & Willium B Ledbetter	Construction Planning equipment and methods	TMH Education
4	Dr. U K Shrivastava	Construction planning and management	Galgotia Publications
5	SC Sharma	Construction equipment and its management	Khanna Publishers
6	B Sengupta & H Guha	Construction management and planning	TMH Education
7	Vulnerability Atlas of India:- Published By BMTPC of India		

Th 3. ADVANCED CONSTRUCTION TECHNIQUES & EQUIPMENT

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

Current age construction industry is adopting state of art materials and technologies to improve aesthetics, strength, earthquake resistance, services relating to civil construction. The course will help the student to develop a general awareness on these advancements.

B. COURSE OBJECTIVES

On completion of the course students will be able to-

1. Select proper material during construction in domain of advanced materials including fibers, artificial timbers etc.
2. Select appropriate prefabrications in pursuance of standard codes
3. Adopt structural requirements and possible retrofits to improve earthquake resistance
4. Comprehend requirement of various services need to be operational
5. Understand the role of different construction earth moving equipments and select during planning
6. Comprehend necessity of soil reinforcing and prescribe appropriate strategy

C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Advanced construction materials	10
2	Prefabrication	08
3	Earthquake Resistant Construction	08
4	Retrofitting of Structures	08
5	Building Services	08
6	Construction and earth moving equipments	10
7	Soil reinforcing techniques	08

D. COURSE CONTENT

1 Advanced construction materials

1.1 Fibers and Plastics-

Types of fibers- Steel, Carbon, glass fibers, Use of fibers as construction material, properties of Fibers.

Types of plastics- PVC, RPVC, HDPE, FRP, GRP etc. Colored plastic sheets. Use of plastic as construction material.

1.2 Artificial Timbers – Properties and uses of artificial timber. Types of artificial timber available in market, strength of artificial timber.

1.3 Miscellaneous materials – Properties and uses of acoustics materials, wall claddings, plaster boards, micro-silica, artificial sand, bonding agents, adhesives etc.

2 Prefabrication

2.1 Introduction, necessity and scope of prefabrication of buildings, history of prefabrication, current uses of prefabrication , types of prefabricated systems, classification of prefabrication, advantages and disadvantages of prefabrication,

2.2 The theory and process of prefabrication, design principle of prefabricated systems, types of prefabricated elements, modular coordination

2.3 Indian standard recommendation for modular planning.

3 Earthquake Resistant Construction

3.1 Building Configuration

3.2 Lateral Load resisting structures

3.3 Building characteristics

3.4 Effect of structural irregularities-vertical irregularities, plan configuration problems.

3.5 Safety consideration during additional construction and alteration of existing Buildings.

3.6 Additional strengthening measures in masonry building-corner reinforcement, lintel band, sill band, plinth band, roof band, gable band etc.

4 Retrofitting of Structures

4.1 Seismic retrofitting of reinforced concrete buildings :

4.2 -Sources of weakness in RC frame building

4.3 -Classification of retrofitting techniques and their uses

5 Building Services

5.1 Cold Water Distribution in high rise building, lay out of installation

5.2 Hot water supply – General principles for central plants-layout

5.3 Sanitation –soil and waste water installation in high rise buildings

5.4 Electrical services – i) requirements in high rise buildings ii) Layout of wiring - types of wiring iii) Fuses and their types iv)Earthing and their uses

5.5 Lighting – Requirement of lighting, Measurement of light intensity

5.6 Ventilation - Methods of ventilation (Natural and artificial Systems of ventilation) problems on ventilation

5.7 Mechanical Services- Lifts, Escalator, Elevators – types and uses.

6 Construction and earth moving equipments –

6.1 Planning and selection of construction equipments

6.2 Study on earth moving equipments like drag line, tractor, bulldozer, Power shovel

6.3 Study and uses of compacting equipments like tamping rollers, Smooth wheel rollers, Pneumatic tired rollers and vibrating compactors

6.4 Owning and operating cost – problems

7 Soil reinforcing techniques

7.1 Necessity of soil reinforcing.

7.2 Use wire mesh and geo-synthetics.

7.3 Strengthening of embankments, Slope stabilization in cutting and embankments by soil reinforcing techniques.

E. Syllabus Coverage up to Internal Assessment: Chapters 1, 2, 3, 4

F. RECOMMENDED BOOKS

Sl. No	**Name of Authors**	**Titles of Book**	**Name of Publisher**
1	Agrawal & Shrikhande	Earthquake Resistant Design of Structures	Prentice-Hall of India Pvt. Ltd.
2	Swami Saran	Reinforced Soil and its Engineering applications	I.K.International Pvt. Ltd.
3	National building code of India_ BIS		
4	Fred & Greeno	Building Services Hand book	Routledge Publisher
5	B.L. Gupta & Amit Gupta	Construction Management & Machinery Limit	Standard Publishers
6	S.K. Duggal,	Earthquake resistant design of structures	Oxford
7	M.R. Samal	Advance Construction and Equipment	Platinum Publisher,Kolkata
8	Hand book on repair & rehabilitation of RCC buildings- CPWD		

Th 4(a). CONCRETE TECHNOLOGY (ELECTIVE)

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

Concrete is said to be the second most consumed material and in construction plays a vital role. The knowledge in constituents, strength development process and deterioration mechanism helps the learner in designing and producing good quality concrete.

B. COURSE OBJECTIVES

On completion of the course, the students will be able to

1. Describe functions and characteristics of the concrete constituents
2. Prescribe test requirements and methods for fresh and hardened concrete
3. Design concrete mix
4. Comprehend concrete production and inspection techniques
5. Acquaint themselves with special concrete preparation and application
6. Know the concrete deteriorating agencies and methods towards durability improvement and repair

C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Concrete as a construction material	02
2	Cement	04
3	Aggregate, Water and Admixtures:	06
4	Properties of fresh concrete	06
5	Properties of hardened concrete	07
6	Concrete mix Design	05
7	Production of concrete	06
10	Inspection and Quality Control of Concrete	06
11	Special Concrete	06
12	Deterioration of concrete and its prevention:	06
13	Repair technology for concrete structures:	06

D. COURSE CONTENTS:

1 Concrete as a construction material:

1.1 Grades of concrete.
1.2 Advantages and disadvantages of concrete.

2 Cement:

2.1 Composition, hydration of cement, water cement ratio and compressive strength, fineness of cement, setting time, soundness, types of cement.

3 Aggregate, Water and Admixtures:

3.1 Classification and characteristics of aggregate, fineness modulus, grading of aggregate,I.S.383
3.2 Quality of water for mixing and curing.
3.3 Important functions, classification of admixtures, I.S 9103, accelerating admixtures, retarding admixtures, water reducing admixtures, air containing admixtures

4 Properties of fresh concrete:

4.1 Concept of fresh concrete, workability, slump test, compacting factor test, V-bee consistency test and flow test, requirement of workability,I.S.1199.

5 Properties of hardened concrete:

5.1 Cube and cylinder compressive strengths, flexural strength of concrete, stress-strain and elasticity, phenomena of creep and shrinkage, permeability, durability of concrete, sulphate, chloride and acid attack on concrete, efflorescence.

6 Concrete mix Design

6.1 a) Introduction

b) Data or input required for mix design.

6.2 Nominal mix concrete &design mix concrete.

6.3 Basic consideration for concrete mix design, Methods of proportioning concrete mix – I.S Code method of mix design(I.S.10262)

7 Production of concrete:

7.1 Batching of materials, mixing of concrete materials, transportation, placing of concrete, compaction of concrete (vibrators), Curing of concrete, Formwork-requirements and types ,stripping of forms. (Concepts only)

10 Inspection and Quality Control of Concrete

10.1 Quality control of Concrete as per I.S.456, Factors causing the variations in the quality of concrete

10.2 Mixing, Transporting, Placing &curing requirements of Concrete as per I.S.456.

10.3 Inspection and Testing as per Clause 17 of IS:456.

10.4 Durability requirements of Concrete as per I.S:456.

11 Special Concrete

11.1 Introduction to ready mix concrete, high performance concrete, silica fume concrete, shot-crete concrete or gunitting (Concepts only).

12 Deterioration of concrete and its prevention:

12.1 Types of deterioration, prevention of concrete deterioration, corrosion of reinforcement, effects and prevention

13 Repair technology for concrete structures:

13.1 Symptom, cause and prevention and remedy of defects during construction, cracking of concrete due to different reasons. Repair of cracks for different purposes, selection of techniques, polymer based repairs, common types of repairs.

E. COURSE COVERAGE UPTO INTERNAL ASSESSMENT

Chapters 1,2,3,4,5,6

F. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	M.S Shetty & A.K.Jain	Concrete technology	S.Chand
2	M.L.Gambhir	Concrete technology	Tata McGraw Hill.
3	A R Santhakumar.	Concrete technology	Oxford Publication
CODE			
4	BIS Codes:- I.S 383,10262,9103		

Th 4(b). DISASTER MANAGEMENT (ELECTIVE)

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

The course helps students to build concepts of disasters and explore into the strategies and existing policies to mitigate challenges imposed by the natural and manmade disasters at national as well as international level.

B. COURSE OBJECTIVES

On completion of the course students will be able to

1. Comprehend the risk and social vulnerability in wake of disasters
2. Define the disasters and comprehend the scales of measuring the intensities associated
3. State the causes and basic science behind the disasters
4. Prescribe mitigating strategies
5. Prepare for possible effects in industry and society
6. Follow appropriate plans and policies formulated by government institutions and policy planning body
7. Develop awareness about application of remote sensing in Disaster Risk Management (DRM)

C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Introduction	04
2	Earthquakes	06
3	Tsunami	05
4	Landslides.	05
5	Cyclones	06
6	Floods	06
7	Droughts	05
8	Forest Fire	05
9	Other type of Hazards and disasters	05
10	Policy, Planning and Institutions for disaster mitigation	05
11	Geospatial Application for Disaster Risk Management at Global and Local level	08

D. COURSE CONTENTS

1 Introduction

1.1 Definition of hazards, disasters. Explain the difference between hazard and disaster.

1.2 Concept of risk and vulnerability. Risk reduction: preparedness and mitigation.

1.3 Disaster management cycle.

1.4 Personal and community awareness.

1.5 Types of disasters, earthquake, Tsunami, Landslide, cyclone ,flood,drought,forest fire, Chemical and industrial accidents.

2 Earthquakes.

2.1 Definition and concept ,intensity, Richter's scale.

2.2 Element of risk.

2.3 Hazard Zones in India.

2.4 Typical effects.

2.5 Main mitigation strategies, safe Engineering practice, Indian Standard code and enforcement Bye-Laws.

3 Tsunami.

3.1 Definition and concept.

3.2 Onset, Type and Cases.

3.3 Warming.

3.4 Elements at risk.

3.5 Typical effects, Physical damage, Environmental Damage, Casualties and Public health.

3.6 Specific Preparedness: Hazard Mapping, Early warning systems, Community preparedness.

3.7 Main mitigation strategies: Site planning and land management, Engineering structures. Flood management.

4 Landslides.

4.1 Definition, concept.

4.2 Onset time and warning.

4.3 Causes.

4.4 Elements at risk.

4.5 Hazard zones and Indian landslides.

4.6 Typical effects: Physical damage, casualties.

4.7 Main mitigation strategies: Hazard mapping, Landslide practice, retaining walls, Surface drainage control works, Engineering structures.

4.8 Community based mitigation.

5 Cyclones.

5.1 Definition, concept.

5.2 Onset type, Warning.

5.3 Elements at risk.

5.4 Typical effects.

5.5 Indian Hazard Zones.

5.6 Main mitigation strategies: Hazard mapping, Land use control, Engineering Structures, Flood management, improving vegetation cover.

5.7 Community based mitigation.

6 Floods.

6.1 Definition, concept, Onset type.
6.2 Warning.
6.3 Elements at risk.
6.4 Hazard zones and Indian floods.
6.5 Typical effects: Physical damage, Casualties and Public health, Crops and flood.
6.6 Main mitigation strategies: Mapping of the flood prone areas, land use control, Flood control and management.
6.7 Community based mitigation.

7 Droughts.

7.1 Definition, concept.
7.2 Onset type and warning.
7.3 Elements at risk.
7.4 Typical effects.
7.5 Main mitigation strategies: drought monitoring, water supply augmentation and conservation.
7.6 Drought Planning.

8 Forest Fire.

8.1 Definition and concept.
8.2 Forest fire damages in India.
8.3 Operational fire management systems and organizations.
8.4 Community involvement.
8.5 Public policies concerning fire.
8.6 The needs of fire management.

9 Other type of Hazards and disasters.

9.1 Chemical and Industrial disasters: brief description, effects, Preparedness.
9.2 Epidemic: Onset type, warning,causes and effects, risk reduction measures.
9.3 Heat waves: definition, dangers and effects, Forecasts and warning, awareness.

10 Policy, Planning and Institutions for disaster mitigation.

10.1 Role of policy makers in disaster risk reduction, course for specific action.
10.2 Institutional arrangement in India: Central level, State Level, District and Block level.
10.3 Major institutions in National and State level.

11 Geospatial Application for Disaster Risk Management at Global and Local level

11.1 Overview of Disaster Risk Management (DRM) and relevance of geospatial technologies in DRM

11.2 Earth observation technologies and their application in disaster management.

11.3 Remote sensing and geospatial intelligence for disaster management.

11.4 Application of remote sensing in hydro metrological, geological and environmental disaster.

11.5 International systems for disaster risk management:- UN-SPIDER, International Charter for Space and Major Disasters, Copernicus Emergency Management Service & Sentinel Missions.

E. COURSE COVERAGE UPTO INTERNAL ASSESSMENT

Chapters 1, 2, 3, 4, 5

F. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	R. Subramanian	Disaster Management	Vikas Publication
2	Donald and David Hyndman	Natural hazards and Disasters	Books/Cole CENGAGE learning
3	D.K.Sinha	Towards Basics of Natural Disaster	Researchco Book Cenre
4	S.B.Reed	Introduction to Hazards	Disaster Management Training Programme, 1997
5	Nigel Blundell	A Century of Man -Made Disaster	Pen & Sword Books Limited
6	**Website of "United Nation office for Outerspace Affairs" & "charter space & measure disasters"** **www.unoosa.org** **www.disasterscharter.org** **www.un-spider.org**		

Th 4(c). ARCHITECTURAL PRACTICES AND INTERIOR DESIGN (Elective)

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

The course helps students comprehend the important roles architects play in providing aesthetics and utility simultaneously. The course further exposes students to undertake designing activities considering anthropomorphic requirement and engineering challenges.

B. COURSE OBJECTIVES

On completion of the course students will be able to-

1. Comprehend the role of architects in taking care of utility and aesthetics
2. Analyze case study relating to residential and commercial buildings
3. Understand and apply procedure of landscaping
4. Comprehend ergonomic requirement and adopt in the building and its components
5. Comprehend the characteristics of interior materials and prescribe accordingly
6. Formulate plans for residential and small commercial buildings in compliance of requirements

C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Architectural design	06
2	Building Aesthetics	06
3	Design of Projects	07
4	Landscaping	07
5	Elements & principle of Interior Design	07
6	Anthropometrics Data	06
7	Interior materials	07
8	Interior of Residential Building	07
9	Interior of small commercial building	07

D. **COURSE CONTENTS:**

1 Architectural design.

1.1 Review of Architecture

1.2 Site selection, climatic conditions, sun control, orientation of building & site

1.3 Building bye laws and its applications.

2 Building Aesthetics

2.1 Feeling for aesthetics and utility, composition, utility, mass composition, order, expression,

2.2 Proportion, scale, accentuation, order, expression, proportion, scale, accentuation & rhythm, contrast, balance, pattern.

2.3 Character of building.

3 Design of Projects

3.1 A case study of residential building.

3.2 A case study of public / commercial building.

3.3 Aspect of working Drawing – Plan, Elevation and Section.

4 Landscaping

4.1 Soft and hard landscaping

4.2 Basic principles of landscaping.

4.3 Assessment of land.

4.4 Design procedure.

4.5 A case study of landscaping for public / commercial building campus.

4.6 Main mitigation strategies: Hazard mapping, Landslide practice, retaining walls, Surface drainage control works, Engineering structures.

4.7 Community based mitigation.

5 Elements & principle of Interior Design

5.1 Elements such as form, texture, light, colour, effect of light on colour and texture, organization of space in design, space pattern.

5.2 Importance of colour as art element, Various colour scheme.

6 Anthropometrics Data

6.1 Relation of human measurement to furniture and movement to circulation patterns.

7 Interior materials

7.1 Different interior materials, paneling, partitions, finishing materials, furniture.

7.2 False ceiling, Flooring, Paints.

8 Interior of Residential Building

8.1 Use of space, circulation, standard size of furniture.

8.2 Plans and elevation of interior with furniture for living space, dining space, kitchen, bed room, guest room etc.

9 Interior of small commercial building.

9.1 Planning of interior of small commercial units such as offices, consulting chambers, shops etc.

9.2 Furniture details such as executive table, architectures table etc. used in commercial units.

E. COURSE COVERAGE UPTO INTERNAL ASSESSMENT

Chapters 1, 2, 3, 4, 5

F. RECOMMENDED BOOKS:

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	David Van Dommalan	Designing and decorating interiors	Jhon Wiley Sons
2	National building code of India		B.I.S
3	P. Stharamamn	Interior Design and Decoration	CBS Publishers & Distributors
5	Julius panero	Human dimension &interior space	Whitney Library of Design
6	Frank D.K Ching	Interior design illustrated	Jhon Wiley Sons

Pr 1. CONSTRUCTION WORKS PRACTICE & MS PROJECT

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	75	Examination	3 hrs
Lab. periods:	5P/week	Term Work	25
Maximum marks:	50	End Semester Examination:	25

A. RATIONALE

Construction works involve construction, fabrication, testing and proper management. The practical course aims at exposing students at all these tasks. The course aims at imbibing the skills and attitude required at construction industries.

Microsoft Project is professional software that can help project managers. Team members will have better usability and control over hours of work. The applications help in developing plans, assigning resources to tasks, tracking budget management, workload analysis and reporting.

B. COURSE OBJECTIVES

On completion of the course students will be able to-

1. Know the construction tools and select as per requirement.
2. Construct brick walls and comprehend the challenges associated
3. Fabricate formworks and reinforcements
4. Evaluate compressive strength of concrete by conducting non-destructive tests
5. Know different plumbing tools and fixtures
6. Use MS Project to plan, schedule and report a project

C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
	PART I: Construction work Practices	
1	Tools for construction of masonry	06
2	Construction of brick walls	06
3	Formwork fabrication	08
4	Fabrication of reinforcements	10
5	Non-destructive tests for concrete	05
6	Pipe joints and Plumbing fixtures	05
	PART II: MS Project	
1	Introduction to Microsoft Project	04
2	Creating a project plan	05
3	Basics of Microsoft Project	06
4	Tracking the project progress	06
5	Project Reporting	07
6	Custom views and field	07

D. COURSE CONTENTS

PART I: Construction work Practices

1 Study of tools required for construction of masonry.

2 Lay out Plan of a building.

3 Construction of 1 &1 ½ Brick thick walls in English Bond in Mud

mortar including a corner.

4 Construction of 1 &1 ½ Brick thick Pillar in Mud mortar.

5 Bar bending and fabrication of reinforcements for a beam.

6 Bar bending and fabrication of reinforcements for a slab.

7 Bar bending and fabrication of reinforcements for a lintel with chajja.

8 Bar bending and fabrication of reinforcements for a column.

9 Conducting a Non destructive compressive strength test on concrete beam using rebound Hammer as per I.S:1311(Part-2)-1992.

10 Study of pipe joints and plumbing fixtures.

11 **Field visits:**

Visit to a construction site of a building where the following works are in progress.

Excavation of foundation, b) Masonry works, c) Plumbing works d) Painting (interior/ exterior), e) Wood works, f) Fabrication & concreting works, g)Flooring

PART II: MS Project

1 **Introduction to Microsoft Project**

1.1 Project Management-Definition & concept

1.2 Features of Microsoft project

1.3 MS project scheduling for engineering

2 **Creating a project plan**

2.1 Basic information for a new project

2.2 Creating project from a blank

2.3 Creating project from existing

3 **Basics of Microsoft Project**

3.1 Estimating a project

3.2 Project Task

3.3 Project Resources

4 **Tracking the project progress**

5 **Project Reporting**

6 **Custom views and field**

E. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	S.C.Rangawala.	Building Construction	Charotar Publishing

			House Pvt. Limited
2	S.S. Bhavikatti,	Building Construction	Vikas Publication
4	BIS Publication	Hand Book on Reinforcement Detailing (SP-34)	

Pr 2. LAND SURVEY PRACTICE – II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	75	Examination	3 hrs
Lab. periods:	5P/week	Term Work	25
Maximum marks:	75	End Semester Examination:	50

A. RATIONALE

Current age Civil Engineering professionals are required to be conversant with traditional as well as modern equipments and techniques for creating accurate maps. The course trains the students in skill sets required to use traditional high-end equipments and modern tools.

B. COURSE OBJECTIVES

On completion of the course students will be able to-

1. Conduct trigonometric leveling work in the field with the help of plane table surveying or geodetic surveying.
2. Prepare contoured maps or plans requiring both the horizontal as well as vertical control
3. Set out circular curve in the field.
4. Prepare survey map by conducting traverse survey with theodolite.
5. Lay out the construction plan of different types of structures at the site.
6. Study and use of modern electronic surveying instruments for its different applications.

C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Trigonometrical surveying & Tacheometry	10
2	Setting out curves and site surveying	10
3	Study of map and map series	10
4	GPS & DGPS and ETS	25
5	GIS and map preparation using GIS	20

D. COURSE CONTENTS

1.0 TRIGONOMETRICAL SURVEYING & TACHEOMETRY:

1.1 Determination of height of 3 objects whose bases are accessible

1.2 Determination of stadia constants

1.3 Determination of horizontal distance an elevation with Staff vertical , by stadia method

2.0 SETTING OUT CURVES AND SITE SURVEYING:

2.1 Setting out a simple circular curve by offsets from long chord

2.2 Setting out a simple circular curve by offsets from the tangent

2.3 Setting out a simple circular curve by offsets from chords produces

2.4 Setting out a simple circular curve by Rankine's method of tangent angle (Deflection angles)
Setting out a site the center line and foundation width of a building from the given plan

2.5 Setting out the foundation line for a culvert

2.6 Dividing an area into plots of given size

3. STUDY OF MAP AND MAP SERIES:

3.1 Physical Map
3.2 Topographic Map
3.3 Road Map
3.4 Political Map
3.5 Economic & Resources Map
3.6 Thematic Map
3.7 Climate Map
3.8 Open Series map and Defense Series Map

4. STUDY ON GPS & DGPS AND ETS:

4.1 GPS: - Global Positioning, GPS Signals, Errors of GPS,Positioning Methods
4.2 DGPS: - Differential Global Positioning System
- 4.2.1 Base Station Setup
- 4.2.2 Rover GPS Set up
- 4.2.3 Download, Post-Process and Export GPS data
- 4.2.4 Sequence to download GPS data from flashcards
- 4.2.5 Sequence to Post-Process GPS data
- 4.2.6 Sequence to export post process GPS data
- 4.2.7 Sequence to export GPS Time tags to file

4.3 ETS: - Electronic Total Station
- 4.3.1 Distance Measurement
- 4.3.2 Angle Measurement
- 4.3.3 Leveling
- 4.3.4 Determining position
- 4.3.5 Reference networks
- 4.3.6 Errors and Accuracy

5. STUDY OF GIS AND MAP PREPARATION USING GIS

5.1 Components of GIS, Integration of Spatial and Attribute Information
5.2 Three Views of Information System
- 5.2.1 Database or Table View, Map View and Model View

5.3 Spatial Data Model
5.4 Attribute Data Management and Metadata Concept
5.5 Prepare data and adding to Arc Map.
5.6 Organizing data as layers.
5.7 Editing the layers.
5.8 Switching to Layout View.
5.9 Change page orientation.
5.10 Removing Borders.
5.11 Adding and editing map information.
5.12 Finalize the map

E. RECOMMENDED BOOKS:

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	R. Agor	A text book of surveying and leveling	Khanna Publishers,
2	B. C. Punmia	Surveying Vol. I, II, III	Laxmi Publication
3	D. Gaikwad, S. Chand & Co.	Advanced Surveying	
4	Bhatta	Remote sensing & GIS	Oxford Publication

REFERENCE Materials

1. https://theconstructor.org/surveying/surveying-principles-methods-civil-engineering/13048/
2. https://www.novatel.com/an-introduction-to-gnss/chapter-2-basic-gnss-concepts/
3. http://gps.alaska.edu/jeff/Spatial_Reference/Freymueller_DOT_GPS.pdf
4. https://drive.google.com/file/d/0B7srsI9Fr4QdUzAzSlRwZnNRZ3M/view :-
5. Surveying and Levelling by N.N. Basak, 2nd Edition
6. **https://2018.foss4g-na.org/sites/default/files/slides/survey_resurvey_cadastral_layer_Odisha.pdf**
7. **http://www.lawsofindia.org/pdf/orissa/2012/2012OR5.pdf**
8. **http://revenueodisha.gov.in/sites/default/files/document/DILRMP/SOP_MRR_2016.pdf**
9. **http://revenueodisha.gov.in/sites/default/files/document/Govt_Land/22958_4_8_14.pdf**
10. **https://www.google.co.in/search?q=map+reading+and+interpretation+ppt&oq=Map+reading+and+&aqs=chrome.3.69i57j0l5.9755j0j7&sourceid=chrome&ie=UTF-8**
11. **Map Use: Reading, Analysis and Interpretation by Juliana O. Muehrcke and Philip Muehrcke**
12. **http://indiageospatialforum.org/2012/proceedings/ppt/P%20K%20parida.pdf**
13. **http://www.indiana.edu/~paleoind/Resources/Guide%20to%20Topographic%20Maps.pdf**
14. **http://www.dst.gov.in/sites/default/files/nationalmappolicy.pdf**
15. **Remote sensing and GIS / BasudebBhatta, 2nd edition, New Delhi, India, Oxford University Press, - Oxford higher education.**
16. **http://www.gisresources.com/basic-of-photogrammetry_2/**
17. **http://giswin.geo.tsukuba.ac.jp/sis/tutorial/Fundamentals_of_GIS_Estoque.pdf**
18. **Learning Material Approved by R&DM Deptt., Govt. of Odisha**

Pr 3. CADD Lab and Design & Detailing Practice

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	45	Examination	3 hrs
Practical periods:	3P/week	Sessional Examination:	25
Maximum marks:	50	Practical Examination:	25

A. RATIONALE

The course intends to imbibe necessary skills in using software towards design and drafting.

B. COURSE OBJECTIVES

On completion of the course students will be able to

1. Draw necessary detailing and schedule of bars for the various structural members
2. Draw important components of buildings using AutoCAD
3. Draw connectors using AutoCAD
4. Use STADD Pro in modeling structural members
5. Analyze the stress and deformation pattern in structural members
6. Design of buildings using STADD Pro software
7. Prepare building drawings suiting to approval needs prescribed by regulatory bodies

C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Structural Detailing Practice	20
2	Use of STADD Pro Software	15
3	Revit Architecture Software	10

D. COURSE CONTENTS

1.0 Structural Detailing Practice:

Draw the following with necessary details and schedule of bars from supplied sketches or given references such as SP 34

1.1 Slab, beam and lintel with chajja as in a simple building (Help from Sections 8 & 9 of SP 34 may be taken) (Plate I)

1.2 Columns, column-beam connections with & without splicing, isolated footing, staircase (Help from sections 6, 7, 10 of SP 34 may be taken)(Plate 2)

1.3 Different types of bolt connections, welded connections. (Plat3)

1.4 Details of Pile and Pile cap

2.0 Use of STADD Pro Software:

2.1 2-D Modelling of structures, Use of Structure wizard, Geometry, Property, Support, Loads and combinations, Analysis

2.2 Analysis of a Continuous beam with more than two span subjected to udl and point load

2.3 3-D modeling of building structures ,dead load, live load, earthquake and wind load analysis, design of a 3 storeyed building and preparation of reinforcement drawing and detailing

2.4 Introduction to STADD foundation.

3.0 Revit Architecture Software:

3.1 Basics- Modify, Wall, Door, Window, Component Room, Roof, Floor, Grid, Lines, Dimension, Section, Level, Text, View
3.2 Modelling- Ramp, Railing, Stair
3.3 Site- Topo surface- Parking Component, Site Component
3.4 Align, Split, Trim, offset, Match type, Line work, Paint, Scale, Unit
3.5 3D View
3.6 Preparation of approval drawing of a double storied residential building from given specifications with its 3D view using above commands

SOFTWARES REQUIRED:

1) STADD-Pro/V8i (latest Version) - Bentley
2) AutoCAD (Architecture) 2010 (Book) -William G. Wyatt

Pr4. PROJECT Phase - II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	75	Examination	3 hrs
Lab. periods:	5 P / week	Sessional	50
Maximum marks:	150	End Sem Examination	100

RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of Civil engineering and practices in real life situations, so as to participate and manage a large Civil engineering projects, in future. Entire Project spreads over 5th and 6th Semester. Part of the Project covered in 5th Semester was named as *Project Phase-I* and balance portion to be covered in 6th Semester shall be named as *Project Phase-II*.

OBJECTIVES

After undergoing the Project Work, the student will be able to:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real practical working environment, preferably in an industrial environment.
- Develop software packages or applications and implement these for the actual needs of the community/industry.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.
- To achieve real life experience in Project design.
- To develop the skill of writing Project Report

Project Phase-I and Phase-II

The Project work duration covers 2 semesters(5th and 6th sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group was done in the beginning of 5th semester under Project Phase-I. The students were allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work and Design of the system also have to be complete in Phase-I. Development may also begin in this phase. Project Milestones are to be set so that progress can be tracked .

In Phase-II Development, Testing, Documentation and Implementation have to be complete. Project Report have to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable alteration in the components of Task and schedule.

At the end of Project Phase-II in 6th semester there shall be one presentation by each group on whole Project work undertaken by them.

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

Sl. No.	Performance Criteria
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9	Viva voce

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.
It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations to such an exhibition.

The Project Report need to be prepared as per standard format and following is the indicative format. The Teacher Guide may make minor alteration keeping the sense in tact.

Organization of Project Report

1. Cover page:
   It should contain the following (in order)
   (i) Title of the Project
   (ii) "Submitted in partial fulfillment of the requirements for the Diploma in <Branch Name>"
   (iii) By Name of the Student(s)
   (iv) Logo of the Institution
   (v) Branch Name/Depart Name and Institution Name with Address
   (vi) Academic Year
2. 1st Inner page
   Certificate:
   It should contain he following
   "This is to certify that the work in this Project Report entitled <Project Title> by <Name of student(s)> has been carried out under my supervision in partial fulfillment of the requirements for the Diploma in <Branch Name>" during session <session > in <Branch /Department Name> of <Institute name> and this work is the original work of the above student(s).

   Seal and signature of the Supervisor/Guide with date
3. 2nd Inner Page
   Acknowledgement by the Student(s)
4. Contents.
5. Chapter wise arrangement of Reports
6. Last Chapter: Conclusion

It should contain

(i) Conclusion

(ii) Limitations

(iii) Scope for further Improvement

7. References

Pr-5 LIFE SKILL

(Common to All Branches)

Practical	**2 Periods per week**	**Sessional**	**25 Marks**
Total Periods	**30 Periods**	**Total Marks**	**25 Marks**

Objective: After completion of this course the student will be able to**:**

- Develop team spirit i.e. concept of working in team
- Apply problem solving skills for a given situation
- Use effective presentation techniques
- Apply task management techniques for given projects
- Enhance leadership traits
- Resolve conflict by appropriate method
- Survive self in today's competitive world
- Face interview without fear

DETAIL CONTENTS:

1. SOCIAL SKILL

Society, Social Structure, Develop Sympathy and Empathy
Swot Analysis – Concept, How to make use of SWOT
Inter personal Relation**:** Sources of conflict, Resolution of conflict ,
Ways to enhance interpersonal relation

2. PROBLEM SOLVING

Steps of Problem solving**:**

- Identify and clarify the problem,
- Information gathering related to problem,
- Evaluate the evidence,
- Consider alternative solutions and their implications,
- Choose and implement the best alternative,
- Review
- Problem solving techniques:

1) Trial and error, 2) Brain storming, 3) Lateral (Out of Box) thinking

3. PRESENTATION SKILL

Body language , Dress like the audience
Posture, Gestures, Eye contact and facial expression. STAGE FRIGHT,
Voice and language – Volume, Pitch, Inflection, Speed, Pause
Pronunciation, Articulation, Language, Practice of speech.
Use of AV aids such as Laptop with LCD projector, white board etc.

4. GROUP DISCUSSION AND INTERVIEW TECHNIQUES

Group Discussion:
Introduction to group discussion, Ways to carry out group discussion,
Parameters— Contact, body language, analytical and logical thinking,
decision making
Interview Technique :
Dress, Posture, Gestures, facial expression, Approach
Tips for handling common questions.

5. WORKING IN TEAM

Understand and work within the dynamics of a groups.
Tips to work effectively in teams,
Establish good rapport, interest with others and work effectively with them
to meet common objectives,
Tips to provide and accept feedback in a constructive and considerate way ,
Leadership in teams, Handling frustrations in group.

6. TASK MANAGEMENT

Introduction, Task identification, Task planning ,
organizing and execution, Closing the task

PRACTICAL

List of Assignment: *(Any Five to be performed including Mock Interview)*

a. SWOT analysis:-

Analyse yourself with respect to your strength and weaknesses, opportunities and threats. Following points will be useful for doing SWOT.

a) Your past experiences,
b) Achievements,
c) Failures,
d) Feedback from others etc.

b. Solve the True life problem assigned by the Teacher.

3. Working in a Team

Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation, environment protection, camps on awareness like importance of cleanliness in slum area, social activities like giving cloths to poor etc.(One activity per group where Team work shall be exhibited)

4. Mock Interview

5. Discuss a topic in a group and prepare minutes of discussion.

6. Deliver a seminar for 5 minutes using presentation aids on the topic given by your teacher.

7. Task Management

Decide any task to be completed in a stipulated time with the help of teacher. Write a report considering various steps in task management (with Break up into sub tasks and their interdependencies and Time)

Note: -1. Please note that these are the suggested assignments on given contents/topic. These assignments are the guide lines to the subject teachers. However the subject teachers are free to design any assignment relevant to the topic.

Note: -2. The following Topics may be considered for Seminar/GD in addition to other Topics at the discretion of the Teacher.

(Comparison with developed countries, Occupational Safety, Health Hazard, Accident & Safety, First-Aid, Traffic Rules, Global Warming, Pollution, Environment, Labour Welfare Legislation, Labour Welfare Acts, Child Labour Issues, Gender Sensitisation ,Harassment of Women at Workplace)

METHODOLOGY:

The Teacher is to explain the concepts prescribed in the contents of the syllabus and then assign different Exercises under Practical to the students to perform.

Books Recommended:-

Sl.No	Name of Authors	Title of the Book	Name of the Publisher
01	E.H. Mc Grath , S.J	Basic Managerial Skills for All	PHI
02	Lowe and Phil	Creativity and problem solving	Kogan Page (I) P Ltd
03	Adair, J	Decision making & Problem Solving	Orient Longman
04	Bishop , Sue	Develop Your Assertiveness	Kogan Page India
05	Allen Pease	Body Language	Sudha Publications Pvt. Ltd.

Equipment List

LAND SURVEY PRACTICE II (For Group Size-30 Students)

Sl No.	Name of Equipments	Quantity Required in Nos.
1	Substence bar	06
2	Photogrametry equipments and 3-D maps	06
3	Theodolite Traversing -Transit Vernier Theodolite-Telescope:Length 210mm, Magnification 30X, Resolving Power 1.3mm, Minimum focusing distance 1.5m, Stadia Multiplying Constant-100, Additive Constant-0(zero),Image-Erect, Accuracy-5mm/Km, Sensitivity of vertical circle-200seconds/2mm, Horizontal circle-100 to115mm, Graduation-20minutes, Vernier-20sec, Vertical Circle -100 to 115mm, Graduation-20 minutes, Vernier -20sec, /00With optical plummet, with telescope level and plate level supplied with all standard accessories as per BIS 2988-1965 including Tripod stand & Box	06
4	Digital Theodolite & EDM	06
5	Total Station (Auto Tracking & Auto Pointing) with all accessories: 1. Data transfer cable, 2. Aluminium Stand, 3. Both side display, 4. Detachable tribarch having following features, Focusing Mode, a)Auto focus mode, b) Power focus mode, c) Manual focus mode, d) Red dot appearing on the object where distance has to be measured, Graph of entire survey displayed on screen of total station. On board preloaded graphical software including are, perimeter, volume (cut/fill), 7500 points on board memory range, prism, single prism3000m (under normal condition) Three prism400m can measure distance without reflections up to 80m , Angle accuracy:5" (Seconds), Temperature, pressure sensor in built, Large LCD display screen 8 lines,20 characters,Battery12 hours continuous, angleony (angle + distance 6hrs.minimum) Charger with graphic display & discharge function.	06
6	DGPS (Dual frequency)	05
7	Electronic Total station	05
8	AutoCAD software	15 user
9	GIS software	Multiuser
10	Image processing software	multiuser

CONSTRUCTION WORKS PRACTICE LABORATORY & MS PROJECT (For Group Size-30 Students)

Sl No.	Name of Equipments	Quantity Required in Nos.
1	Masonry tools: Steel wire brush, Mason's Trowel, Pointing Trowel, Hacking hammer, Trig square (300 x 600mm), Blaster Chisel, Hammer (2 lbs), Cold steel chisel, straight edge (1800 mm), straight edge (1200mm), plumb bob (250g) with thread, steel measuring tape (3m), mortar pan (350 dia), GI bucket (15 Ltr), spade, wheel barrow, sprit level (300mm), wooden float (1200mm), wooden float (600mm), steel towel, Gauge Box (1.25 ft), Sand screen, Water storage tank (500 ltr.) Plastic mug, PVC tube (5mm dia), 20m, Nylon thread bundle (100 ft), Cotton Thread bundle (100 ft)	5 each

2	Claw hammer (216), Ball pin hammer (2 lb), Hand saw (18''), Tenon saw (12''), Wooden making gauge, wooden mortise gauge, spirit level (12'' long), Tri square (5'') Drill machine with bits from 3mm to 25 mm, fammer chisel (1 ½ ''), Mortise chisel (½ ''), cutting plier (8''), Screw driver set, making knife / scribe, Hacksaw frame with blade (12''), spanner set, wire rail (1 ½ ''-1 Kg), Wire nail (2 ½ ''-1 kg), wire nail (3'' – 1 kg), portable cutter with blade	5 each
3	Measuring steel tape (15m & 30m), binding hook, bending lenr (8mm, 10mm, 12mm, 16mm, 20mm, 25mm), rail piece (450-600mm long), cold chisel flat nose, Hammer (10lb), trysquare (300 x 600mm) Hacksaw frame, standard wire gauge, cutting blades for hacksaw, bar bending machine (36mm dia), Bar shearing machine (36mm dia), Hand shearing machine (upto 12mm dia), bending tables with support and sleeper, Bar Cutting Machine	5 each
4	Water supply plumbing fitting - (1'' dia) GI & PVC – bend, draw, short piece, ripple, socket, plug, reducer socket, union tee, RS tee, Reducer socket etc	5 each
5	Sanitary plumbing fittings–(4" dia) GI & PVC- Bend, Door Bend, T-Juction, Y-Juction, Short piece- P,S,Q trap, vent pipe, cowl.	5 each
6	Fixtures – Wash basin, sink, Indian pan, European pan (Commode), Anglo Indian Pan, Videt, Showers(Overhead, Health, Hand), Bib-cocks with hot & cold water Mixture, Connection pipe, waste, Waste Pipe, Bibcock, Pillar cock, Angle cock, Stop cock, Valves – oneway (Reflux), full way	5 each
7	MS Project software	Multi user

CIVIL ENGG. CAD LABORATORY (FOR A GROUP OF 30 STUDENTS)
(Can be used for Engg. Drawing/Civil Engg. Drawing-I & II /Estimation & Cost Evaluation Practice – I & II)
Gr. Size -30students

Sl. No.	Item with Specification-	QNTY in Nos.
1	STAAD-Pro -V8i(Latest Educational Version) software	30 users
2	AutoCAD-2016 or lates Educational version	15 users
3	Desk Top Computer with following latest version configuration :	30
4	Laptop Computer with following latest version configuration :	1
5	Online UPS: 15KVA	
6	Laser Printer- Paper size:A4	1
7	Document Scanner A4/Legal size, Resolution: 600x600, Flat Bed size:A4	1
8	Plotter(44") with accessories in complete set	1
9	LCD projector 4000 ansi lumen with screen	1

6th semester Civil Engineering

Sub:- Pr 1. CONSTRUCTION WORKS PRACTICE & MS PROJECT

SL. NO.	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QUANTITY NO.
1	Tools for construction of masonry	**Measuring and Marking Tools** Tape measure Spirit level Plumb bob Square / T-square **Cutting Tools** Brick chisel / mason's chisel Hammer / club hammer Cold chisel Angle grinder with masonry disc Handsaw for masonry **Mixing and Mortar Tools** Trowels: Hawk Mortar board Mixing tools: Buckets / wheelbarrow **Laying and Finishing Tools** Masonry hammer / brick hammer Jointers / pointing tools Float Brush **Lifting and Handling Tools** Trolley / wheelbarrow Buckets with hooks Scaffolding Pulleys or hoists **Safety Equipment** Gloves Safety goggles Dust mask / respirator Helmet Safety boots	1 Each
2	Construction of brick walls	**Measuring and Marking Tools** Tape measure Spirit level Plumb bob Square / T-square **Cutting Tools** Brick chisel / mason's chisel Hammer / club hammer Cold chisel Angle grinder with masonry disc Handsaw for masonry **Mixing and Mortar Tools** Trowels: Hawk Mortar board Mixing tools: Buckets / wheelbarrow **Laying and Finishing Tools** Masonry hammer / brick hammer Jointers / pointing tools Float	1 Each

		Brush **Lifting and Handling Tools** Trolley / wheelbarrow Buckets with hooks Scaffolding Pulleys or hoists **Safety Equipment** Gloves Safety goggles Dust mask / respirator Helmet Safety boots	
3	Formwork fabrication	**Measuring and Marking Tools** Tape measure T-square Spirit level / laser level Plumb bob Chalk line / pencil / marking gauge **Cutting Tools** Hand saw / circular saw Handsaw for metal Chisels Angle grinder **Joining and Fixing Tools** Hammer / mallet Screwdriver / drill with bits Clamps Wrenches / spanners Staple gun **Concrete Preparation & Finishing Tools** Trowels / floats Vibrator (optional) Brush / sponge **Safety Equipment** Gloves Safety goggles Dust mask / respirator Helmet Safety boots	1 Each
4	Fabrication of reinforcements	Tape measure Chalk / marker Carpenter's square / angle gauge Rebar cutter Hacksaw / cold saw Angle grinder with cutting disc Welding machine Gloves Safety goggles Dust mask / respirator Helmet Safety boots	1 Each
5	Non-destructive tests for concrete	Rebound Hammer Ultrasonic pulse velocity equipment	1 Each
6	Pipe joints and Plumbing fixtures	Pipe cutter Hacksaw	1 Each

		Pipe reamer / deburring tool Pipe wrench / adjustable wrench Spanner set Threading machine / die set Pipe vice / clamps Plumber’s tape (Teflon tape) Solvent cement / primer Soldering torch and flux Plumbing Fixtures Faucets / taps Washbasins / sinks Water closets (WC) Bathtubs / showers Showers / showerheads Valves Adjustable wrench / basin wrench Pipe pliers / tongue-and-groove pliers Screwdriver set Drill and bits Hacksaw / pipe cutter Plumber’s putty / silicone sealant Threading kit / taps and dies Spirit level Measuring tape / ruler Bucket / rag	

6th semester Civil Engineering

Sub:- Pr 2. LAND SURVEY PRACTICE – II

SL. NO.	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QUANTITY NO.
1	Trigonometrical surveying & Tacheometry	Theodolite / Total Station	1
		Telescope / Alidade	1
		Tripod	1
		Measuring staff / leveling rod	5
		Tape / Chain / Steel Tape	2
		Plumb bob	1
		Compass / GPS	1
		Field notebook / data sheets	1
		Calculator / software	1
2	Setting out curves and site surveying	Total Station / Theodolite / Transit	1
		Tape measure / Chain / Steel tape	1
		Range poles / Surveying rods / Staffs	5
		Peg / Wooden stakes / Markers	1
		Plumb bob / Optical plummet	
		Compass / GPS	1
		Leveling instrument / Dumpy level	1
		Calculator / Field notebook	1
3	Study of map and map series	Topographic / Cadastral maps	1
		Scale ruler / engineer's scale / map	1
		scale	1
		Protractor / angle measurer	1
		Compass / GPS	1
		Tracing paper / overlays	1
		Colored pencils / pens	1
		Magnifying glass	1
		Field notebook / data sheets	1
4	GPS & DGPS and ETS	GPS receiver / handheld GPS device	1
		Tripod	1
		Antenna / GNSS receiver	1
		Data logger / controller	1
		Batteries / power supply	1
		Field notebook / data sheets	1
5	GIS and map preparation using GIS	Computer / Workstation	1
		GIS software	1
		GPS / DGPS / Total Station data	1
		Scanner / Digitizer / Drone	1
		Internet / Satellite imagery / Aerial photographs	1
		Data storage / External hard drives / Cloud storage	1
		Printer / Plotter	1

6th semester Civil Engineering

Sub:- **Pr 3. CADD Lab and Design & Detailing Practice**

SL. NO.	NAME OF THE EXPERIMENT	SOFTWARE REQUIRED	QUANTITY NO.
1	Structural Detailing Practice		
2	Use of STADD Pro Software	STADD Pro Software	
3	Revit Architecture Software	Autodesk	

Final

DIPLOMA CURRICULUM OF ELECTRICAL ENGINEERING (SECOND YEAR) (3rd Semester)

(To be implemented from 2025-26)

Prepared by;

National Institute of Technical Teachers' Training & Research Kolkata
Block – FC, Sector – III, Salt Lake City, Kolkata – 700106

Vetted by:
Domain experts from Polytechnics of Odisha

State Council for Technical Education & Vocational Training
Near Raj Bhawan, Unit-VIII, Bhubaneswar, Odisha

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PROGRAMME TITLE: ELECTRICAL ENGINEERING

SEMESTER - III

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme				Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory		Practical			
					L	T	P	End Exam	Progressive Assessment	End Exam	Progressive Assessment		
1	Programme Core	EEPC201 TH:1	Introduction to Electric Generation Systems		3	0	0	70	30	-	-	100	3
2		EEPC203 TH:2	Electrical Circuits		3	0	0	70	30	-	-	100	3
3		EEPC205 TH:3	Electrical and Electronic Measurements		3	0	0	70	30	-	-	100	3
4		EEPC207 TH:4	DC Machines and Transformers		3	0	0	70	30	-	-	100	3
5		EEPC209 TH:5	Renewal Energy Power Plants		3	0	0	70	30	-	-	100	3
6		EEPC211 PR:1	Programming for Problem Solving		0	0	4	-	-	15	35	50	2
7		EEPC213 PR:2	Electrical Circuits Laboratory		0	0	4	-	-	15	35	50	2
8		EEPC215 PR:3	Electrical and Electronic Measurements Laboratory		0	0	4	-	-	15	35	50	2
9		EEPC217 PR:4	DC Machines and Transformers Laboratory		0	0	4	-	-	15	35	50	2
10	Summer Internship	SI201	Summer Internship – I*		0	0	0	-	-	15	35	50	2
TOTAL					**15**	**0**	**16**	**350**	**150**	**75**	**175**	**750**	**25**

*3 - 4 weeks after 2nd Semester

***The best of 2 IA conducted in a subject out of 20 marks to be considered. Assignment/ quiz etc. of 10 marks to be treated as part of IA. Besides this, Monthly Test to be conducted for each subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester. Club/Innovation/ Idea Tinkering Activities etc. shall be encouraged to be performed by students beyond the above stipulated hours.**

SEMESTER - III COURSES

TH:1- INTRODUCTION TO ELECTRIC GENERATION SYSTEMS

L	T	P		Course Code: EEPC201	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PC	

RATIONALE:

This course concentrates on the field of electric generation systems. It includes thermal power plants: coal, gas/diesel and nuclear-based, large and micro-hydropower plants, solar and biomass based power plants, and wind power plants. After completion of this course, the students will be able to know about economics of power generation and interconnected power system and maintain the efficient operation of various electric power generating plants.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Explain the optimized working of the thermal power plant
- Describe the efficient operation of large hydropower plants.
- Describe the efficient operation micro hydropower plants.
- Select the adequate mix of power generation based on economic operation.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Thermal Power Plants: Coal, Gas/Diesel and Nuclear-based** 1.1 Layout and working of a typical thermal power plant with steam turbines and electric generators 1.2 Properties of conventional fuels used in the energy conversion equipment used in thermal power plants: Coal, Gas, Diesel, Nuclear fuels-fusion and fission action 1.3 Safe Practices and working of various thermal power plants: coal-based, gas- based, diesel-based, and nuclear-based 1.4 Functions of the following types of thermal power plants and their major auxiliaries 1.4.1 Coal fired boilers: fire tube and water tube 1.4.2 Gas/diesel based combustion engines 1.4.3 Types of nuclear reactors :Disposal of nuclear waste and nuclear shielding	16
II	**Large Hydropower Plants** 2.1 Energy conversion process of hydro power plant 2.2 Classification of hydro power plant: High ,medium and low head 2.3 Construction and working of hydro turbines used in different types of hydro power plant 2.3.1 High head-Pelton turbine 2.3.2 Medium head-Francis turbine 2.3.3 Low head-Kaplan turbine 2.4 Safe Practices for hydro power plants 2.5 Locations of these different types of large hydro power plants in India	09
III	**Micro-Hydropower Plants** 3.1 Lay out of micro hydro power plants 3.2 Different types of micro-hydro turbines for different heads: 3.2.1 Pelton turbines 3.2.2 Francis turbines 3.2.3 Kaplan turbines 3.3 Locations of these different types of micro-hydro power plants in India	08

IV	**Economics of Power Generation and Interconnected Power System** 4.1 Related terms: connected load, firm power, cold reserve, hot reserve, spinning reserve. Base load and peak load plants; Load curve, load duration curve, integrated duration curve 4.2 Cost of generation: Average demand, maximum demand, demand factor, plant capacity factor, plant use factor, diversity factor, load factor and plant load factor 4.3 Choice of size and number of generator units 4.4 Combined operation of power station Causes, Impact and reasons of Grid system fault: State grid, national grid, brownout and blackout; sample blackouts at national and international level.	12

REFERENCES:

1.	Electrical Power Generation by Tanmoy Deb, Khanna Publishing House, Delhi.
2.	Generation of Electrical Energy by B.R. Gupta, S. Chand & Co. New Delhi.
3.	Wind Power Technologies by Rachel, Sthuthi; Earnest, Joshua, PHI Learning, New Delhi.
4.	Solar Photovoltaics: Fundamentals, Technologies and Applications by Chetan Singh Solanki, PHI Learning, New Delhi.
5.	Wind Energy Basics by Gipe Paul, Chelsea Green Publishing Co.
6.	Wind Power Plants and Project Development by Wizelius, Tore, Earnest, Joshua, PHI.
7.	A Course in Electrical Power by J.B. Gupta, S.K. Kataria and Sons, New Delhi.
8.	A Course in Electrical Power by Soni, Gupta, Bhatnagar, Dhanpat Rai and Sons.

TH:2- ELECTRICAL CIRCUITS

L	T	P		Course Code: EEPC203	
3	0	0			
Total Contact Hours			**Total Marks: 100**	**Theory Assessment**	
Theory		: 45 Hrs		End Term Exam	: 70
Tutorial		: 0		Progressive Assessment	: 30
Pre Requisite		**: Nil**			
Credit		**: 3**		Category of Course : PC	

RATIONALE:

The concept of electrical circuits and networks is very essential for more advanced topics in Electrical and related Engineering programs. This course aims to cover basic circuit concepts, different methods for analyzing large-scale circuits, and applications of these concepts.

COURSE OUTCOMES:

After the completion of this course, the students will be able to:

- Explain various characteristics of different single phase AC series, AC parallel circuits and terms related to three phase circuits
- Solve problems using network reduction & principles of circuit analysis
- Apply Network theorems in analyzing and solving electrical circuit problems
- Explain the behavior of circuit in transient condition.
- Describe two-port networks

DETAILED COURSE CONTENT:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Single Phase A.C Series Circuits** 1.1 Generation of alternating voltage 1.2 Phasor representation of sinusoidal quantities 1.3 R, L, C circuit elements its voltage and current response 1.4 R-L, R-C, R-L-C combination of A.C series circuit 1.4.1 Impedance, reactance, impedance triangle 1.4.2 Power factor, active power, reactive power, apparent power 1.4.3 Power triangle and vector diagram 1.4.4 Resonance, Bandwidth 1.4.5 Quality factor and voltage magnification in series R-L, R-C, R-L-C circuit	7

II	**Single Phase A.C Parallel Circuits** 2.1 R-L, R-C and R-L-C parallel combination of A.C. circuits 2.1.1 Impedance, reactance, phasor diagram, impedance triangle 2.1.2 Power factor, active power, apparent power, reactive power, power triangle 2.2 Resonance in parallel R-L, R-C, R-L-C circuit 2.3 Bandwidth, Quality factor and voltage magnification	8
III	**Three Phase Circuits** 3.1 Phasor and complex representation of three phase supply 3.2 Phase sequence and polarity 3.3 Types of three-phase connections 3.4 Phase and line quantities in three phase star and delta system 3.5 Balanced and unbalanced load 3.6 Neutral shift in unbalanced load 3.7 Three phase power, active, reactive and apparent power in star and delta system	8
IV	**Network Reduction and Principles of Circuit Analysis** 4.1 Source transformation 4.2 Star/delta and delta/star transformation 4.3 Mesh Analysis 4.4 Node Analysis	5
V	**Network Theorems** 5.1 Superposition theorem 5.2 Thevenin's theorem 5.3 Norton's theorem 5.4 Maximum power transfer theorem 5.5 Reciprocity Theorem	9
VI	**Two Port Network** 6.1 Open Circuit Impedance Parameters 6.2 Short Circuit Admittance Parameters, Transmission Parameters , Hybrid Parameters 6.3 Interrelationship of Two Port Network 6.4 Inter Connection of Two Port Network	8

REFERENCES:

1.	Network Analysis, M. E. Van Valkenburg; Prentice Hall of India
2.	Electric Circuits; David A. Bell; Oxford University Press New Delhi.
3.	Electric Circuit Theory, Chattopadhyay, Rakshit S. Chand &. Co
4.	Network & Systems, D. Roy Choudhury Wiley Eastern Ltd
5.	Networks and Systems, Ashfaq Husain Khanna Publishing House
6.	Engineering Circuit Analysis, W. H. Hayt, J. E. Kemmerly, and S. M. Durbin, McGraw Hill
7.	Fundamentals of Electrical Engineering; S.B Lal Saxena and K.Dasgupta; Cambridge University Press Pvt. Ltd., New Delhi.
8.	Electrical Circuits; Joseph Edminister, Schaum's Outline, Tata McGraw Hill.

TH:3- ELECTRICAL AND ELECTRONIC MEASUREMENTS

L	T	P		Course Code: EEPC205	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		**: 45Hrs**	**Total Marks: 100**	**End Term Exam**	**: 70**
Tutorial		**: 0 Hrs.**		**Progressive Assessment**	**: 30**
Pre Requisite		**: Nil**			
Credit		**: 3**		**Category of Course : PC**	

RATIONALE:

The subject "Electrical & Electronics Measurements" is important in the field of Electrical Engineering. This subject deals with the technique of measuring voltage, current and wattage by the indicating type of instruments. The technique of measurement of Electrical power in single phase and three phase circuits will be studied here. Measurement of energy and calibration and adjustment of energy meters will also be studied under this subject. Prior to above the working principle construction of all type of measuring instruments like indicating, integrating and recording type will also be studied here.

LEARNING OBJECTIVES:

After completion of the course, the students will be able to

- Explain the construction and working principle of different types of electrical measuring instruments.
- Connect different types of electrical measuring instruments to measure various electrical parameters.
- Select the right instruments for the measurement of voltage, current, power and energy.
- Apply the appropriate technique to measure resistance, inductance and capacitance.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Fundamentals of Measurements** 1.1 Measurement: Significance, units, fundamental quantities and standards 1.2 Classification of Instrument Systems 1.3 Null and deflection type instruments 1.4 Absolute and secondary instruments 1.5 Analog and digital instruments 1.6 Static and dynamic characteristics, types of errors 1.7 Calibration: need and procedure 1.8 Classification of measuring instruments: indicating, recording and integrating instruments 1.9 Essential requirements of an indicating instruments	**10**
II	**Measurement of voltage and current** 2.1 DC Ammeter: Basic, Multi range, Universal shunt, 2.2 DC Voltmeter: Basic, Multi-range, concept of loading effect and sensitivity 2.3 AC voltmeter: Rectifier type (half wave and full wave) 2.4 CT and PT: construction, working and applications	**9**

III	**Measurement of Electric Power** 3.1 Analog meters: Permanent magnet moving coil (PMMC) and Permanent magnet moving iron (PMMI) meter, their construction, working, salient features, merits and demerits 3.2 Dynamometer type wattmeter: Construction and working 3.3 Errors and compensations of PMMI,PMMC and Dynamometer type wattmeter 3.4 Active and reactive power measurement: One, two and three wattmeter method 3.5 Effect of Power factor on wattmeter reading in two wattmeter method 3.6 Maximum Demand indicator(Definition only)	**9**
IV	**Measurement of Electric Energy** 4.1 Single and three phase electronic energy meter: Constructional features and working principle 4.2 Errors and their compensations 4.3 Calibration of single-phase electronic energy meter using direct loading.	**7**
V	**Circuit Parameter Measurement, CRO and Other Meters** 5.1 Measurement of resistance 5.1.1 Low resistance: Kelvin's double bridge, 5.1.2 Medium Resistance: Voltmeter and ammeter method 5.1.3 High resistance: Megger and Ohm meter: Series and shunt 5.2 Measurement of inductance using Anderson bridge (no derivation and phasor diagram) 5.3 Measurement of capacitance using Schering bridge (no derivation and phasor diagram) 5.4 Single beam/single trace CRO (Working principle and block diagram only) 5.5 Digital storage Oscilloscope**:** Basic block diagram, working, Cathode ray tube, electrostatic deflection, vertical amplifier, time base generator, horizontal amplifier, measurement of voltage/ amplitude/ time period/ frequency/ phase angle delay line, specifications. 5.6 Other meters: Earth tester, Digital Multimeter; L-C-R meter, Frequency meter (ferromagnetic and Weston type), Phase sequence indicator, power factor meter (single phase and three phase dynamometer type), Synchro scope, Tri-vector meter 5.7 Signal generator: need, working and basic block diagram.	**10**

REFERENCES:

1.	A Text Book of Electrical Technology Vol-I (Basic Electrical Engg.) by B. L. Theraja, A. K. Theraja, S.Chand and Co. New Delhi.
2.	Basic Electrical Engineering by V. N. Mittle, Mc Graw-Hill New Delhi.
3.	Electrical Technology by Edward Hughes, Pearson Education, New Delhi.
4.	Electrical and Electronic Measurement and Instrumentation by R.K. Rajput, S.Chand and Co. New Delhi.
5.	Electrical and Electronics Measurements and Instrumentation by A.K. Sawhney, Dhanpai Rai and Sons, New Delhi.
6.	Electrical Measurements and Measuring Instruments by N.V. Suryanarayna, S.Chand and Co., New Delhi.

TH:4- DC MACHINES AND TRANSFORMERS

L	T	P		Course Code: EEPC207	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		**: 45Hrs**	**Total Marks: 100**	**End Term Exam**	**: 70**
Tutorial		**: 0 Hrs.**		**Progressive Assessment**	**: 30**
Pre Requisite		**: Nil**			
Credit		**: 3**		**Category of Course : PC**	

RATIONALE:

The applications of DC machine in modern industries are still in practice. The Electrical Engineering Technicians has to look after the installation, operation and control of electrical machines. Therefore, the knowledge of "Electrical Machine" is very essential in this regard. This subject covers DC generators, DC motors, single-phase transformers, three phase transformers and special purpose transformers. This subject deals with the working principles, operation of the machines.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Explain the construction and working principle of dc machines.
- Describe the performance characteristics of dc motor and dc generator.
- Explain the construction and working principle of transformer.
- Describe the performance of single phase and three-phase transformer.
- Discuss about special purpose transformers

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**DC Generators** 1.1 D.C. generator: construction, parts, materials and their functions 1.2 Principle of operation of DC generator 1.2.1 Fleming's right hand rule 1.2.2 Derive the emf equation of DC Generator 1.2.3 Schematic diagrams of different types of DC generator 1.2.4 Armature reaction 1.2.5 Commutation 1.2.6 Applications of D.C. generators	9
II	**D.C. Motors** 2.1 D.C. motor: Types of DC motors 2.1.1 Fleming's left hand rule 2.1.2 Principle of operation of Back e.m.f. and its significance 2.1.3 Voltage equation of DC motor 2.1.4 Torque and Speed; Armature torque, Shaft torque, BHP, Brake test, losses, efficiency	9

	2.2 DC motor starters: Necessity, two point and three point starters 2.3 Speed control of DC shunt and series motor: Flux and Armature control 2.4 Brushless DC Motor: Construction and working	
III	**Single Phase Transformers** 3.1 Types of transformers: Shell type and core type 3.2 Construction: Parts and functions 3.3 Materials used for different parts: CRGO, CRNGO, HRGO, amorphous cores 3.4 Transformer: Principle of operation 3.5 EMF equation of transformer: Derivation, Voltage transformation ratio 3.6 Significance of transformer ratings 3.7 Transformer No-load and on-load phasor diagram, Leakage reactance 3.8 Equivalent circuit of transformer: Equivalent resistance and reactance 3.9 Voltage regulation and Efficiency: Direct loading, OC/SC method, All day efficiency	10
IV	**Three Phase Transformers** 4.1 Bank of three single phase transformers,(Y-Y,Δ-Δ ,Δ-Y, Y- Δ) 4.2 Single unit of three phase transformer 4.3 Distribution and Power transformers: Construction and cooling, 4.4 Criteria for selection of distribution transformer, and power transformer. 4.5 Need of parallel operation of three phase transformer 4.6 Conditions for parallel operation. 4.7 Polarity tests on mutually inductive coils and single phase transformers 4.8 Polarity test, Phasing out test on Three-phase transformer	9
V	**Special Purpose Transformers** 5.1 Single phase and three phase autotransformers: Construction, working and applications. 5.2 Isolation transformer: Constructional Features and applications	8

REFERENCES:

1.	Electrical Machines, Vol-I, II, by G.C.Garg & P.S.Bimbhra, Khanna Book Publishing House, New Delhi.
2.	Basic Electrical Engineering by V.N. Mittle and Arvind. Mittle, McGraw Hill Education, New Delhi.
3.	Electrical Machines by D.P. Kothari, and I.J. Nagrath, McGraw Hill Education, NewDelhi.
4.	Electrical Machines by S.K. Bhattacharya, McGraw Hill Education, New Delhi.
5.	Principles of Electrical Machines by V.K. Mehta, and Rohit Mehta, ,S. Chand and Co.Ltd., New Delhi.
6.	Electrical Technology Vol-II (AC and DC machines) by B.L. Theraja, S. Chand and Co. Ltd., New Delhi.
7.	Electrical Machines Theory and Practice by M.N. Bandyopadhyay, PHI Learning Pvt. Ltd., New Delhi.
8.	DC Machines and Transformers by K. Murugesh Kumar.

TH:5- RENEWABLE ENERGY POWER PLANTS

L	T	P		Course Code: EEPC209	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		**: 45Hrs**	**Total Marks: 100**	**End Term Exam**	**: 70**
Tutorial		**: 0 Hrs.**		**Progressive Assessment**	**: 30**
Pre Requisite		**: Nil**			
Credit		**: 3**		**Category of Course : PC**	

RATIONALE:

The aim of this course is to help the student to attain industry-identified competency through various teaching learning experiences that will develop the ability to maintain the efficient operation of various types of renewable energy power plants.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Explain the construction and working principle of Solar PV and Concentrated Solar Power Plants.
- Describe the components and working principles of large and small Wind Power Plants
- Explain the construction and working principle of Micro-hydro Power Plants
- Discuss the properties of solid, liquid and gaseous fuels for biomass power plants
- Prepare layout for biomass-based Power Plants

DETAILED COURSE CONTENTS

Unit No	Topic/Sub-Topic	Allotted Time (Hours)
I	**Solar PV and Concentrated Solar Power Plants** 1.1 Solar Map of India: Global solar power radiation, Solar PV 1.2 Concentrated Solar Power (CSP) plants, construction and working of: Power Tower, Parabolic Trough, Parabolic Dish, Fresnel Reflectors 1.3 Solar Photovoltaic (PV) power plant: components layout, construction, working. Roof top solar PV power system	12

II	**Large Wind Power Plants** 2.1 Wind Map of India: Wind power density in watts per square meter Lift and drag principle; long path theory. 2.2 Geared type wind power plants: components, layout and working. Direct drive type wind power plants: components, layout and working. 2.3 Constant Speed Electric Generators: Squirrel Cage Induction Generators(SCIG), 2.4 Wound Rotor Induction Generator (WRIG); Variable Speed Electric Generators: Doubly-fed induction generator (DFIG), wound rotor synchronous generator (WRSG), permanent magnet synchronous generator (PMSG).	**12**
III	**Small Wind Turbines** 3.1 Horizon axis small wind turbine: direct drive type, components and working Horizontal axis small wind turbine: geared type, components and working 3.2 Vertical axis small wind turbine: direct drive and geared, components and Working Types of towers and installation of small wind turbines on rooftops and open fields. 3.3 Electric generators used in small wind power plants	**09**
IV	**Biomass-based Power Plants** 4.1 Properties of solid fuel for biomass power plants: bagasse, wood chips, rice husk, municipal waste 4.2 Properties of liquid and gaseous fuel for bio mass power plants: Jatropha, bio-diesel gobar gas 4.3 Layout of a Bio-chemical based (e.g. biogas) power plant: 4.4 Layout of a Thermo-chemical based (e.g. Municipal waste) power plant 4.5 Layout of a Agro-chemical based (e.g.bio-diesel) power plant	**12**

REFERENCES:

1.	Deambi, Suneel: From Sunlight to Electricity: a practical handbook on solar photo voltaic application; TERI, New Delhi ISBN:9788179935736
2.	David M. Buchla, Thomas E. Kissell, Thomas L. Floyd-Renewable Energy Systems, Pearson Education New Delhi ,ISBN:9789332586826,
3.	Rachel, Sthuthi; Earnest, Joshua–Wind Power Technologies, PHI Learning, NewDelhi, ISBN:978-93-88028-49-3; E-book978-93-88028-50-9
4.	Khoiyangbam, RS Navindu; Gupta and Sushil Kumar; Biogas Technology: Towards Sustainable Development; TERI, New Delhi; ISBN:9788179934043
5.	Gipe, Paul: Wind Energy Basics, Chelsea Green Publishing Co; ISBN:978-1603580304
6.	Wizelius, Tore; Earnest, Joshua –PHI Learning, New Delhi, ISBN:978-8120351660
7.	Kothari, D.P. et al: Renewable Energy Sources and Emerging Technologies, PHI Learning, New Delhi, ISBN:-978-81-203-4470-9
8.	Bhadra, S.N., Kastha, D., Banerjee, S, Wind Electrical Systems installation; Oxford University Press, NewDelhi,ISBN:9780195670936.
9.	O. P. Gupta, Energy Technology, Khanna Publishing House, New Delhi (ISBN:978-9386173-683)

PR:1- PROGRAMMING FOR PROBLEM SOLVING

L	T	P		
0	0	4		**Course Code: EEPC211**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 50**	End Term Exam 15
				Progressive Assessment 35
Pre Requisite		**: Nil**		
Credit		**2**		Category of Course : PC

RATIONALE:

This course is included in the curriculum to develop logical skills and basic programming skills of the students so that they will be able to solve basic computing problems. The students will learn the fundamentals of computer programming language using C Programming and MATLAB programming.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Illustrate problem solving using fundamentals of C programming language
- Apply appropriate Control structures to solve problems using C programming
- Demonstrate concept of Arrays and Strings in C programming language
- Apply user defined functions and pointers to solve problems using C programming
- Write simple programs to illustrate application of MATLAB programming in problem solving

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic
I	**C Programming:** History and importance of C, Basic structure of C program, executing a C program. Constants, Variable and Data Types: Introduction, Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning Values to Variables, Defining Symbolic Constants. Managing Input and Output Operations: Reading a Character, Writing a Character, Formatted Input, Formatted Output. Operators and Expressions: Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operator, Bitwise Operators, Special Operators, Arithmetic Expressions, Decision Making and Branching: Introduction, Decision Making with IF Statement, Simple IF Statement, the IF-ELSE Statement, Nesting of IF-ELSE Statements,

	Decision Making and Looping: Introduction, The while Statement, The do statement, The for statement, Arrays: One-dimensional Arrays, Declaration of One-dimensional Arrays, Initialization of One-dimensional Arrays, Two-dimensional Arrays, Declaration of Two-dimensional Arrays, Initialization of Two-dimensional Arrays, Simple Example programs- Sort, Matrix Multiplication, Transpose of a matrix. **Suggested list of programs for practice:** Write a C program 1. To display our College name twenty times on screen. 2. To display and add all even numbers from 1-100. 3. To find smallest / largest number from array elements. 4. To sort array elements in ascending / descending order. 5. To enter elements for 3X3 matrix and display them. 6. To calculate addition / subtraction of 2 dimensional matrix. 7. To calculate multiplication of 2 dimensional matrix. 8. To demonstrate output of standard library functions Strlen (), strcpy (), strcat (), strcmp (). 9. To calculate area of circle using function. 10. To calculate factorial of any given number using recursion. 11. To demonstrate call by reference, call by value To perform arithmetic functions on pointers.
II	**Introduction to MATLAB Programming:** Basics of MATLAB Programming, elementary features in a vector array, matrices, Eigen values and Eigen vectors, matrix operations, matrix operators, creating matrix arrangement, indexing array value, other operations, mathematical operations on array, array types, loops and execution of control, working with M-files, Scripts and functions, plotting and programming output, examples. Introduction to MATLAB Simulink, Simulink libraries
At least six (6) programs in C programming and four (4) programs in MATLAB.	

REFERENCES:

1.	Programming in C by Balgurusamy, Tata MGH
2.	E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
3.	Agam Kumar Tyagi, "MATLAB and Simulink for Engineers", OXFORD Higher Education.

PR:2- ELECTRICAL CIRCUITS LABORATORY

L	T	P		Course Code: EEPC213	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs	**Total Marks: 50**	End Term Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PC	

RATIONALE:

The aim of this course is to implement, test, and troubleshoot Electric Circuit problems using hardware and design/model for verification using MATLAB Simulink to understand the concept better.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Troubleshoot problems related to single phase A.C series circuits
- Troubleshoot problems related to single phase A.C parallel circuits
- Troubleshoot problems related to three phase circuits
- Use principles of circuit analysis to troubleshoot electric circuits.
- Apply network theorems to troubleshoot electric circuits

DETAILED COURSE CONTENTS

Sr. No.	List of experiments
1	Use voltmeter, ammeter, wattmeter to determine active, reactive and apparent power consumed in given R-L-C series circuit. Draw phasor diagram.
2.	Use variable frequency supply to create resonance in given series R-L-C circuit or by using variable inductor or variable capacitor.
3.	Use voltmeter, ammeter, wattmeter, p.f meter to determine current, p.f., active, reactive and apparent power for given R-L-C parallel circuit with series connection of resistor and inductor in parallel with capacitor.
4.	Use variable frequency supply create resonance in given parallel R-L-C circuit or by using variable inductor or capacitor
5.	Use voltmeter, ammeter, wattmeter, p.f meter to determine line and phase quantities of voltage and current for balanced three phase star and delta connected load and calculate active, reactive, and apparent power. Draw phasor diagram.
6.	Use voltmeter, ammeter to determine current through the given branch of a electric network by applying mesh analysis.

7.	Use voltmeter, ammeter to determine current through the given branch of a electric network by applying node analysis.
8.	Use voltmeter, ammeter to determine current through the given branch and voltage across the given element of circuit by applying superposition theorem.
9.	Use voltmeter, ammeter to determine equivalent circuit parameter in a given circuit by applying Thevenin's theorem
10.	Use voltmeter, ammeter to determine equivalent circuit parameter in a given circuit by applying Norton's theorem
11.	Use voltmeter, ammeter to determine load resistance for maximum power transfer for a given circuit by applying maximum power transfer theorem.
12.	Use the node-voltage method to solve a circuit that containing resistors and independent and dependent current sources and voltage sources is connected between non-reference nodes using Simulink Simscape
13.	Use the mesh-current method to solve a circuit for an arbitrary network containing resistors and independent and dependent voltage and current sources using Simulink Simscape
14.	Using Simulink, determine A.C voltage and current response in given R, L, C circuit.
15.	Using Simulink, create resonance in given series R-L-C circuit
16.	Verify network theorems(Superposition, Thevenin's, Norton's, Maximum power transfer) using Simulink Simscape
Atleast ten (10) experiments – Eight(8) using hardware and two(2) using MATLAB Simulink Any three experiments from serial number 1 to 5 , any five from serial number 06 to 11, any two from sl no 12 to sl no 16.	

REFERENCES:

1.	Same as in EEPC203
2.	Agam Kumar Tyagi, "MATLAB and Simulink for Engineers", OXFORD Higher Education.
3.	Dr. Shailendra Jain, "Modeling& Simulation using MATLAB – Simulink", Wiley – India.

PR:3- ELECTRICAL & ELECTRONIC MEASUREMENTS LABORATORY

L	T	P		Course Code: EEPC215	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		**: 60Hrs**	**Total Marks: 50**	**End Term Exam**	**15**
				Progressive Assessment	**35**
Pre Requisite		**: Nil**			
Credit		**2**		**Category of Course : PC**	

RATIONALE:

The Electrical & Electronics Measurements Laboratory is very important in the field of Electrical Engineering. This subject deals with the technique of measuring voltage, current and wattage by the indicating type of instruments. The technique of measurement of Electrical power in single phase and three phase circuits will be studied in this laboratory. Measurement of energy and calibration and adjustment of energy meters will also be studied under this subject. Prior to above the working principle construction of all type of measuring instruments like indicating, integrating and recording type will also be studied in this course.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Check the working of the electrical measuring instrument.
- Use different types of measuring instruments for measuring voltage and current.
- Use different types of measuring instruments for measuring electric power
- Use different types of measuring instruments for measuring electric energy.
- Use CRO for the Measurement of supply frequency in single-phase circuit

DETAILED COURSE CONTENTS

Sr. No.	Practical
1.	Identify measuring instruments on the basis of symbols on dial, type, accuracy, class position and scale
2.	Identify the components of PMMC and MI instruments.
3.	Extend range of ammeter and voltmeter by using (i) shunt and multiplier
4.	Use electro-dynamic watt-meter for measurement of power in a single phase circuit
5.	Use single three phase wattmeter for measurement of active and reactive power of three phase-balanced load.
6.	Use two wattmeters for measuring active power of three-phase balanced load.
7.	Calibrate single-phase electronic energy meter by direct loading.
8	Use Kelvin's double bridge for measurement of low resistance.
9.	Use voltmeter and ammeter method for measurement of medium resistance.

10.	Use Megger for insulation resistance measurements.
11.	Use earth tester for measurement of earth resistance.
12.	Use Tri-vector meter for measuring kW, kVAr and kVA of a power line.
13.	Study of Resolution and sensitivity of Digital Instrument
14.	Measure the unknown frequency and phase angle, using CRO by Lissajous figure.
At least ten (10) experiments to be performed by each student	

REFERENCES:

1.	A Text Book of Electrical Technology Vol-I (Basic Electrical Engg.) by B. L. Theraja, A. K. Theraja, S.Chand and Co. New Delhi.
2.	Basic Electrical Engineering by V. N. Mittle, Mc Graw-Hill New Delhi.
3.	Electrical Technology by Edward Hughes, Pearson Education, New Delhi.
4.	Electrical and Electronic Measurement and Instrumentation by R.K. Rajput, S.Chand and Co. New Delhi.
5.	Electrical and Electronics Measurements and Instrumentation by A.K. Sawhney, Dhanpai Rai and Sons, New Delhi.
6.	Electrical Measurements and Measuring Instruments by N.V. Suryanarayna, S.Chand and Co., New Delhi.

PR:4- DC MACHINES AND TRANSFORMERS LABORATORY

L	T	P		Course Code: EEPC217	
0	0	4			
Total Contact Hours				Practical Assessment	
Practical		: 60Hrs	Total Marks: 50	End Term Exam	15
				Progressive Assessment	35
Pre Requisite		: Nil			
Credit		2		Category of Course : PC	

RATIONALE:

The applications of d.c. machine in modern industries are still in practice. The Electrical Engineering Technicians has to look after the installation, operation and control of electrical machines. So the practical knowledge of "Electrical Machine" is very essential in this regard. This subject covers d.c. Generators, d.c. motors, single phase transformers, three phase transformers and special purpose transformers. The aim of this course is to help the student to use electric motors and transformers.

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LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Check the working of the electrical dc machines and transformers
- Maintain different types of DC generators.
- Maintain different types of DC motors.
- Maintain single-phase transformer.
- Maintain three phase transformers.
- Maintain different types of special purpose transformers used in different applications.

DETAILED COURSE CONTENTS

Sr. No.	List of experiments /Practical
1.	Dismantle a DC machine.
2.	Reverse the direction of rotation of the DC shunt motor.
3.	Control the speed of DC shunt motor by field flux and armature voltage control methods.
4.	Perform the brake test on DC series motor.
5.	Check the functioning of single phase transformer
6.	Determine regulation and efficiency of single phase transformer by direct loading
7.	Perform open circuit and short circuit test on single phase transformer to determine equivalent circuit constants, voltage regulation and efficiency
8.	Perform parallel operation of two single-phase transformers to determine the load current sharing.

9.	Perform polarity test on a single-phase transformer whose polarity markings are masked.
10.	Perform phasing out test on a three-phase transformer whose phase markings are masked.
11.	Connect the autotransformer in step-up and step-down modes noting the input/output readings.
12.	Test the pulse transformer.
Atleast ten (10) experiments to be performed by each student.	

REFERENCES:

1.	From Sunlight to Electricity: a practical handbook on solar photovoltaic application by Suneel Deambi, TERI, New Delhi.
2.	Renewable Energy Systems, Pearson Education by David M. Buchla, Thomas E. Kissell, Thomas L. Floyd, New Delhi.
3.	Wind Power Technologies by Sthuthi Rachel, Joshua Earnest, PHI Learning, New Delhi.
4.	Biogas Technology: Towards Sustainable Development by Khoiyangbam, R S Navindu; Gupta and Sushil Kumar; TERI, New Delhi.
5.	Wind Energy Basics by Paul, Gipe, Chelsea Green Publishing Co.
6.	Renewable Energy Sources and Emerging Technologies by D.P. Kothari, PHI Learning, New Delhi.
7.	Wind Electrical Systems installation by S.N. Bhadra, D. Kastha, S, Banerjee, Oxford University Press, New Delhi.
8.	Energy Technology by O.P. Gupta, Khanna Publishing House, New Delhi.

SUMMER INTERNSHIP – I

L	T	P		Course Code: SI201	
0	0	0			
Total Contact Hours				Internship Assessment	
Practical		0	Total Marks: 50	End Term Exam	15
				Progressive Assessment	35
Pre Requisite		: Nil			
Credits		2		Category of Course : SI	

Duration: 3-4 weeks during summer vacation after 2nd Semester.

RATIONALE

Summer Internship - I is to offer a structured and practical learning experience that prepares individuals for their future careers, helps them make informed career choices, and equips them with the skills and knowledge necessary to succeed in their chosen field. This course provides opportunities to students for hands-on industry experience.

LEARNING OUTCOMES

After completion of the course, the students will be able to:

- Apply theoretical knowledge gained in their academic coursework to real-world situations.
- Enhance specific skills relevant to their field.
- Gain hands-on experience in a professional network by interacting with mentors and industry professionals.
- Manage time effectively.
- Clarify career goals.

DETAILED COURSE CONTENTS

SUGGESTED ACTIVITIES:

I Orientation:

- Introduction to the organization's mission, values, and culture.
- Familiarization with workplace policies, procedures, and safety guidelines.
- Orientation to the team and organizational structure.

II Project-Based Learning:

- Description of the main project or tasks the intern will be working on during the internship.
- Detailed project goals and objectives.
- Training and guidance on project-specific tools, technologies, or methodologies.

III Technical and Skill Development:

- Training sessions or workshops to enhance technical skills relevant to the internship role (e.g., programming languages, software tools, laboratory techniques).
- Soft skills development, including communication, teamwork, problem solving, and time management

IV Mentorship and Supervision:

- Regular meetings with a designated mentor or supervisor for guidance, feedback, and support.
- Mentorship objectives and expectations.

V Professional Development:

- Sessions on professional etiquette, networking, and building a personal brand
- Resume writing and interview preparation workshops.

VI Industry and Field-Specific Knowledge:

- Lectures, seminars, or presentations on industry trends, best practices, and emerging technologies.
- Guest speakers from the field to share insights and experiences.

VII Reporting and Documentation:

- Training on how to document project progress, results, and findings.
- Practice in creating reports, presentations, or other deliverables.

VIII Ethics and Professionalism:

- Discussions on ethical considerations within the field.
- Scenarios and case studies related to ethical decision-making

IX Feedback and Evaluation:

- Regular performance evaluations and feedback sessions.
- Self-assessment and goal-setting exercises.

X Networking and Industry Exposure:

- Opportunities to attend industry conferences, webinars, or networking events.
- Encouragement to connect with professionals in the field.

NOTE

As per AICTE guidelines, in Summer Internship-I, students are required to be involved in Inter/ Intra Institutional Activities viz;

- Training with higher Institutions;
- Soft skill training organized by Training and Placement Cell of the respective institutions;
- contribution at incubation/ innovation /entrepreneurship cell of the institute;
- participation in conferences/ workshops/ competitions etc.;
- Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop;
- Working for consultancy/ research project within the institutes and
- Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

Suggested Online Link:

Web Links:

1.https://www.youtube.com/watch?v=LZP1StpYEPM

2.http://nptel.ac.in/courses/12110600/

3RD SEMESTER ELECTRICAL ENGINEERING

SUB:- PR:1- PROGRAMMING FOR PROBLEM SOLVING

SL.NO	NAME OF THE EXPERIMENT	APPARATUS REQUIED	QTY. NO
1	To display our College name twenty times on screen.	Turbo C++ Software	
2	To display and add all even numbers from 1-100.	Turbo C++ Software	
3	To find smallest / largest number from array elements.	Turbo C++ Software	
4	To sort array elements in ascending / descending order.	Turbo C++ Software	
5	To enter elements for 3X3 matrix and display them	Turbo C++ Software	
6	To calculate addition / subtraction of 2 dimensional matrix	Turbo C++ Software	
7	To calculate multiplication of 2 dimensional matrix.	Turbo C++ Software	
8	To demonstrate output of standard library functions Strlen (), strcpy (), strcat (), strcmp ()	Turbo C++ Software	
9	To calculate area of circle using function.	Turbo C++ Software	
10	To calculate factorial of any given number using recursion.	Turbo C++ Software	
11	To demonstrate call by reference, call by value To perform arithmetic functions on pointers.	Turbo C++ Software	
12	Introduction to MATLAB Programming	MATHWORK SOFTWARE	

SUB:- PR:2- ELECTRICAL CIRCUITS LABORATORY

SL. NO	NAME OF THE EXPERIMENT	APPARATUS REQUIED	QTY. NO
1	Use voltmeter, ammeter, wattmeter to determine active, reactive and apparent power consumed in given R-L-C series circuit. Draw phasor diagram.	1. Single phase variac(230/0-270 V AC) 2. LCR Trainer Kit 3. Digital Multimeter (0-750V,10A) 4. Wattmeter 5. LCR Meter 6. Coonecting Probe	1 1 3 1 1 10
2	Use variable frequency supply to create resonance in given series R-L-C circuit or by using variable inductor or variable capacitor.	**1.** Rheostat(0-220 ohm ,5A) 2.Capacitor 3. Inductor 4. Voltmeter(0-300V) 5. Ammeter (0-2A) 6. Auto Transformer	1 1 1 3 1 1
3	Use voltmeter, ammeter, wattmeter, p.f meter to determine current, p.f., active, reactive and apparent power for given R-L-C parallel circuit with series connection of resistor and inductor in parallel with capacitor	**1.** Rheostat(0-220 ohm ,5A) 2.Capacitor(100 micro F) 3. Inductor(30mH) 4. Voltmeter(0-300V) 5. Ammeter (0-5A) 6. Auto Transformer	1 1 1 3 1 1
4	Use variable frequency supply create resonance in given parallel R-L-C circuit or by using variable inductor or capacitor	**1.** Rheostat(0-220 ohm ,5A) 2.Capacitor(100 micro F) 3. Inductor(30mH) 4. Voltmeter(0-300V) 5. Ammeter (0-5A) 6. Autotransformer(0-300V,10A)	1 1 1 1 1 1
5	Use voltmeter, ammeter, wattmeter, p.f meter to determine line and phase quantities of voltage and current for balanced three phase star and delta connected load and calculate active, reactive, and apparent power. Draw phasor diagram.	**1.** Three phase variac 2.Three phase load) 3. Voltmeter 4. Ammeter 5. Wattmeter 6. Power Factor Meter	1 1 3 2 2 1
6	Use voltmeter, ammeter to determine current through the given branch of a electric network by applying mesh analysis.	1. Resistors 2. Ammeter 3. Voltage Source 4. Voltmeter	3 3 2 1
7	Use voltmeter, ammeter to determine current through the given branch of a electric network by applying node analysis.	1. Resistors 2. Ammeter 3. Voltage Source 4. Multimeter	3 3 2 1
8	Use voltmeter, ammeter to determine current through the given branch and voltage across the given element of circuit by applying superposition theorem.	1. Ammeter 2. Voltmeter 3. Rheostat 4. voltage source 5. Multimeter	3 1 3 2 1
9	Use voltmeter, ammeter to determine equivalent circuit parameter in a given circuit by applying Thevenin's theorem	1. Voltmeter 2. Rheostat 3. voltage source 4. Multimeter	1 3 2 1

10	Use voltmeter, ammeter to determine equivalent circuit parameter in a given circuit by applying Norton's theorem	1. Voltmeter 2. Rheostat 3. voltage source 4. Multimeter 5.Ammeter	1 3 2 1 1
11	Use voltmeter, ammeter to determine load resistance for maximum power transfer for a given circuit by applying maximum power transfer theorem.	1. Ammeter 2. Voltmeter 3. Rheostat	1 1 2
12	Use the node-voltage method to solve a circuit that containing resistors and independent and dependent current sources and voltage sources is connected between non-reference nodes using Simulink Simscape	Maths work software	
13	Use the mesh-current method to solve a circuit for an arbitrary network containing resistors and independent and dependent voltage and current sources using Simulink Simscape	Maths work software	
14	Using Simulink, determine A.C voltage and current response in given R, L, C circuit.	Maths work software	
15	Using Simulink, create resonance in given series R-L-C circuit	Maths work software	
16	Verify network theorems(Superposition, Thevenin's, Norton's, Maximum power transfer) using Simulink Simscape	Maths work software	

SUB:- PR:3- ELECTRICAL & ELECTRONIC MEASUREMENTS LABORATORY

SL. NO	NAME OF THE EXPERIMENT	APPARATUS REQUIED	QTY. NO
1	Identify measuring instruments on the basis of symbols on dial, type, accuracy, class position and scale	1. Ammeter(AC& DC) 2. Wattmeter 3. Volmeter(AC&DC) 4. Eneregy Meter 5. Frequency Meter 6. P.F Meter 7. Multimeter	1 1 1 1 1 1 1
2	Identify the components of PMMC and MI instruments.	1. PMMC Instrument 2. MI instrument 3. Standard symbols and construction chart 4. Magnifying Glass	1 1 1 1
3	Extend range of ammeter and voltmeter by using (i) shunt and multiplier	1. Resistance 2. Ammeter 3. Voltmeter	1 1 1
4	Use electro-dynamic watt-meter for measurement of power in a single phase circuit	1. Electro- Dynamic Wattmeter 2. Single phase AC supply(230v, 50HZ) 3.Ammeter 4. Voltmeter 5. single phase load 6. Rheostat 7. Power Factor meter	1 1 1 1 1 1 1 1
5	Use single three phase wattmeter for measurement of active and reactive power of three phase-balanced load.	1. 3 phase wattmeter 2. 3 phase Ac supply 3. 3- phase load 4. 3- phase variac 5. Ammeter(AC) 6. Voltmeter(AC) 7. Phse sequence Indicator 8. Switch/ MCB 9. Connecting Wire	1 1 1 1 1 1 1 1 1
6	Use two wattmeters for measuring active power of three-phase balanced load.	1. Two Wattmeters 2. Three phase load 3. Three phase Power Supply 4. Switch 5. voltmeter 6. ammeter 7. Connecting Wire	2 1 1 1 1 1
7	Calibrate single-phase electronic energy meter by direct loading.	1.Ammeter (0-5A) 2. Voltmeter0-150/300 volts 3. Wattmeter 0-500watt 4. Resistive Load bank, 5KW,230 V 5. Single phase energy meter	1 1 1 1 1
8	Use Kelvin's double bridge for measurement of low resistance.	1. Ammeter (0-5A) 2. Wattmeter0-150/300watt 3.Kelvin double bridge range-full Scale Resistance Range from 1.1111ohm to	1 1 1 1

		1.11110 Kohm. 4. Unknown resistance 5. Galvanometer	1 1
9	Use voltmeter and ammeter method for measurement of medium resistance.	1. Single phase Auto Transformer(5kva,0-270v) 2. Rheostat (0-80 ohm), 5A 3. Voltmeter 4. Ammeter 5. multimeter 6. Connecting Wire	1 1 1 1 1 1
10	Use Megger for insulation resistance measurements	1. Ammeter (0-5A) 2. Wattmeter0-150/300watt 3.Megger : Digital insulation tester 1000V,200ohm	1 1 1
11	Use earth tester for measurement of earth resistance.	1. Ammeter (0-5A) 2. Wattmeter0-150/300watt 3.Earth tester: 0-10/1000 ohms, 4 terminals 4.Megger : Digital insulation tester 1000v,200MQ 5. Connecting wires 6. Measuring Tape	1 1 1 1
12	Use Tri-vector meter for measuring kW, kVAr and kVA of a power line.	1. Tri vector Meter 2. Three –phase AC Power Supply 3. Three Phase Load(R,RL,RLC) 4. CT 5. PT 6. Conncting Wire 7. Main Switch	1 1 1 1 1 1 1
13	Study of Resolution and sensitivity of Digital Instrument	1. Digital VoltMeter 2. Multimeter 3. DC Power Supply 4. Resistance Box 5. Switch 6. Connecting Wire	1 1 1 1 1
14	Measure the unknown frequency and phase angle, using CRO by Lissajous figure.	1. CRO 2. Function Generator 3. Connecting Lead	1 2

SUB:- PR 4 :- DC MACHINES AND TRANSFORMERS LABORATORY

SL. NO	NAME OF THE EXPERIMENT	APPARATUS REQUIED	QTY. NO
1	Dismantle a DC machine.	1. DC Machine 2. Insulated Combination Plier 3. Screwdriver 4. Line Tester 5. Double Ended Spanner 6. Lamp 7. Multimeter 8. Megger 9. Connecting Wire	1 1 1 1 1 1 1 1
2	Reverse the direction of rotation of the DC shunt motor	1. DC Shunt Motor 2. 3- Phase Starter 3. Connecting Wire	1 1
3	Control the speed of DC shunt motor by field flux and armature voltage control methods.	1. AMMETER 2. Voltmeter 3. Rheostat 4. Tachometer 5. Connecting Wire	1 1 1 1
4	Perform the brake test on DC series motor	1. Ammeter 2. Voltmeter 3. Tachometer $. Connecting Wire	1 1 1
5	Check the functioning of single phase transformer	1. Single Phase Transformer 2. Ac Supply 3. Ammeter 4. Voltmeter 5. Wattmeter 6. Load Resistor Lamp &. Connecting Wire	1 1 1 1 1 1
6	Determine regulation and efficiency of single phase transformer by direct loading	1. Ammeter 2. Wattmeter 3. Voltmeter 4. Autotransformer 5. Resistive Load 6. Connecting Wire	1 1 1 1 1
7	Perform open circuit and short circuit test on single phase transformer to determine equivalent circuit constants, voltage regulation and efficiency	1. Single Phase Transformer 2. Ammeter 3. Voltmeter 4. Wattmeter 5. Connecting Wire	1 1 2 2
8	Perform parallel operation of two single-phase transformers to determine the load current sharing.	1. AMMETER 2. Voltmeter 3. Auto Transformere $. Connecting Wire	1 1 1
9	Perform polarity test on a single-phase transformer whose polarity markings are masked.	1. Single Phase Transformer 2. Ammeter 3. Voltmeter 4. Wattmeter 5. Connecting Wire	1 1 1 1

10	Perform phasing out test on a three-phase transformer whose phase markings are masked.	1. Single phase Ac Supplty 2. Voltmeter 3. Switch 4. Connecting Wire	1 1 1
11	Connect the autotransformer in step-up and step-down modes noting the input/output readings	1. Single Phase Autotransformer 2. Ac supply 3. Voltmeter 4. Multimeter 5. Load 6. Connecting Wire	1 1 1 1 1
12	Test the pulse transformer.	1. Pulse Generator 2. DC Power Supply 3. CRP 4. Load Resistor 5. Attenuator 6. connecting Wire	1 1 1 1 1

Final

DIPLOMA CURRICULUM OF ELECTRICAL ENGINEERING (SECOND YEAR) (4th Semester)

(To be implemented from 2025-26)

Prepared by;

National Institute of Technical Teachers' Training & Research Kolkata
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Vetted by:
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State Council for Technical Education & Vocational Training
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	Contents	Page No.
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PROGRAMME TITLE: ELECTRICAL ENGINEERING

SEMESTER - IV

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme				Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory		Practical			
					L	T	P	End Exam	Progressive Assessment	End Exam	Progressive Assessment		
1	Programme Core	EEPC202 TH:1	Fundamentals of Power Electronics		3	0	0	70	30	-	-	100	3
2		EEPC204 TH:2	Electric Power Transmission and Distribution	EEPC 201	3	0	0	70	30	-	-	100	3
3		EEPC206 TH:3	AC Machines and Special Electrical Machines	EEPC 207	3	0	0	70	30	-	-	100	3
4		EEPC208 PR:1	Power Electronics Laboratory		0	0	4			15	35	50	2
5		EEPC210 PR:2	AC machines and special electrical machines laboratory	EEPC 217	0	0	4			15	35	50	2
6	Programme Elective	EEPE202 (Any one) TH:4	(a) Electrical Testing and Commissioning (b) Linear Control Systems (c) Communication Technologies		3	0	0	70	30	-	-	100	3
7		EEPE204 (Any one) TH:5	(a) Sensors & Actuators' (b) Electrical Estimation and Contracting (c) Industrial Instrumentation and Condition Monitoring		3	0	0	70	30	-	-	100	3
8		EEPE206 (Any one) PR:3	(a) Electrical Estimation and Contracting Laboratory (b) Linear Control System Laboratory (c) Sensors & Actuators Laboratory (d) Electrical Testing and Commissioning Laboratory (e) Power System Simulation Laboratory		0	0	4	-	-	15	35	50	2
9	Minor Project	PR202 PR:4	MINOR PROJECT		0	0	4	-	-	30	70	100	2
10	Mandatory*	AU202	Essence of Indian knowledge and tradition		2	0	0	-	-	0	0	0	0
TOTAL					**17**	**0**	**16**	**350**	**150**	**75**	**175**	**750**	**23**

*All Audit (mandatory) courses will have assessment, but will have no credit.

The best of 2 IA conducted in a subject out of 20 marks to be considered. Assignment/ quiz etc. of 10 marks to be treated as part of IA. Besides this, Monthly Test to be conducted for each subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester. Club/Innovation/ Idea Tinkering Activities etc. shall be encouraged to be performed by students beyond the above stipulated hours.

SEMESTER - IV COURSES

TH:1- FUNDAMENTALS OF POWER ELECTRONICS

L	T	P		Course Code: EEPC202	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre-Requisite		**: Nil**			
Credit		**3**		Category of Course: PC	

RATIONALE:

Power Electronics is an interdisciplinary area using the thyristor family devices to control the ON and OFF processes of semiconductor switches and principles of control theory. The application area of power electronics can have two-sided development – one as the development of improved performance power semiconductor devices and the other side as development of control circuit of these devices. This course includs power electronic devices, thyristor family devices, turn-on and turn-off methods of thyristors, phase controlled rectifiers and industrial control circuits including SMPS and UPS.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Explain the operating principle of power electronic devices
- Select power electronic devices for specific applications
- Describe the turn-on and turn-off methods of thyristors
- Explain the operation and applications of phase-controlled rectifiers.
- Discuss the operating principle of industrial control circuits.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Power Electronic Devices** 1.1 Power electronic devices 1.2 Power transistor 1.2.1 construction and working principle 1.2.2 V-I characteristics and uses 1.3 IGBT 1.3.1 Construction and working principle 1.3.2 V-I characteristics and uses 1.4 Concept of single electron transistor (SET) 1.5 Aspects of Nano- technology(concept only)	10

II	**Thyristor Family Devices** 2.1 SCR 2.1.1 Construction of SCR 2.1.2 Two transistor analogy of SCR 2.1.3 Types, working and characteristics 2.1.4 SCR mounting and cooling 2.2 Types of Thyristors: SCR, LASCR, SCS, GTO, UJT, PUT, DIAC and TRIAC 2.3 Thyristor family devices 2.3.1 Symbol and construction 2.3.2 Operating principle 2.3.3 V-I characteristics 2.4 Protection circuits 2.4.1 Over-voltage 2.4.2 Over-current 2.4.3 Snubber 2.4.4 Crowbar	10
III	**Turn-on and Turn-off Methods of Thyristors** 3.1 SCR Turn-On methods 3.1.1 High Voltage thermal triggering, 3.1.2 Illumination triggering 3.1.3 dv/dt triggering 3.1.4 Gate triggering 3.2 Gate trigger circuits 3.2.1 Resistance and Resistance-Capacitance circuits 3.3 SCR triggering using UJT 3.4 PUT: Relaxation Oscillator and Synchronized UJT circuit 3.5 Pulse transformer and opto-coupler based triggering. 3.6 SCR Turn-Off methods: 3.6.1 Class A- Series resonant commutation circuit 3.6.2 Class B-Shunt Resonant commutation circuit 3.6.3 Class C-Complimentary Symmetry commutation circuit 3.6.4 Class D-Auxiliary commutation 3.6.5 Class E-External pulse commutation 3.6.6 Class F-Line or natural commutation	8
IV	**Phase Controlled Rectifiers** 4.1 Phase control: firing angle, conduction angle. 4.2 Single phase half controlled, full controlled and midpoint controlled rectifier with R, RL load 4.2.1 Circuit diagram, working, input- output waveforms, equations for DC output and effect of freewheeling diode 4.3 Different configurations of bridge controlled rectifiers: Full bridge, half bridge with common anode, common cathode, SCRs in one arm and diodes in another arm	10

V	**Industrial Control Circuits** 5.1 Applications: Burglar's alarm system, Battery charger using SCR, Emergency light system, Temperature controller using SCR and; Illumination control/fan speed control TRIAC 5.2 SMPS 5.3 UPS: Offline and Online 5.4 SCR based AC and DC circuit breakers.	7

REFERENCES:

1.	An Introduction to Thyristors and their applications by M. Ramamoorty, East-West Press Pvt. Ltd., New Delhi.
2.	Thyristors: Theory and Applications by Rajendra Kumar Sugandhi and Krishna Kumar Sugandhi, New Age International (P) ltd. Publishers, New Delhi.
3.	Fundamentals of Power Electronics by S.K. Bhattacharya, Vikas Publishing House Pvt. Ltd. Noida.
4.	Power Electronics and its Applications by Alok Jain, Penram International Publishing (India) Pvt. Ltd, Mumbai.
5.	Power Electronics Circuits Devices and Applications by Muhammad Rashid, Pearson Education India, Noida.
6.	Power Electronics by M. D Singh and K.B. Khanchandani, Tata McGraw Hill Publishing Co. Ltd, New Delhi.
7.	Industrial Electronics: A Text –Lab Manual by Paul B. Zbar, McGraw Hill Publishing Co. Ltd., New Delhi.
8.	SCR Manual by D.R. Grafham, General Electric Co.

TH:2- ELECTRIC POWER TRANSMISSION AND DISTRIBUTION

L	T	P		Course Code: EEPC204	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PC	

RATIONALE:

The electric power transmission and distribution subject covers basics of transmission and distribution, transmission line parameters and performance, extra high voltage transmission, a.c distribution system and different components of transmission and distribution line. The aim of this course is to help the student to maintain the proper functioning of the electrical transmission and distribution systems. The aim of this course is to help the student to maintain the proper functioning of the electrical transmission and distribution systems

LEARNING OBJECTIVES:

After completion of the course, the students will be able to

- Explain the basics of electrical power transmission and distribution
- Describe the transmission line parameters and performance of transmission line
- Explain the operation and applications of EHVAC and HVDC
- Discuss the a.c distribution system
- Explain different components of transmission and distribution line

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted time (Hours)
I	**Basics of Transmission and Distribution** 1.1 Single line diagrams with components of the electric supply transmission and distribution systems 1.2 Classification of transmission lines 1.3 Primary and secondary transmission 1.4 Standard voltage level used in India 1.5 Classification of transmission lines: based on type of voltage, voltage level, length and others 1.6 Characteristics of high voltage for power transmission 1.7 Method of construction of electric supply transmission system- 110 kV, 220 kV, 400 kV 1.8 Method of construction of electric supply distribution systems- 220 V, 400V, 11 kV, 33 kV	10

II	**Transmission Line Parameters and Performance** 2.1 Line Parameters: Concepts of R, L and C of line parameters and types of lines 2.2 Performance of short line: Efficiency, regulation and its derivation, effect of power factor, vector diagram for different power factor 2.3 Performance of medium line: representation, nominal 'T', nominal 'π' and end condenser methods 2.4 Transposition of conductors and its necessity 2.5 Skin effect and proximity effect	**9**
III	**Extra High Voltage Transmission** 3.1 Extra High Voltage AC (EHVAC) transmission line**:** Necessity, high voltage substation components such as transformers and other switchgears 3.1.1 Advantages, limitations and applications of EHVAC 3.1.2 EHVAC lines in India 3.2 Ferranti and Corona effect 3.3 High Voltage DC (HVDC) Transmission Line**:** Necessity components, advantages, limitations and applications 3.3.1 Layout of monopolar, bi-Polar and homo-polar transmission lines of HVDC 3.3.2 HVDC Lines in India 3.4 Features of EHVAC and HVDC transmission line 3.5 Flexible AC Transmission line: Features, types of FACTS controller 3.6 New trends in wireless transmission of electrical power	**9**
IV	**A.C Distribution System** 4.1 AC distribution: Components classification, requirements of an ideal distribution system, primary and secondary distribution system 4.2 Feeder and distributor, factors to be considered in design of feeder and distributor 4.3 Types of different distribution schemes: radial, ring, and grid, layout, advantages, disadvantages and applications 4.4 Voltage drop, sending end and receiving end voltage 4.5 Distribution Sub-Station: Classification, site selection, advantages, disadvantages and applications 4.6 Single Line diagram (layout) of 33/11KV Sub-Station, 11KV/400V sub-station 4.7 Symbols and functions of their components	9

V	**Components of Transmission and Distribution Line** 5.1 Overhead Conductors**:** Properties of material, types of conductor with trade names, significance of sag 5.2 Line supports: Requirements, types of line structures and their specifications, methods of erection 5.3 Line Insulators 5.3.1 Properties of insulating material 5.3.2 Selection of material 5.3.3 Types of insulators and their applications 5.3.4 Causes of insulator failure 5.3.5 Derivation of equation of string efficiency for string of three suspension insulator 5.3.6 Methods of improving string efficiency 5.4 Underground Cables**:** Requirements, classification, construction, comparison with overhead lines, cable laying and cable jointing.	**8**

REFERENCES:

1.	Utilization of Electric Power & Electric Traction by G.C. Garg, Khanna Book Publishing Co., New Delhi.
2.	Principles of Power System by V.K. Mehta, S. Chand and Co. New Delhi.
3.	A Course in Electrical Power by Soni; Gupta; Bhatnagar, Dhanpat Rai and Sons New Delhi.
4.	A Course in Power Systems by J.B. Gupta, S.K. Kataria and sons, New Delhi.
5.	A Textbook of Electrical Technology Vol. III, by B.L Theraja,.; A.K. Theraja, S.Chand and Co. New Delhi.
6.	A Course in Electrical Power by, S.L. Uppal,.Khanna Publisher New Delhi.
7.	Electrical Power Transmission and Distribution by S. Sivanagaraju; S. Satyanarayana, Pearson Education, New Delhi.
8.	Electrical Power System: A First Course by Ned Mohan, Wiley India Pvt. Ltd. New Delhi.
9.	Power System Analysis and Design by B.R. Gupta, S. Chand and Co. New Delhi.
10.	Electrical Power Distribution System by V. Kamraju, Tata McGraw-Hill, New Delhi.

TH:3- AC MACHINES AND SPECIAL ELECTRICAL MACHINES

L	T	P		Course Code: EEPC206	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: EEPC207**			
Credit		**3**		Category of Course: PC	

RATIONALE:

Presently single phase and three phase induction motors, synchronous machines and fractional horse power (FHP) motors are commonly used in modern industries. The Electrical Engineering Technicians has to look after the installation, operation and control of electrical machines in any industries. So the knowledge of electrical machine is very essential in this regard. This subject covers single phase induction motors, three phase induction motor, three phase alternators, synchronous motors and fractional horse power (FHP) motors. This subject deals with the working principles, operation of the above machines. The aim of this course is to help the student to maintain induction, synchronous and FHP machines used in different applications.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Explain the construction and working principle of single phase and three phase induction motors.
- Describe the Torque vs. Speed characteristics of single phase and three phase induction motors
- Explain the different methods of starting and speed control of induction motors
- Describe the construction and working principle of Synchronous Machine
- Explain the performance characteristics of Synchronous Machine
- Discuss the construction and working principle of Special types of motors

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted time (Hours)
I	**Three Phase Induction Motor** 1.1 Working principle: production of rotating magnetic field, Synchronous speed, rotor speed and slip 1.2 Constructional details of 3 phase induction motors: Squirrel cage induction motor and Slip ring induction motor 1.3 Rotor quantities: frequency, induced emf, power factor at starting and running condition 1.4 Characteristics of torque versus slip (speed), Torques: starting, full load and maximum with relations among them(numerical) 1.5 Induction motor as a generalized transformer with phasor diagram 1.6 Four quadrant operation, Power flow diagram(numerical) 1.7 Starters: need and types; stator resistance, auto transformer, star delta, rotor resistance and soft starters 1.8 Speed control methods: stator voltage, pole changing, rotor resistance and VVVF 1.9 Motor selection for different applications as per the load torque-	10

	speed requirements 1.10 Maintenance of three phase induction motors	
II	**Single phase Induction Motors** 2.1 Double field revolving theory 2.2 Principle of making single phase induction motors self-start 2.3 Construction and working of single phase induction motors 2.3.1 Resistance start induction run 2.3.2 Capacitor start induction run 2.3.3 Capacitor start capacitor run 2.3.4 Shaded pole 2.3.5 Repulsion type 2.3.6 Series motor 2.3.7 Universal motor 2.3.8 Hysteresis motor 2.4 Torque-speed characteristics for all of the above motors. 2.5 Motor selection for different applications as per the load torque-speed requirements 2.6 Maintenance of single phase induction motors	9
III	**Three phase Alternators** 3.1 Principle of working, moving and stationary armatures 3.2 Constructional details: parts and their functions 3.2.1 Rotor constructions 3.2.2 Windings: Single and Double layer 3.3 E.M.F. equation of an Alternator with numerical by considering short pitch factor and distribution factor 3.4 Alternator loading 3.4.1 Factors affecting the terminal voltage of alternator 3.4.2 Armature resistance and leakage reactance drops. 3.5 Armature reaction at various power factors and synchronous impedance 3.6 Voltage regulation: direct loading and synchronous impedance methods 3.7 Maintenance of alternators	9
IV	**Synchronous Motors** 4.1 Principle of working /operation, significance of load angle. 4.2 Torques: starting torque, running torque, pull in torque, pull out torque 4.3 Synchronous motor on load with constant excitation (numerical), effect of excitation at constant load (numerical). 4.4 Curves and Inverted V-Curves. 4.5 Hunting and Phase swinging. 4.6 Methods of Starting of Synchronous Motor 4.7 Losses in synchronous motors and efficiency (no numerical). 4.8 Applications areas	9
V	**Fractional horse power (FHP) Motors** 5.1 Construction and working 5.1.1 Synchronous Reluctance Motor 5.1.2 Switched Reluctance Motor 5.1.3 BLDC 5.1.4 Permanent Magnet Synchronous Motors 5.1.5 Stepper motors 5.1.6 AC and DC servomotors 5.2 Torque speed characteristics of above motors 5.3 Applications of above motors	8

REFERENCES:

1.	Electric Machines by P.S. Bimbhra, Khanna Book Publishing Co., New Delhi.
2.	Basic Electrical Engineering by V.N. Mittle and Arvind Mittle, McGraw Hill EducationNew Delhi.
3.	Electrical Machines by D. P. Kothari and I. J. Nagrath, McGraw Hill Education. New Delhi.
4.	Electrical Machines by S. K. Bhattacharya, McGraw Hill Education, New Delhi.
5.	Electrical Technology Vol-II (AC and DC machines) by B.L. Theraja, S.Chand and Co. Ltd., New Delhi.
6.	Special Purpose Electrical Machines by S. K, Sen, Khanna Publishers, New Delhi.
7.	Special Electrical Machines by E. G Janardanan, Prentice Hall India, New Delhi.
8.	Electrical Technology by E. Hughes, ELBS.
9.	Electrical Technology by H. Cotton, ELBS.

PR:1- POWER ELECTRONICS LABORATORY

L	T	P		Course Code: EEPC208	
0	0	4			
Total Contact Hours				Laboratory Assessment	
Practical		: 60Hrs	Total Marks: 50	End Exam	15
				Progressive Assessment	35
Pre Requisite		: Nil			
Credit		2		Category of Course: PC	

RATIONALE:

The aim of this course is that the students will get an opportunity to apply the knowledge acquired in the connected theory course and have the experiences, which will enable them to demonstrate essential technical skills needed as an Electrical engineer. This course supports student to maintain the proper functioning of power electronic devices.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Select power electronic devices for specific applications.
- Maintain the performance of Thyristors.
- Troubleshoot turn-on and turn-off circuits of Thyristors.
- Maintain phase controlled rectifiers.
- Maintain industrial control circuits.

DETAILED COURSE CONTENTS

Sl. No.	List of experiments / Practical
1	Test the proper functioning of power transistor.
2	Verify the VI characteristics of IGBT.
3	Verify the VI characteristics of DIAC to determine the break over voltage.
4	Verify the VI characteristics of SCR.
5	Test the variation of R, C in R and RC triggering circuits on firing angle of SCR.
6	Test the effect of variation of R, C in UJT triggering technique.
7	Perform the operation of Class – A, B, C, turn-off circuits.
8	Perform the operation of Class –D, E, F turn off circuits.
9	Use CRO to observe the output waveform of half wave-controlled rectifier with resistive load and determine the load voltage.
10	Draw the output waveform of Full-wave-controlled rectifier with R load, RL load, free-wheeling diode and determine the load voltage.
11	Determine the firing angle using DIAC and TRIAC phase-controlled circuit on output power under different loads such as lamp, motor or heater
12	Test the performance of given SMPS, UPS.

13	Troubleshoot the Burglar's alarm, Emergency light system, Speed control system, Temperature control system.

REFERENCES:

1	Ramamoorty M., An Introduction to Thyristors and their applications, East-West Press Pvt. Ltd.,New Delhi, ISBN: 8185336679.
2	Sugandhi, Rajendra Kumar and Sugandhi, Krishna Kumar, Thyristors: Theory and Applications, New Age International (P) ltd. Publishers, New Delhi, ISBN: 978-0-85226-852-0.
3	Bhattacharya, S.K., Fundamentals of Power Electronics, Vikas Publishing House Pvt. Ltd. Noida.ISBN: 978-8125918530.
4	Jain & Alok, Power Electronics and its Applications, Penram International Publishing (India)Pvt. Ltd, Mumbai, ISBN: 978-8187972228.
5	Rashid, Muhammad, Power Electronics Circuits Devices and Applications, Pearson EducationIndia, Noida, ISBN: 978-0133125900.
6	Singh, M. D. and Khanchandani, K.B., Power Electronics, Tata McGraw Hill Publishing Co. Ltd,New Delhi, 2008 ISBN: 9780070583894.
7	Zbar, Paul B., Industrial Electronics: A Text –Lab Manual, McGraw Hill Publishing Co. Ltd., New Delhi, ISBN: 978-0070728226.
8	Grafham D.R., SCR Manual, General Electric Co., ISBN: 978-0137967711

PR:2- AC MACHINES AND SPECIAL ELECTRICAL MACHINES LABORATORY

L	T	P		Course Code: EEPC210	
0	0	4			
Total Contact Hours				Laboratory Assessment	
Practical		: 60Hrs	Total Marks: 50	End Exam	15
				Progressive Assessment	35
Pre Requisite		: EEPC217			
Credit		2		Category of Course: PC	

RATIONALE:

Presently single phase and three phase induction motors, synchronous machines and fractional horse power (FHP) motors are commonly used in modern industries. The Electrical Engineering Technicians has to look after the installation, operation and control of electrical machines in any industries. So the knowledge of electrical machine is very essential in this regard. This subject covers single phase induction motors, three phase induction motor, three phase alternators, synchronous motors and fractional horse power (FHP) motors. This subject deals with the working principles, operation of the above machines. The aim of this course is to help the student to maintain induction, synchronous and FHP machines used in different applications.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Maintain three phase induction motor used in different applications
- Maintain single phase induction motor used in different applications
- Maintain three phase alternators used in different applications
- Maintain synchronous motors used in different applications
- Maintain FHP motors used in different applications

DETAILED COURSE CONTENTS

Sr. No.	List of Experiments /Practical
1.	Identify the different parts (along with function and materials) for the given single phase and three phase induction motor.
2.	Connect and run the three phase squirrel cage induction motors (in both directions) using the DOL, star-delta, auto-transformer starters (any two)
3.	Perform the direct load test on the three phase squirrel cage induction motor and plot the i) efficiency versus output, ii) power factor versus output, iii) power factor versus motor current and iv) torque – slip/speed characteristics
4.	Conduct the No-load and Blocked-rotor tests on given 3-f squirrel cage induction motor and determine the equivalent circuit parameters.
5.	Control the speed of the given three phase squirrel cage/slip ring induction motor using the applicable methods: i) auto-transformer, ii) VVVF.

6.	Conduct the direct load test to determine the efficiency and speed regulation for different loads on the given single phase induction motor; plot the efficiency and speed regulation curves with respect to the output power.
7.	Perform the direct loading test on the given three-phase alternator and determine the regulation and efficiency.
8.	Determine the regulation and efficiency of the given three phase alternator from OC and SC tests (Synchronous impedance method)
9.	Conduct the test on load or no load to plot the 'V' curves and inverted 'V' curves (at no-load) of 3-f synchronous motor.
10.	Dismantling and reassembling of single-phase motors used for ceiling fans, universal motor for mixer.
11.	Control the speed and reverse the direction of stepper motor
12.	Control the speed and reverse the direction of the AC servo motor
13.	Control the speed and reverse the direction of the DC servo motor

REFERENCES:

Same as EEPC206

PROGRAM ELECTIVE – I (Any One)

TH:4(A)- ELECTRICAL TESTING AND COMMISSIONING

L	T	P		Course Code: EEPE202(A)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PE	

RATIONALE:

The aim of this course is to help the student to attain the industry-identified competency through various teaching-learning experiences, which will enable them to follow standard safety procedures in testing and commissioning of electrical equipment.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Discuss safety procedures with respect to earthing and insulation of electrical equipment
- Identify proper tools, equipment, for installation, testing, maintenance of electrical machines and transformers
- Explain the process of testing and commissioning of electrical equipment in accordance with IS codes
- Discuss plans for troubleshooting electrical machines.
- Discuss regular preventive and breakdown maintenance.

COURSE CONTENT DETAILS:

Unit No.	Topic/Sub Topic	Allotted time (Hours)
I	**Electrical Safety and Insulation** Do's and don'ts regarding safety in domestic electrical appliances as well for substation/power station operators Electrical safety in industry/power stations/ substations at the time of operation/ control/ maintenance. Fire detection alarm, fire-fighting equipment. Factors affecting life of insulating materials, classifications of insulating materials as per IS:1271-1958 Measuring insulation resistance by different methods such as i) Polarization, ii) Dielectric absorption, iii) Megger Insulating oil - properties of insulating oil, causes of deterioration of oil, testing of transformer oil as per IS 1866-1961	9
II	**Installation and Erection** Concept of foundation for installation of machinery. Requirements of foundation for static and rotating electrical machinery.	9

	Concept of leveling and aligning Procedure for leveling and alignment of direct coupled drive, effects of misalignment Installation of transformer as per I.S.-1886-1967 and procedure of installation of transformer, Requirements of installation of pole mounted transformer Requirements of installation of rotating electrical machines as per I.S. 900 - 1965 Devices and tools required for loading, unloading, lifting, and carrying heavy equipment andprecautions to be taken while handling them	
III	**Testing and Commissioning** Concept of testing, Objectives of testing. Roles of I.S.S. in testing of electrical equipment, Types of tests: Routine tests, type tests, supplementary test, special tests, Methods oftesting - Direct/Indirect/Regenerative testing. Tolerances for the various items for equipment–transformer, induction motor, dc motor, synchronous machines Commissioning: Tests before Commissioning for transformer, induction motor, alternator. Testing of transformer as per I.S.1886- 1967 and I.S.2026- 1962 Testing of three-phase Induction motor as per I.S.325 - 1970. Testing of single- phase induction motor as per I.S.990-1965. Testing of synchronous machines as per ISS Testing of D.C. machines	9
IV	**Troubleshooting Plans** Internal and external causes for failure / abnormal operation of equipment. List of mechanical faults, electrical faults and magnetic faults in the electrical equipment, remedies, applications Use of tools like bearing puller, filler gauges, dial indicator, spirit level, megger, earth tester, and growler. Common troubles in electrical equipment and machines.	9
V	**Maintenance** Causes of failure of electrical machines Preventive maintenance-procedure or developing maintenance schedules for electrical machines. Factors affecting preventive maintenance schedules, Concept of TPM, Pillars of TPM Identification of different types of faults developed such as mechanical/ electrical/ magnetic faults	9

REFERENCES:

1	Deshpande. V. PHI Learning Pvt. Ltd., 2010, Design and Testing of Electrical Machines ISBN No8120336453, 9788120336452.
2	Rao, B V S Asia Club House, First Reprint, 2011, Operation and Maintenance of Electrical Equipment Vol-I, ISBN No 8185099022
3	Rosenberg. McGRAW-HILL, 1st Edition, May 2003, Maintenance and Repairs, ISBN No9780071396035
4	Sharotri, S. K. Glencoe/ Mcgraw- Hill; 2nd Edition, June 1969; Preventive Maintenance of Electrical Apparatus, ISBN No 10: 007030839X 13: 978-0070308398

TH:4(B)- LINEAR CONTROL SYSTEMS

L	T	P		Course Code: EEPE202(B)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PE	

RATIONALE:

This course shall introduce the fundamentals of modelling and control of Linear Time Invariant (LTI) systems; primarily from the classical viewpoint of Laplace transforms. The course will be useful for students to build foundations of time/frequency analysis of systems as well as the feedback control of such systems.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Express the basic elements and structures of feedback control systems
- Correlate the pole-zero configurations of transfer functions and their time-domain response
- Apply Routh-Hurwitz criterion, Root Locus, Bode Plot and Nyquist Plot to determine the stability of LTI systems
- Determine the steady-state response, errors of stable control systems
- Design compensators to achieve the desired performance

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub Topic	Allotted time (Hours)
I	**Introduction to Laplace Transform.** **Open loop and closed loop control systems:** Feedback principle, Transfer function of LTI systems-Mechanical and Electromechanical systems – Force voltage and force current analogy - block diagram representation - block diagram reduction - signal flow graph - Mason's gain formula - characteristic equation.	**9**
II	**Control system components:** DC and AC servo motors – synchro - gyroscope - stepper motor - Tacho generator. Time domain analysis of control systems: Transient and steady state responses - time domain specifications - first and second order systems step responses of first and second order systems.	**9**
III	**Error analysis:** Steady-state error analysis - static error coefficient of type 0, 1, 2 systems - Dynamic error coefficients. Concept of stability: Time response for various pole locations - stability of feedback system - Routh's stability criterion	**9**
IV	**Root locus and Polar plot:** General rules for constructing Root loci – stability from root loci - effect of addition of poles and zeros. Lag, Lead and Lead-Lag compensators, Nyquist stability criterion-Nichols chart - Non-minimum phase system - transportation lag.	**10**
V	**Frequency domain analysis:** Frequency domain specifications- Analysis based on Bode plot - Log magnitude vs. phase plot, State space model, State Transition matrix	**8**

REFERENCES:

1.	Control Systems Engineering by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers.
2.	Automatic Control Systems, by B. C. Kuo
3.	Modern Control Engineering by Katsuhiko Ogata Prentice Hall of India Pvt. Ltd.
4.	Imthias Ahamed T P, Control Systems, Phasor Books, 2016
5.	Control System Components; Gibson J. E., F. B. Tuteur and J. R. Ragazzini, , Tata McGraw Hill,
6.	Gopal M., Control Systems Principles and Design, Tata McGraw Hill,

TH:4(C)- COMMUNICATION TECHNOLOGIES

L	T	P		Course Code: EEPE202(C)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PE	

RATIONALE:

The aim of this course is to help the student to attain the industry-identified competency through various teaching learning experiences and enable them to use relevant data communication technique.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Identify the different types of data communication equipment and techniques.
- Use relevant digital modulation techniques.
- Interpret the specifications of the data communication media.
- Discuss maintenance of the fibre optics networks for data communication.
- Use OSI model and relevant data communication protocols.
- Discuss wireless network environment.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub Topic	Allotted time (Hours)
I	**Data Communication and Modulation** Block diagram of communication system **Types of communication system:** synchronous and asynchronous, simplex, half-duplex, Full duplex, serial and parallel communication **Classification of communication technique:** AM, FM, & PM on the basis of definition, waveform, bandwidth, modulation index **Modulation and demodulation:** Block diagram of AM, FM and PM **Pulse Modulation:** Block diagram for waveform generation of PAM, PWM& PPM, working principle, advantages, disadvantages and applications. Advantages of pulse modulation over AM and FM.	8
II	**Digital Modulation Techniques** **Digital Communication:** Block diagram and working principle, waveforms, strength and limitations. Sampling process Nyquist sampling theorem, quantization process, quantization error, quantization noise. **PCM:** Block diagram, working principle, waveforms, advantages, disadvantages, application of PCM. Principle of ASK, PSK, FSK. Application of ASK, PSK, FSK	8
III	**Data Communication Media** Baud rate, Bit rate, types of errors in data communication and error correction techniques. Types of communication media and frequency band of operation. **Guided media:** Types of cable-twisted pair cable, co-axial cable, fiber optic cable.	8

	Unguided media: Microwave communication, Infrared communication.	
IV	**Fibre Optics** Introduction to Fibre optic communication. Strength and limitations of fiber optic system **Light propagation:** reflection, refraction, Snell's law . **Light propagation through cable:** Mode of propagation, index profile **Fibre optic cables:** cable construction, fibre optics cable modes, single mode, step index fibre, multimode index fibre, multimode graded index fibre, fibre cable losses. **Light source and Detector:** Light emitting diode (LED), Photo Transistor, Laser diode, optocoupler.	**8**
V	**Data Communication Protocols and Interfacing Standard** OSI (Open Systems Interconnection) Reference model Introduction to protocol, FTP, SMTP, TCP/IP, UDP, LAN standards. Introduction to IEEE Standards for LAN and GPIB **RS-232 standard:** Introduction, and working principle Network topologies, introduction star, ring, tree, bus, mesh, hybrid Basic functions of networking devices: modem, switches, routers, repeaters, hubs, bridges, gateway.	**8**
VI	**Advanced Data Communication** Introduction to Wi-Fi and Wi- Max Bluetooth architecture and its layers, Universal serial bus (USB) architecture. Bluetooth and USB	**5**

REFERENCES:

1.	Wayne Tomasi, Electronic Communication System, Prentice Hall of India, ISBN 13:9780130494924
2.	Reynders D., Steve Macky, Wright Edvin, Practical Industrial Data Communications, Newnes publication, ISBN 10:07506639523
3.	Tanenbaum, Andrew S.David J. Wetherall , Computer Networks, Pearson; 5 edition ISBN 13:9788121924252
4.	Kumar A.,Text Book of Communication Engineering, Umesh Publication, ISBN 13:978818114160
5.	A. Kumar,D. Manjunath, Joy Kuri, Communication Networking, Academic Press Publication ISBN 13:9780124287518
6.	Hemant Kumar Garg, Soni Manish, Electronic Communication & Data Communication, UniversityBook House Private Ltd., ISBN 13:9788181980717

PROGRAM ELECTIVE – II (Any One)

TH:5(A)- SENSORS & ACTUATORS

L	T	P		Course Code: EEPE204(A)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PE	

RATIONALE:

The objective of this course is to understand basics of sensors, actuators and their operating principle. Also this course is to provide information about interfacing of sensors and signal conditioning circuits to establish any control system or monitoring system. The course will also provide knowledge about simulation and characterization of different sensors and finally the students will be able to select sensors for various applications.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Explain the characteristics of sensors and measurement
- Describe principles of various Sensors.
- Explain Pressure and level measuring elements
- Discuss Flow and temperature measuring elements:
- Select various types of actuators

DETAILED COURSE CONTENTS

Unit	Topic/Sub Topic	Allotted Time (Hours)
I	**Introduction to sensors and measurement.** 1.1 Overview of measurement systems: Definition of sensor, Difference between sensor, transmitter and transducer; Primary measuring element: selection, 1.2 static and dynamic characteristics: Range; Response time; Accuracy; Precision; Sensitivity; Dead band; Dead time; Signal transmission: 1.3 Types of signal: Pneumatic signal; Hydraulic signal; Electronic Signal. Standard signal ranges 1.4 Introduction of Electronic transmitter; Pneumatic transmitter; Smart transmitters.	**6**
II	**Principles of various Sensors:** 2.1 Classification of sensors. Characteristics and calibration of different sensors 2.2 Working Principle of Displacement, Position and Motion sensors, Limit switches, Proximity sensors, LVDT, strain gauge, Tacho- generator,. Encoders, Hall sensors, Distance sensors. Light Sensor. Accelerometer, Force, Torque, Tactile sensors, Load cells, Piezoelectric transducer. 2.3 Principle of Piezo Resistive Type; Variable Capacitive Type; Variable reluctance	**10**

	type sensors. Synchros and resolver	
III	**Pressure and level measuring elements:** 3.1 Bourden tube, Bellows; Diaphragm. 3.2 Application of Diaphragm: Capacitance Type, Reluctance Type, Strain Gauge Type and Inductive Type. 3.3 Application of Bellows: Electrical and Piezoelectric pressure transducers, 3.4 McLeod gage, Pirani gage and Ionisation gage. 3.5 Level sensors: Float type, Variable resistive type, Inductive type, Capacitive type.	**10**
IV	**Flow and temperature measuring elements:** 4.1 Flow sensors: Reynolds numbers; Types of Flow meters and principle of flow measurement: 4.2 Differential pressure type: orifices; venturi tubes; flow tubes; flow nozzles; pitot tubes; and Rotameter, Nutating disk & Rotary-vane types. 4.3 Velocity meters: Turbine; Vortex shedding; Electromagnetic and Mass flow meters, Anemometer, Ultrasonic flow meter. 4.4 Temperature sensors: Thermocouples, Thermistor, RTD, Pyrometer.	**10**
V	**Actuators :** 5.1 Definition and Example; selection; Types of Actuators; 5.2 Pneumatic actuator; Electro-Pneumatic actuator; cylinder, rotary actuators, Mechanical actuating system: 5.3 Hydraulic actuator; Control valves: Construction; Valve coefficient or valve sizing; valve characteristics; types of valves; valve selection. 5.4 Electrical actuating systems: Solid-state switches, Solenoids, Voice Coil; Electric Motors; Principle of operation and its application: D.C motors - AC motors - Single phase & 3 Phase Induction Motor; Synchronous Motor; Stepper motors - Piezoelectric Actuator.	**9**

REFERENCES:

1.	Patranabis.D - Sensors and Transducer, Wheeler publisher, 1994.
2.	Doeblin, E.O. – Measurement Systems: Application and Design, Mc Graw Hill International
3.	Murthy, D.V.S., Transducers and Instrumentation, PHI, New Delhi.
4.	Newbert, H. K. – Instrument Transducers, Oxford University Press.
5.	D Patranabis. Principles of Industrial Instrumentation, TMH

TH:5(B)- ELECTRICAL ESTIMATION AND CONTRACTING

L	T	P		Course Code: EEPE204(B)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PE	

RATIONALE:

Electrical installation plays a major role in distributing the electrical energy from electric utilities to consumers. Electrical diploma holders should work as technicians and supervisors for planning, installation and testing of various electrical wiring installations such as residential, commercial and industrial installation schemes. Therefore, the knowledge of electrical estimation and contracting is highly essential for electrical diploma engineers. This subject covers electric installation and safety, estimation and costing, non-industrial installations, industrial installations, public lighting installation, distribution lines and LT substation. The aim of this course is to help the student to design electrical installation with costing for tendering.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Explain the different types of electrical installation
- Illustrate different standard electrical symbols
- Explain different types of electrical wiring systems
- Prepare detail estimate for domestic building, sub-station, service line and distribution panel.
- Design various practical lighting schemes and LT substation

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted time (Hours)
I	**Electric Installation and Safety** 1.1 Scope and features of National electric code 2011 1.2 Types of electrical installation 1.3 Fundamental principles for electrical installation 1.4 Permit to work, safety instructions and safety practices 1.5 Purpose of estimating and costing	8

II	**Estimation and Costing** 2.1 Meaning and purpose of- Rough estimate 2.2 Detailed estimate 2.3 Supplementary estimate 2.4 Annual maintenance estimate and revised estimate 2.5 Factors to be considered while preparation of detailed estimate and economical execution of work 2.6 Contracts 2.6.1 Concepts of contracts 2.6.2 Types of contracts 2.6.3 Contractor 2.6.4 Role of contractor 2.7 Tenders and Quotations 2.7.1 Type of tender 2.7.2 Tender notice 2.7.3 Preparation of tender document, and method of opening of tender 2.7.4 Quotation 2.7.5 Quotation format 2.7.6 comparison between tender and quotation 2.8 Comparative statement 2.8.1 Format comparative statement 2.8.2 Order format 2.8.3 Placing of purchasing order 2.9 Principles of execution of works, planning, organizing and completion of work, Billing of work	10
III	**Non-Industrial Installations** 3.1 Types of Non-industrial installations-Office buildings, shopping and commercial centre, residential installation, Electric service and supply 3.2 Design consideration of electrical installation in commercial buildings 3.3 Design procedure of installation- steps involved in detail 3.4 Estimating and costing of unit 3.5 Earthing of commercial installation 3.6 Design electrical installation scheme of commercial complex. 3.7 Erection, Inspection and testing of installation as per NEC	9
IV	**Industrial Installation** 4.1 Classification of industrial buildings based on power consumption 4.2 Drawing of wiring diagram and single line diagram for single phase and three phase Motors. 4.3 Design consideration in industrial installations 4.4 Design procedure of installation-detailed steps 4.5 Design electrical installation scheme of factory/ small industrial unit 4.6 Preparation of material schedule and detailed estimation 4.7 Installation and estimation of agricultural pump and flourmill	9
V	**Public Lighting Installation** 5.1 Classification of outdoor installations streetlight/ public lighting installation 5.2 Street light pole structures 5.2.1 Selection of equipment 5.2.2 Sources used in street light installations. 5.3 Cables 5.3.1 Recommended types and sizes of cable 5.3.2 Control of street light installation 5.4 Design, estimation and costing of streetlight	9

REFERENCES:

1.	Electrical Design Estimating and Costing by K.B. Raina, S. K. Bhattacharya, New Age International Publisher.
2.	Electrical Estimating and Costing by Allagappan,, N. S. Ekambarram, Tata Mc-Graw Hill Publishing Co. Ltd.
3.	Electrical Estimating and Costing b. Singh, Surjit Ravi Deep Singh, Dhanpat Rai and Sons.
4.	A Course in Electrical Installation Estimating and Costing by J.B. Gupta, S.K. Kataria and Sons.
5.	Code of Practice for Electrical Wiring Installation, Bureau of Indian Standard. IS: 732-1989.
6.	National Electrical Code 2011, Bureau of Indian Standard. SP-30:2011.

TH:5(C)- INDUSTRIAL INSTRUMENTATION AND CONDITION MONITORING

L	T	P		Course Code: EEPE204(C)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		3		Category of Course: PE	

RATIONALE:

The aim of this course is to help the student to attain the industry-identified competency through various teaching learning experiences and enable them to use instrumentation equipment for condition monitoring and control.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Identify relevant instruments used for measuring electrical and non-electrical quantities.
- Identify relevant transducers/sensors for various applications.
- Discuss the use of relevant instruments for measuring non-electrical quantities.
- Explain checking of the signal conditioning and telemetry system for their proper functioning.
- Illustrate the use of data acquisition systems in various applications.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted time (Hours)
I	**Fundamentals of instrumentation** Basic purpose of instrumentation. Basic block diagram (transduction, signal conditioning, signal presentation) and their function. Construction, working and application of switching devices- Push button, limit switch, float switch, pressure switch, thermostat, electromagnetic relay.	4
II	**Transducers** Distinguish between Primary and Secondary, Electrical and Mechanical, Analog and Digital, Active and Passive. Mechanical devices pry. And sec. transducers Advantages of electric transducers Required characteristics of transducers. Factors affecting the choice of transducers Construction and principle of resistive transducer-Potentiometer –variac and strain gauges -No derivation. Only definition and formula for gauge factor Types of strain gauges like unbonded, bonded and semiconductor. Construction and principle of Inductive transducers-L.V.D.T. and R.V.D.T, their applications. Construction, principle and applications of transducers – Piezo-Electric transducer, photoconductive cells, photo voltaic cells.	8
III	**Measurement of Non-Electrical Quantities** **Temperature measurement** - Construction and Working of RTD, Thermistor and Thermocouple, radiation pyrometer, technical specifications and ranges. **Pressure measurement** – Construction and working of bourdon tube, bellow diaphragm and strain gauge, Combination of diaphragm and inductive transducer, Bourdon tube and LVDT, bellow and LVDT, diaphragm capacitance and bridge Circuit. Construction and Working of Speed Measurement by contacting and non-Contact Type- DC tachometer, photo- electric tachometer, toothed rotor tachometer Generator - magnetic pickup and Stroboscope. Construction and Working of Vibration measurement by accelerometer - LVDT accelerometer, Piezo electric type. Construction and Working of Flow measurement by electromagnetic and Turbine Flow meter. Construction and Working of Liquid level measurement by resistive, inductive, Capacitive gamma rays and Ultrasonic methods. Construction and Working of Thickness measurement by resistive, inductive, capacitive, ultrasonic and Nuclear methods.	10

IV	**Signal Conditioning** Basic Concept of signal conditioning System. Draw pin configuration of IC 741. Define Ideal OP-AMPand Electrical Characteristics of OP-AMP. Different Parameters of op-amp:-Input offset voltage, Input offset current, Input bias current, Differential input resistance, CMMR, SVRR, voltage gain, output voltage, slew rate, gain bandwidth. Output, short circuit current. Use of op-amp as inverting, non- inverting mode, adder, subtractor, and Working of Differential amplifier and instrumentation amplifier. Filters: Types of RC filters and frequency response -no derivation. Sample and hold circuits - operation and its application.	8
V	**Data Acquisition System** Generalized DAS- Block diagram and description of Transducer, signal conditioner, multiplexer, converter and recorder Draw Single Channel and Multi-channel DAS- Block diagram only. Difference between Signal Channel and Multi-Channel DAS. Data conversion- Construction and Working of Analog to digital conversion- successive approximation method, ramp type method. Digital to Analog conversion- Construction and Working of binary weighted resistance method. Concept and methods of data transmission of electrical and electronic transmission. Construction and principle of telemetry system and its type - Electrical telemetering system- Digital display device- operation and its application of seven segment display, dot matrix display and concept of 3½, 4½ digits, LED and LCD applications	8
VI	**Condition Monitoring and Diagnostic Analysis** Definition of condition monitoring Insulation deterioration Mechanism- factors affecting occurrence and rate of deterioration, types of stresses responsible for deterioration Different tests on transformer, their purpose, and the necessary condition of machine. Tests on Circuit breaker, purpose and required condition of machine Tests on CT, purpose, item to be tested and required condition of machine. Power factor, capacitance /tan delta test Insulation and Polarization index, DC winding resistance test, Turns Ratio test Tools and equipment used in Condition monitoring	7

REFERENCES:

1.	Sawhney, A.K. Electric and Electronic Measurement and instrumentation, Dhanpat Rai and Co. Author, Nineteenth revised edition 2011 reprint, 2014, ISBN:10: 8177001000
2.	2. Rangan, C.S. G.R.Sharma. andV.S.V.Mani, Instrumentation devices and system, Pen ram International Publishing India Pvt. Ltd. Fifth edition, ISBN:10: 0074633503
3.	3. Mehta, V.K. Electronics and instrumentation, Third edition-S.Chand and company Pvt Ltd Reprint, 2010, ISBN:81-219-2729-3
4.	4. Singh, S.K. Industrial instrumentation and control, Tata McGraw-Hill, 1987. ISBN: 007451914X, 9780074519141.
5.	5. J.G. Joshi, Electronic Measurement and Instrumentation, Khanna Publishing House, New Delhi (ISBN: 978-93-86173-621)

PROGRAM ELECTIVE – III(Any One)

PR:3(A)- ELECTRICAL ESTIMATION AND CONTRACTING LABORATORY

L	T	P		Course Code: EEPE206(A)	
0	0	4			
Total Contact Hours				Laboratory Assessment	
Practical		: 60Hrs	Total Marks: 50	End Exam	: 15
				Progressive Assessment	: 35
Pre Requisite		: Related PE Course			
Credit		: 2		Category of Course: PE	

RATIONALE:

Electrical installation plays a major role in distributing the electrical energy from electric utilities to consumers. Electrical diploma holders should work as technicians and supervisors for planning, installation and testing of various electrical wiring installations such as residential, commercial and industrial installation schemes. Therefore, the knowledge of electrical estimation and contracting is highly essential for electrical diploma engineers. This subject covers electric installation and safety, estimation and costing, non-industrial installations, industrial installations, public lighting installation, distribution lines and LT substation. The aim of this course is to help the student to design electrical installation with costing for tendering.

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LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Follow National Electrical Code 2011 in electrical installations
- Estimate the electrical installation works
- Estimate the work of non-industrial electrical installations
- Estimate the work of industrial electrical installations
- Prepare abstract, tender, quotation of public lighting and other installations
- Prepare abstract, tender, quotation of low tension (LT) substations

DETAILED COURSE CONTENTS

Sr. No.	List of Experiments / Activities
1.	Prepare a tender notice for purchasing a transformer of 200 KVA for commercial installation.
2.	Prepare a quotation for purchasing different electrical material required.
3.	Prepare a comparative statement for above material Prepare purchase order for the same.

4.	Design drawing, estimating and costing of hall / cinema theater / commercial installation. Prepare report and draw sheet.
5.	Design electrical installation scheme for any one factory / small industrial unit. Draw detailed wiring diagram. Prepare material schedule and detailed estimate. Prepare report and draw sheet.
6.	Estimate with a proposal of the electrical Installation of streetlight scheme for small premises after designing.
7.	Estimate with a proposal of the L.T. line installation. Prepare report and draw sheet.
8.	Estimate with a proposal of the 500 KVA, 11/0.433 KV outdoor substation and prepare a report

REFERENCES:

Same as EEPE 204(b)

PR:3(B)- LINEAR CONTROL SYSTEMS LABORATORY

L	T	P		
0	0	4		Course Code: EEPE206(B)
Total Contact Hours				Laboratory Assessment
Practical		: 60Hrs	Total Marks: 50	End Exam : 15
				Progressive Assessment : 35
Pre Requisite		: Related PE Course		
Credit		: 2		Category of Course: PE

RATIONALE:

Aim of this course is to provide hands-on experience in using the control system which are developed to learn the fundamental concepts of control systems and control system components. It will also enhance the learning experience of the students in topics encountered in Control Systems using MATLAB software

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Use MATLAB software to study control systems
- Analyze the response of control system by measuring relevant parameters
- Interpret the role of various components in control system
- Compare theoretical predictions with experimental results

DETAILED COURSE CONTENTS

Sr. No.	List of Experiments /Practical
1.	**Using hardware : Implement atleast any four(4)** 1. To study speed Torque characteristics of • AC servo motor • DC servomotor. 2. To study and demonstrate • Simple motor driven closed loop DC position control system. • Simple closed loop speed control system. 3. To study the lead, lag, lead-lag compensators and to draw their magnitude and phase plots. 4. To study behavior of 1st order, 2nd order type 0, type 1 system. • Step, ramp and Impulse response of first order systems. • Step, ramp and Impulse response of second order 5. To study • DC potentiometer as error detector. • Synchro transmitter/receiver

	6. To study temperature control system
2.	**Using software (Control System Toolbox), Implement atleast six(6)** 1. Different Toolboxes in software, 2. Introduction to Control Systems Toolbox. 3. Determine transpose, inverse values of given matrix. 4. Plot the pole-zero configuration in s-plane for the given transfer function. 5. Plot unit step response of given transfer function and find peak overshoot, peak time. 6. Plot unit step response and to find rise time and delay time. 7. Plot locus of given transfer function, locate closed loop poles for different values of k. 8. Plot root locus of given transfer function and to find out S, Wd, Wn at given root & to discuss stability. 9. Plot Nyquist plot and identify stability of a system. 10. Plot Bode plot and identify stability of a system

REFERENCES:

Same as EEPE202(b)

PR:3(C)- SENSORS & ACTUATORS LABORATORY

L	T	P		Course Code: EEPE206(C)	
0	0	4			
Total Contact Hours				Laboratory Assessment	
Practical		: 60Hrs	Total Marks: 50	End Exam	15
				Progressive Assessment	35
Pre Requisite		: Related PE Course			
Credit		2		Category of Course: PE	

RATIONALE:

Knowledge of sensors, are needed for self-realization of a system and actuators, as they are the way through which the control systems act upon the system. The objective of this lab is to impart practical knowledge and hands-on training to students on the characterization, calibration and applications of sensors and actuators.

LEARNING OUTCOMES:

After completion of this laboratory-oriented course, the students will be able to

- Set up testing strategies of different types of sensors and transducers
- Evaluate performance characteristics of sensors
- Show professional skills in applying the knowledge of sensors in real world
- Design a real-life Industrial instrumentation system.

DETAILED COURSE CONTENTS

Sr. No	List of Experiments / Practical
1	Experiment on Load cell
2	Experiment on LVDT, LVRT
3	Study the Characteristics of bourdon gauge
4	Experiment on capacitive level sensor
5	Experiment on RTD, Thermistor and thermocouple
6	Study the application of proximity sensor
7	Experiment on air quality sensors
8	Study the performance of Rotameter and Orifice meter
9	Study the characteristics of encoder fitted with DC motor
10	Study the operation of Synchro
11	Study the characteristics of Pneumatic and Electrically operated control valves
12	Experiment on pneumatic cylinder and direction control valve
13	Study the characteristics of servo motor and stepper motor

REFERENCES:

Same as EEPE204(a)

PR:3(D)- ELECTRICAL TESTING AND COMMISSIONING LABORATORY

L	T	P		Course Code: EEPE206(D)	
0	0	4			
Total Contact Hours				Laboratory Assessment	
Practical		: 60Hrs	Total Marks: 50	End Exam	15
				Progressive Assessment	35
Pre Requisite		: Related PE Course			
Credit		2		Category of Course: PE	

RATIONALE:

Electrical testing and commissioning plays a major role in healthy distribution of electrical energy from electric utilities to consumers. Electrical diploma holders should work as technicians and supervisors for planning, installation and testing of different electrical installations such as residential, commercial and industrial installation schemes. Consequently, the knowledge of electrical testing and commissioning is highly essential for electrical diploma engineers. This subject covers electrical safety and insulation, installation and erection, testing and commissioning, troubleshooting plans and maintenance. The aim of this course is to help the student to follow standard safety procedures in testing and commissioning of electrical equipment.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- State safety measures and safety precautions
- Follow safety procedures with respect to earthing and insulation of electrical equipment
- Select proper tools, equipment, for installation, testing, maintenance of electrical machines and transformers
- Commission electrical equipment in accordance with IS codes after testing
- Make plans for troubleshooting electrical machines
- Undertake regular preventive and breakdown maintenance

DETAILED COURSE CONTENTS

Sr. No.	List of Experiments / Practical
1.	Determine breakdown strength of transformer oil.
2.	Perform insulation resistance test on any one motor/transformer.
3.	Prepare trouble shooting charts for electrical machines such as Transformer, D.C. machines, Induction motor, and Synchronous machines
4.	Measure impedance voltage and load losses of three-phase transformer

5.	Find regulation and efficiency of single-phase transformer by direct loading and back-to-back connection method and compare the results.
6.	Determine efficiency of D.C. machine by Swinburne's test.
7.	Determine efficiency of D.C. machine by Hopkinson's test.
8.	Perform reduced voltage running up test on three-phase Induction motor as per I.S.325 -1967.
9.	Measure no load losses and no load current of a transformer as per IS.
10.	Perform no load test on single phase Induction motor for the measurements of no load current, power input, and speed at rated voltage as per I.S.
11.	Perform temperature rise test on single-phase transformer.
12.	Find efficiency of M.G. set

REFERENCES:

Same as EEPE202(a)

PR:3(E)- POWER SYSTEM SIMULATION LABORATORY

L	T	P		Course Code: EEPE206(E)	
0	0	4			
Total Contact Hours				**Laboratory Assessment**	
Practical		**: 60Hrs**	**Total Marks: 50**	**End Exam**	**15**
				Progressive Assessment	**35**
Pre Requisite		**: Nil**			
Credit		**2**		**Category of Course: PE**	

RATIONALE:

This course provides the students a simulated environment to understand and apply the relevant theoretical concepts. Hence, the theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the related industry-oriented competency.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Interpret the normal operation of the electric transmission and distribution systems.
- Maintain the functioning of the medium and high voltage transmission system.
- Interpret the parameters of the extra high voltage transmission system.
- Maintain the functioning of the low voltage AC distribution system.
- Maintain the components of the transmission and distribution lines.

DETAILED COURSE CONTENTS

Sr. No.	List of Experiments / Practical
1.	To study the Power System blocks in MATLAB
2.	To design short and long transmission line using MATLAB.
3.	To study and calculate the transmission line parameters.
4.	To study the corona loss in power distribution system.
5.	To study the proximity and skin effect.
6.	To find ABCD parameters of a model of transmission line.
7.	To study performance of a transmission line under no load condition and under load at different power factors.
8.	To observe the Ferranti effect in a model of transmission line.
9.	To study performance characteristics of typical DC distribution system in radial and ring main configuration
10.	To study mechanical design of transmission line.

REFERENCES:

Same as EEPC208

PR:4- MINOR PROJECT

L	T	P		Course Code: PR202	
0	0	4			
Total Contact Hours				Laboratory Assessment	
Practical		: 60Hrs	Total Marks: 100	End Exam	30
				Progressive Assessment	70
Pre Requisite		: Nil			
Credit		2		Category of Course: Project	

RATIONALE:

A Minor project generally requires a larger amount of effort and more independent work than that involved in a normal assignment. It requires students to undertake their own fact-finding and analysis. The students will select the topic, perform and design work. Minor project is as preparation for the students to take on more responsibilities and bigger project in the future. It is a learning experience, which aims to provide students with the opportunity to synthesize knowledge from different areas of learning, and critically and creatively apply it to real life situations. The leadership quality, co-ordination of job and maintaining good communal harmony is an important factor of this type of activity.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Plan a Minor Project
- Execute a Minor Project with team.
- Implement hardware/software/analytical/numerical techniques, etc. based on project requirements.
- Optimize time related works through sharing of work responsibility
- Develop cost awareness and utilization of fund.
- Prepare a technical report on the project.

GUIDELINES FOR MINOR PROJECT

- Minimum three and maximum five students can form a group for the minor project.
- Project type can include
  - Development of a simple prototype system/product.
  - Investigation of performance of some systems using experimental method
  - Analysis of components/systems/devices using suitable software
  - Investigation of optimum process/material for product development using market survey.
  - Solution for society/industry problems
- Project domain may not be limited to the specific area / discipline.
- Project report to be prepared and submitted by the students with following components:
  1. Title
  2. Objectives
  3. Relevance and significance
  4. Methodology
  5. Analysis-Simulation/experimentation/survey/testing etc.
  6. Result and Discussion
  7. Conclusion

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

L	T	P		Course Code: AU202	
2	0	0			
Total Contact Hours				Theory Assessment	
Theory		: 30Hrs	Total Marks: NA	End Term Exam	0
				Progressive Assessment*	0
Pre Requisite		: Nil			
Credit		0		Category of Course: Mandatory	

***Mandatory Audit Courses will be assessed only for confirmation of student learning without reflecting in the total scores or Credit.**

RATIONALE:

Considering the need of protecting Indian knowledge and tradition, the diploma level students of Automobile Engineering should be facilitated the concepts Indian traditional knowledge and to make them understand the importance of roots of knowledge system and methods of application in today's life and how to protect traditional knowledge system. Interpretation of the concepts of Intellectual property to protect the traditional knowledge as well as importance of Traditional knowledge in Agriculture and Medicine must be known.

COURSE OUTCOME:

On successful completion of the course, students will be able to:

- Discuss the concepts of traditional Indian knowledge and roots of knowledge system and indigenous knowledge system
- Explain the technique of protection of traditional Indian knowledge
- Discuss legal frameworks of traditional knowledge
- State intellectual property rights
- State traditional knowledge in Different Sectors

DETAILED COURSE CONTENTS

UNIT	TOPIC/SUB-TOPIC	Allotted HRS.
1	Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge (Unani / Siddha/ Ayurveda), Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge of Odisha	07
2	Protection of traditional knowledge (TK): The need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.	07
3	Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.	06
4	Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, Geographical Indications (GI).	04

5	Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK	06

REFERENCE BOOKS:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. "Knowledge Traditions and Practices of India" Kapil Kapoor.
3. Madhya Himalayi Sanskriti mein Gyan, Vigyan evam Paravigyan by Prof PC Pandey.

Suggested Online Link:

Web Links:
1.https://www.youtube.com/watch?v=LZP1StpYEPM
2.http://nptel.ac.in/courses/12110600/

4TH SEMESTER ELECTRICAL ENGG.

SUB:-POWER ELECTRONICS LAB. (PR-1)

SL NO.	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QTY
1.	. Test the proper functioning of power transistor.	1. CRO(0-20MHz) 2. Function Generator(1Hz-1MHz) 3. Resistor(1Kohm-100Kohm) 4. Transistor(BC107) 5. D.C Power Supply(0-30V) 6. Connecting wires 7. Bread Board	1No. 1No. 1No. 1No. 1No. As required 1No.
2.	Verify the VI characteristics of IGBT.	1. Characteristics Kit 2. Ammeter (0-500)mA 3. Voltmeter(0-50)V 4. RPS(0-30)V,2A	1 2 2 1
3.	Verify the VI characteristics of DIAC to determine the break over voltage.	1.DIAC KIT 2.Voltmeter (0-50V ,DC) 3.Ammeter(0-50mA,DC) 4.Ammeter(0-25 mA,DC) 5.Resister (100ohm) 6.Patch cards	1 1 1 1 2 As per required
4.	Verify the VI characteristics of SCR.	1. SCR KIT 2.Voltmeter (0-50V ,DC) 3.Ammeter(0-500mA,DC) 4.Ammeter(0-25 mA,DC) 5.Resister (100ohm) 6.Patch cards	1 1 1 1 1 As per required
5.	Test the variation of R, C in R and RC triggering circuits on firing angle of SCR.	1. Thyristor inbuilt kit (PECI4M121)(R,RC triggering circuit inbuilt) 2.DMM(AC/DC voltage /current measurements) 3.CRO(Monitoring device) 4. patch Cords(connecting medium)	1 1 1 3
6.	Test the effect of variation of R, C in UJT triggering technique.	1. Regulated power supply (0-30V DC) 2.UJT (2N2646) 3.Variable Capacitor(C1=100MICRO FARAD) 4.Resistors(R1=10k,1/4watt),(R2=500KOHM), (R3=150ohm,0.25 watt),(R4=27OHM,0.25 watt).	1 1 1 1 Each

7.	Perform the operation of Class – A, B, C, turn-off circuits	1.Regulated power supply(0-300/32V DC) 2.Dual Trace CRO (20MHz) 3.SCR(2N6394/TYN612) 4.Resistors(1KOHMor any) 5.Inductor(5mH or any) 6.Capacitor(1micro farad) 7. UJT triggering circuit	1 2 2 1 1 1 1
8.	Perform the operation of Class –D, E, F turn off circuits.	1.Power Supply(0-50Vdc,AC power supply) 2.Dual Trace CRO (20MHz) 3.SCR(2N6394/TYN612 or any) 4.Resistors 5.Inductor 6.Capacitor 7.UJT triggering circuit	1 2 2 1 1 1 1
9.	Use CRO to observe the output waveform of half wave-controlled rectifier with resistive load and determine the load voltage	1.CRO 2. HWR Circuit setup(including a diode or thyristor) 3.Resistor(load) 4.AC power supply 5.Multimeter	1 1 1 1
10.	Draw the output waveform of Full-wave-controlled rectifier with Rload, RL load, freewheeling diode and determine the load voltage.	1.Trainer Module 2.Multi-meters 3.CRO 4.Patch cords 5.Rheostat 6.Inductor	1 1 1 1 1 1
11.	Determine the firing angle using DIAC and TRIAC phase-controlled circuit on output power under different loads such as lamp, motor or heater.	1.TRIAC firing circuit trainer kits, 2. CRO 3.40W lamp load 4.CRO probes 5.Connecting wires	1 1 1 As per required
12.	Test the performance of given SMPS, UPS.	1.SMPS 2.UPS 3.Digital Multimeter 4.Digital Stopwatch 5.CRO(20MHz ,Dual Trace)	1 1 2 1 1
13.	Troubleshoot the Burglar's alarm, Emergency light system, Speed control system, Temperature control system.	1.Multimeter 2.Screwdriver set 3.Wire-stripper 4.Spare fuses 5. Thermal Camera /Thermocouple	2 2 2 2 1

SUB:- AC MACHINES AND SPECIAL ELECTRICAL MACHINES LABORATORY(PR-2)

SL NO.	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QTY
1.	Identify the different parts(along with function and materials) for the given single phase and three phase induction motor.	1.Single-phase squirrel cage induction motor 2.Three-phase squirrel cage induction motor 3.Insulated Screw-driver heavy duty 20cm 4.Insulated combination plier 20cm 5.Double ended and ring spanner sets. 6.Wooden Hammer(mallet) 7.Ballpeen Hammer 1/2kg 8.Cold Chisel 10cm.	1 1 1 2 2 2 2
2.	Connect and run the three phase squirrel cage induction motors (in both directions) using the DOL, star-delta, auto-transformer starters (any two)	1.Three-phase squirrel cage induction motor 7.5H.P. 2.Direct online starter 3.Star-Delta starter 4.TPIC(63AMP) 5.Voltmeter(0-500V) 6.Ammeter(0-100A) 7.Combination plier 15cm 8.Screw driver 30cm 9.P.v.C. WIRE 7/22 10.Hand Gloves 11. Wire stripper	1 1 1 1 1 1 2 2 As per required 1
3.	Perform the direct load test on the three phase squirrel cage induction motor and plot the i) efficiency versus output, ii) power factor versus output, iii) power factor versus motor current and iv) torque – slip/speed characteristics	1.Three-phase AC supply 2.Three-phase squirrel cage induction motor 3.spring balances 4.voltmeter(0-600V) 5.Ammeter(0-10A) 6.Wattmeter 7.Tachometer 8.Connecting Wires 9.fuses	1 1 1 1 1 1 1 1 1
4.	Conduct the No-load and Blocked-rotor tests on given 3-f squirrel cage induction motor and determine the equivalent circuit parameters.	1.Ammeter(0-10A) 2. Wattmeter (300v,10 Amp) 3. Voltmeter(0-300v) 4. Tachometer(0-10000rpm) 5. 3- phase squirrel cage I M 6. Variac 7. D.O.L Starter	1 2 1 1 1 1 1
5.	Control the speed of the given three phase squirrel cage/slip ring induction motor using the applicable methods: i) auto-transformer, ii) VVVF.	1. Slip Ring I M 2. Auto Transformer(3 phase) 3. Ammeter 4. Voltmeter 5. Wattmeter 6. Tachometer(0-10000rpm) 7. Connecting Wires 8. Load	1 1 1 1 1 1
6	Conduct the direct load test to determine the efficiency and speed regulation for different loads on the	1. 1- Phase Induction Motor 2. Ammeter 3. Voltmeter	1 1 1

	given single phase induction motor; plot the efficiency and speed regulation curves with respect to the output power	4. Wattmeter 5. Tachometer(0-10000rpm) 6. Connecting Wires 7. Auto Transformer(1- phase) 8. Load	1 1 1
7	Perform the direct loading test on the given three-phase alternator and determine the regulation and efficiency.	1. Ammeter 2. Voltmeter 3. Wattmeter 4. Tachometer(0-10000rpm) 5. Connecting Wires 6. Load	 1 1 1 1
8	Determine the regulation and efficiency of the given three phase alternator from OC and SC tests (Synchronous impedance method)	1. 3- phase Alternator 2. DC Motor 3. AC Ammeter 4. DC Ammeter 5. AC Voltmeter 6. DC Voltmeter 7. Rheostat 8. Connecting Wire	1 1 1 1 1 1 1
9	Conduct the test on load or no load to plot the 'V' curves and inverted 'V' curves (at no-load) of 3-f synchronous motor.	1. 3-Phase Synchronous Motor 2. Load 3.AC Ammeter 4. DC Ammeter 5. AC Voltmeter 6. DC Voltmeter 7. AC & Dc Power supply 8. Rheostat 9. Starter 10. Connecting Wires	1 1 1 1 1 1 1 1 1
10	Dismantling and reassembling of single-phase motors used for ceiling fans, universal motor for mixer	1. Screw Driver Set 2. Combination Plier 3. Wire stripper 4. Spanner Set 5. Hammer 6. Nose Pliers 7. Insulation Tape	1 1 1 1 1 1 1
11	Control the speed and reverse the direction of stepper motor	1. Stepper Motor 2. Microcontroller Unit 3. Motor Driver 4. Power Supply 5. switch	1 1 1 1 1
12	Control the speed and reverse the direction of the AC servo motor	1. AC Servo Motor 2. Controller 3. AC Power Supply 4. Feedback Device 5. Speed Controller input Device 6. Power Cable 7. Mcb or switch	1 1 1 1 1 1 1
13	Control the speed and reverse the direction of the DC servo motor	1. Dc Servo Motor 2. DC Servo drive 3. DC Power supply 4. Controller 5. Speed control device 6. Lonnecting lead 7. load	1 1 1 1 1 1 1

SUB:- PR 3 :- LINEAR CONTROL SYSTEM LABORATORY

SL.NO	NAME OF THE EXPERIMENT	APPARATUS REQUIED	QTY. NO
1. Using hardware : Implement atleast any four(4)			
	1.To study speed Torque characteristics of • AC servo motor • DC servomotor.	1. Servo Motor 2. DC servo Meter	
	2. To study and demonstrate • Simple motor driven closed loop DC position control system. • Simple closed loop speed control system.	DC Motor	
	3. To study the lead, lag, lead-lag compensators and to draw their magnitude and phase plots.	1. Passive Component 2. Function Generator 3. CRO	
	4. To study behavior of 1st order, 2nd order type 0, type 1 system. • Step, ramp and Impulse response of first order systems. • Step, ramp and Impulse response of second order	1. CRO 2. Function Generator 3. Power supply 4. patch cords	1 1 1 Few
	5. To study • DC potentiometer as error detector. • Synchro transmitter/receiver	1. Dc Potentiometer 2. Synchro transmitter/ receiver 3. Fuse / Mcb 4. Ac Supply	1 1 1 1
	6. To study temperature control system	1. Temperature sensor 2. temperature control trainer 3. power supply 4. Heating Element 5. Temperature Indicator 6. Control Unit 7. load 8. fuse/ mcb 9. connecting cable	1 1 1 1 1 1 1 1
2. Using software (Control System Toolbox), Implement atleast six(6)			
	1. Different Toolboxes in software,	MATH WORKS software	
	2. Introduction to Control Systems Toolbox.	MATH WORKS software	
	3. Determine transpose, inverse values of given matrix.	MATH WORKS software	
	4. Plot the pole-zero configuration in s-plane for the given transfer function.	MATH WORKS software	
	5. Plot unit step response of given transfer function and find peak overshoot, peak time.	MATH WORKS software	
	6. Plot unit step response and to find rise time and delay time.	MATH WORKS software	

	7. Plot locus of given transfer function, locate closed loop poles for different values of k.	MATH WORKS software	
	8. Plot root locus of given transfer function and to find out S, Wd, Wn at given root & to discuss stability.	MATH WORKS software	
	9. Plot Nyquist plot and identify stability of a system.	MATH WORKS software	
	10. Plot Bode plot and identify stability of a system.	MATH WORKS software	

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA									
TEACHING AND EVALUATION SCHEME FOR 5th Semester (Electrical)(wef 2020-21)									
Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Entrepreneurship and Management & Smart Technology	4		-	20	80	3	100
Th.2		Energy Conversion-II	4		-	20	80	3	100
Th.3		Digital Electronics & Microprocessor	5		-	20	80	3	100
Th.4		Utilization of Electrical Energy & Traction	4			20	80	3	100
Th.5		Power Electronics & PLC*	4			20	80	3	100
		Total	21			100	400	-	500
		Practical							
Pr.1		Electrical Machine Lab-II	-	-	6	25	50	3	75
Pr.2		Power Electronics & PLC Lab	-	-	3	25	50	3	75
Pr.3		Digital Electronics & Microprocessor Lab	-	-	3	25	50	3	75
Pr.4		Project Phase– I			3	25	-	-	25
		Student Centered Activities(SCA)		-	3	-	-	-	-
		Total	-	-	*18*	*100*	*150*	-	*250*
		Grand Total	**21**	**-**	**18**	**200**	**550**	**-**	**750**
Abbreviations: L-Lecturer, T-Tutorial, P-Practical. Each class is of minimum 55 minutes duration									
Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%									
SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM etc. Seminar and SCA shall be conducted in a section.									
There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester									

CURRICULLUM OF 5TH SEMESTER

For

DIPLOMA IN ELECTRICAL ENGINEERING

(Effective from 2020-21 Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

Th1. ENTREPRENEURSHIP and MANAGEMENT & SMART TECHNOLOGY

(Common to All Branches)

Theory	**4 Periods per week**	**Internal Assessment**	**20 Marks**
Total Periods	**60 Periods**	**End Sem Exam**	**80 Marks**
Examination	**3hours**	**Total Marks**	**100Marks**

Topic Wise Distribution of Periods

Sl No.	Topic	Periods
1	Entrepreneurship	10
2	Market Survey and Opportunity Identification(Business Planning)	8
3	Project report Preparation	4
4	Management Principles	5
5	Functional Areas of Management	10
6	Leadership and Motivation	6
7	Work Culture, TQM & Safety	5
8	Legislation	6
9	Smart Technology	6
	TOTAL	60

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students, so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mind set with managerial skill helps the student in the job market. The students can also be introduced with Startup and Smart Technology concept, which shall radically change the working environment in the coming days in the face of Industry 4.0

In this subject, the Students shall be introduced/ exposed to different concepts and Terminologies in brief only, so that he/she can have broad idea about different concepts/items taught in this subject. Solving numerical problem on any topic/item is beyond the scope of this subject.

OBJECTIVES

After undergoing this course, the students will be able to :

- Know about Entrepreneurship, Types of Industries and Startups
- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- know the management Principles and functional areas of management
- Inculcate leadership qualities to motivate self and others.
- Maintain and be a part of healthy work culture in an organisation.
- Use modern concepts like TQM
- Know the General Safety Rules
- Know about IOT and its Application in SMART Environment.

DETAILED CONTENTS

1. **Entrepreneurship**
   - Concept /Meaning of Entrepreneurship
   - Need of Entrepreneurship
   - Characteristics, Qualities and Types of entrepreneur, Functions
   - Barriers in entrepreneurship
   - Entrepreneurs vrs. Manager
   - Forms of Business Ownership: Sole proprietorship, partnership forms and others
   - Types of Industries, Concept of Start-ups
   - Entrepreneurial support agencies at National, State, District Level(Sources): DIC, NSIC,OSIC, SIDBI, NABARD, Commercial Banks, KVIC etc.
   - Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

2. **Market Survey and Opportunity Identification (Business Planning)**

   - Business Planning
   - SSI, Ancillary Units, Tiny Units, Service sector Units
   - Time schedule Plan, Agencies to be contacted for Project Implementation
   - Assessment of Demand and supply and Potential areas of Growth
   - Identifying Business Opportunity
   - Final Product selection

3. **Project report Preparation**

   - Preliminary project report
   - Detailed project report, Techno economic Feasibility
   - Project Viability

4. **Management Principles**
   - Definitions of management
   - Principles of management
   - Functions of management (planning, organising, staffing, directing and controlling etc.)
   - Level of Management in an Organisation

5. **Functional Areas of Management**
   a) Production management
      - Functions, Activities
      - Productivity
      - Quality control
      - Production Planning and control

   b) Inventory Management
      - Need for Inventory management
      - Models/Techniques of Inventory management

   c) Financial Management
      - Functions of Financial management
      - Management of Working capital
      - Costing (only concept)
      - Break even Analysis

- Brief idea about Accounting Terminologies: Book Keeping, Journal entry, Petty Cash book, P&L Accounts, Balance Sheets(only Concepts)

d) Marketing Management
- Concept of Marketing and Marketing Management
- Marketing Techniques (only concepts)
- Concept of 4P s (Price, Place, Product, Promotion)

e) Human Resource Management
- Functions of Personnel Management
- Manpower Planning, Recruitment, Sources of manpower, Selection process, Method of Testing, Methods of Training & Development, Payment of Wages

6. **Leadership and Motivation**

a) Leadership
- Definition and Need/Importance
- Qualities and functions of a leader
- Manager Vs Leader
- Style of Leadership (Autocratic, Democratic, Participative)

b) Motivation
- Definition and characteristics
- Importance of motivation
- Factors affecting motivation
- Theories of motivation (Maslow)
- Methods of Improving Motivation
- Importance of Communication in Business
- Types and Barriers of Communication

7. **Work Culture, TQM & Safety**

- Human relationship and Performance in Organization
- Relations with Peers, Superiors and Subordinates
- TQM concepts: Quality Policy, Quality Management, Quality system
- Accidents and Safety, Cause, preventive measures, General Safety Rules , Personal Protection Equipment(PPE)

8. **Legislation**

a) Intellectual Property Rights(IPR), Patents, Trademarks, Copyrights
b) Features of Factories Act 1948 with Amendment (only salient points)
c) Features of Payment of Wages Act 1936 (only salient points)

9. **Smart Technology**
- Concept of IOT, How IOT works
- Components of IOT, Characteristics of IOT, Categories of IOT
- Applications of IOT- Smart Cities, Smart Transportation, Smart Home, Smart Healthcare, Smart Industry, Smart Agriculture, Smart Energy Management etc.

Syllabus to be covered before IA: Chapter 1,2,3,4

RECOMMENDED BOOKS

1. Entrepreneurship Development and Management by R.K Singhal, Katson Books., New Delhi
2. Entrepreneurship Development and Management by U Saroj and V Mahendiratta, Abhishek Publications, Chandigarh
3. Entrepreneurship Development and Management by Vasant Desai, Himalaya Pub.House
4. Industrial Engineering and Management by O.P Khanna ,Dhanpat Rai and Sons
5. Industrial Engineering and Management by Banga and Sharma, Khanna Publications
6. Internet of Things by Jeeva Jose, Khanna Publications, New Delhi
7. Online Resource on Startups and other concepts
8. https://www.fundable.com/learn/resources/guides/startup

TH.2 ENERGY CONVERSION – II

Name of the Course: Diploma in Electrical Engineering			
Course code:	Th.2	Semester:	5th
Total Period:	60 Periods	Examination:	3 Hrs.
Theory periods:	4 P / Week	Internal Assessment:	20
Tutorial:	---	End Semester Examination:	80
Maximum marks:	100		

A. Rationale:

Modern industries are mostly equipped with AC machines. So the students are given a scope to gain the concepts of electrical machines like synchronous machines, 3-phase & 1- phase induction motors and fractional horse power motors and other special machines. The students are required to be familiar with constructional features, working principles, starting and speed control methods and performance characteristics with applications of the machines. Numerical solving makes the student to understand the feature more clearly.

B. Objectives:

After completion of this subject the student will be able:

1. To describe various parts, their material specification with suitable reasoning and working principle of synchronous machines, 3-phase & 1- phase AC motors and fractional horse power and other special machines.
2. To describe their operating principle and working characteristics, torque equation of three phase motors.
3. To describe the losses and efficiency of all machines.
4. To be familiar with starting and speed control of AC motors.
5. To develop problem solving ability on synchronous machines and 3-phase induction motor for better understanding about the concept of machines.
6. To be familiar with different testing methods carried out on such three phase machines.

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topics	Periods
1.	Alternator (Synchronous Generator)	14
2.	Synchronous Motor	08
3.	Induction motor	14
4.	Single Phase induction motor	08
5.	Commutator motors	06
6.	Special Electric Machine	05
7.	Three phase transformers	05
	Total	**60**

D. COURSE CONTENT:

1. ALTERNATOR:

1.1. Types of alternator and their constructional features.
1.2. Basic working principle of alternator and the relation between speed and frequency.
1.3. Terminology in armature winding and expressions for winding factors (Pitch factor, Distribution factor).
1.4. Explain harmonics, its causes and impact on winding factor.
1.5. E.M.F equation of alternator. (Solve numerical problems).
1.6. Explain Armature reaction and its effect on emf at different power factor of load.
1.7. The vector diagram of loaded alternator. (Solve numerical problems)
1.8. Testing of alternator (Solve numerical problems)
  1.8.1. Open circuit test.
  1.8.2. Short circuit test.
1.9. Determination of voltage regulation of Alternator by direct loading and synchronous impedance method. (Solve numerical problems)
1.10. Parallel operation of alternator using synchro-scope and dark & bright lamp method.
1.11. Explain distribution of load by parallel connected alternators.

2. SYNCHRONOUS MOTOR:

2.1. Constructional feature of Synchronous Motor.
2.2. Principles of operation, concept of load angle
2.3. Derive torque, power developed.
2.4. Effect of varying load with constant excitation.
2.5. Effect of varying excitation with constant load.
2.6. Power angle characteristics of cylindrical rotor motor.
2.7. Explain effect of excitation on Armature current and power factor.
2.8. Hunting in Synchronous Motor.
2.9. Function of Damper Bars in synchronous motor and generator.
2.10. Describe method of starting of Synchronous motor.
2.11. State application of synchronous motor.

3. THREE PHASE INDUCTION MOTOR:

3.1. Production of rotating magnetic field.
3.2. Constructional feature of Squirrel cage and Slip ring induction motors.
3.3. Working principles of operation of 3-phase Induction motor.
3.4. Define slip speed, slip and establish the relation of slip with rotor quantities.
3.5. Derive expression for torque during starting and running conditions and derive conditions for maximum torque. (solve numerical problems)

3.6. Torque-slip characteristics.
3.7. Derive relation between full load torque and starting torque etc. (solve numerical problems)
3.8. Establish the relations between Rotor Copper loss, Rotor output and Gross Torque and relationship of slip with rotor copper loss. (solve numerical problems)
3.9. Methods of starting and different types of starters used for three phase Induction motor.
3.10. Explain speed control by Voltage Control, Rotor resistance control, Pole changing, frequency control methods.
3.11. Plugging as applicable to three phase induction motor.
3.12. Describe different types of motor enclosures.
3.13. Explain principle of Induction Generator and state its applications.

4. SINGLE PHASE INDUCTION MOTOR:

4.1. Explain Ferrari's principle.
4.2. Explain double revolving field theory and Cross-field theory to analyze starting torque of 1-phase induction motor.
4.3. Explain Working principle, Torque speed characteristics, performance characteristics and application of following single phase motors.
    4.3.1. Split phase motor.
    4.3.2. Capacitor Start motor.
    4.3.3. Capacitor start, capacitor run motor.
    4.3.4. Permanent capacitor type motor.
    4.3.5. Shaded pole motor.
4.4. Explain the method to change the direction of rotation of above motors.

5. COMMUTATOR MOTORS:

5.1. Construction, working principle, running characteristic and application of single phase series motor.
5.2. Construction, working principle and application of Universal motors.
5.3. Working principle of Repulsion start Motor, Repulsion start Induction run motor, Repulsion Induction motor.

6. SPECIAL ELECTRICAL MACHINE:

6.1. Principle of Stepper motor.
6.2. Classification of Stepper motor.
6.3. Principle of variable reluctant stepper motor.
6.4. Principle of Permanent magnet stepper motor.
6.5. Principle of hybrid stepper motor.
6.6. Applications of Stepper motor.

7. THREE PHASE TRANSFORMERS:

7.1. Explain Grouping of winding, Advantages.
7.2. Explain parallel operation of the three phase transformers.
7.3. Explain tap changer (On/Off load tap changing)
7.4. Maintenance Schedule of Power Transformers.

Syllabus coverage up to Internal assessment

Chapters: 1, 2 and 3.

Learning Resources:			
Sl.No	**Title of the Book**	**Name of Author**	**Publisher**
1	Electrical Technology – II	B. L. Theraja and A. K. Theraja	S.Chand
2	A Textbook of Electrical Machines	K R Siddhapura, D B Raval	Vikas
3.	Electrical Technology	J. B. Gupta	S.K.Kataria and Sons
4.	Electric Machine	Ashfaq Husain	Dhanpat Rai and Sons
5.	Electrical Machine	S. K. Bhattarcharya	TMH
6.	Electrical Machines	D P Kothari, I J Nagrath	Mc Graw Hill

TH.3 DIGITAL ELECTRONICS & MICROPROCESSOR

Name of the Course: Diploma in Electrical Engineering			
Course code:	Th.3	Semester	5th
Total Period:	75	Examination	3 Hrs.
Theory periods:	5P / week	Internal Assessment:	20
Tutorial:	---	End Semester Examination:	80
Maximum marks:	100		

A. RATIONALE

The tremendous power and usefulness of digital electronics can be seen from the wide variety of industrial and consumer products, such as automated industrial machinery, computers, microprocessors, pocket calculators, digital watches and clocks, TV games, etc., Which are based on the principles of digital electronics? The years of applications of digital electronics have been increasing every day. In fact, digital systems have invaded all walks of life. This subject will very much helpful for student to understand clearly about the developmental concept of digital devices.

B. OBJECTIVES

On comprehend of the subject, the student will able to

1. Comprehend the systems and codes.
2. Familiar with logic gates.
3. Realize logic expressions using gates.
4. Construct and verify the operation of arithmetic & logic circuits
5. Understand and appreciate the relevance of combinational circuits.
6. Know various logic families & flops.
7. Architecture & different instructions of 8085 microprocessor.
8. Assembly language programs and write programs & functions of the interfacing chips like 8255, 8259, 8259 etc.

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topics	Periods
1	Basics Of Digital Electronics	15
2	Combinational Logic Circuits	15
3	Sequential Logic Circuits	15
4	8085 Microprocessor	20
5	Interfacing And Support Chips	10
	Total	**75**

D : **COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES**

1. BASICS OF DIGITAL ELECTRONICS

1.1 Binary, Octal, Hexadecimal number systems and compare with Decimal system.

1.2 Binary addition, subtraction, Multiplication and Division.
1.3 1‘s complement and 2‘s complement numbers for a binary number
1.4 Subtraction of binary numbers in 2‘s complement method.
1.5 Use of weighted and Un-weighted codes & write Binary equivalent number for a number in 8421, Excess-3 and Gray Code and vice-versa.
1.6 Importance of parity Bit.
1.7 Logic Gates: AND, OR, NOT, NAND, NOR and EX-OR gates with truth table.
1.8 Realize AND, OR, NOT operations using NAND, NOR gates.
1.9 Different postulates and De-Morgan‘s theorems in Boolean algebra.
1.10 Use Of Boolean Algebra For Simplification Of Logic Expression
1.11 Karnaugh Map For 2,3,4 Variable, Simplification Of SOP And POS Logic Expression Using K-Map.

2. COMBINATIONAL LOGIC CIRCUITS

2.1 Give the concept of combinational logic circuits.
2.2 Half adder circuit and verify its functionality using truth table.
2.3 Realize a Half-adder using NAND gates only and NOR gates only.
2.4 Full adder circuit and explain its operation with truth table.
2.5 Realize full-adder using two Half-adders and an OR – gate and write truth table
2.6 Full subtractor circuit and explain its operation with truth table.
2.7 Operation of 4 X 1 Multiplexers and 1 X 4 demultiplexer
2.8 Working of Binary-Decimal Encoder & 3 X 8 Decoder.
2.9 Working of Two bit magnitude comparator.

3. SEQUENTIAL LOGIC CIRCUITS

3.1 Give the idea of Sequential logic circuits.
3.2 State the necessity of clock and give the concept of level clocking and edge triggering,
3.3 Clocked SR flip flop with preset and clear inputs.
3.5 Construct level clocked JK flip flop using S-R flip-flop and explain with truth table
3.6 Concept of race around condition and study of master slave JK flip flop.
3.7 Give the truth tables of edge triggered D and T flip flops and draw their symbols.
3.8 Applications of flip flops.
3.9 Define modulus of a counter
3.10 4-bit asynchronous counter and its timing diagram.
3.11 Asynchronous decade counter.
3.12 4-bit synchronous counter.
3.13 Distinguish between synchronous and asynchronous counters.
3.14 State the need for a Register and list the four types of registers.
3.15 Working of SISO, SIPO, PISO, PIPO Register with truth table using flip flop.

4. 8085 MICROPROCESSOR

4.1 Introduction to Microprocessors, Microcomputers
4.2 Architecture of Intel 8085A Microprocessor and description of each block.
4.3 Pin diagram and description.
4.4 Stack, Stack pointer & stack top
4.5 Interrupts
4.6 Opcode & Operand,
4.7 Differentiate between one byte, two byte & three byte instruction with example.
4.8 Instruction set of 8085 example
4.9 Addressing mode
4 .10 Fetch Cycle, Machine Cycle, Instruction Cycle, T-State
4.11 Timing Diagram for memory read, memory write, I/O read, I/O write
4.12 Timing Diagram for 8085 instruction
4.13 Counter and time delay.
4. 14 Simple assembly language programming of 8085.

5. INTERFACING AND SUPPORT CHIPS

5.1 Basic Interfacing Concepts, Memory mapping & I/O mapping
5.2 Functional block diagram and description of each block of Programmable peripheral interface Intel 8255 ,
5.3 Application using 8255: Seven segment LED display, Square wave generator, Traffic light Controller

Syllabus coverage up to Internal assessment

Chapters: 1,2 and 3

Learning Resources:			
Sl. No.	**Title of the Book**	**Name of Authors**	**Name of Publisher**
1	Fundamental of Digital Electronics	Ananda Kumar	PHI
2	Digital Electronics – Principal & Application	S. K. Mondal	TMH
3	Digital Electronics	B. R. Gupta & V. Singhal	S. K. Kateria
4	Digital Electronics	P. Raja	SciTech
5	Microprocessor Architecture programming & Application with 8085	R.S Gaonkar	Peneram
6	Fundamentals of Microprocessor & Micro Computers	B.Ram	Dhanpat rai
7	Microprocessor and Inter facing	Sunetra Choudhury & S. P. Chowdhury	Scitech

TH.4 UTILIZATION OF ELECTRICAL ENERGY & TRACTION

Name of the Course: Diploma in Electrical Engineering			
Course code:	Th.4	Semester:	5th
Total Period:	60 Periods	Examination:	3 Hrs.
Theory periods:	4 P / Week	Internal Assessment:	20
Tutorial:	---	End Semester Examination:	80
Maximum marks:	100		

A. Rationale:

There is great demand for utilization of electrical power in various fields in the form of power for electrolysis, illumination, electrical heating, electrical welding, electrical traction and for electrical drives. Hence these aspects are taken care of, in the subject of utilization of electrical energy and traction to give exposure of the student.

B. Objectives:

The subject will facilitate the student :

1. To acquire knowledge of principle of ionic dissociation and electrolysis and loss involving in the process, usage of this process.
2. To acquire knowledge of types of electrical heating as employed in the electrical oven, induction furnaces and arc furnaces and dielectrically ovens.
3. To acquire knowledge of principle of arc welding and resistant welding,
4. To define various terms used in illumination engineering to design lighting schemes with specific attention to laws of illumination to explain the working and construction and use of fluorescent lamp, SV lamp, H.P. MV, Neon lamps and energy saving lamps.
5. To classify various types of industrial drives and their application.
6. To classify various methods of traction and traction motor with their control and types of braking.

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topics	Periods
1.	Electrolytic Process	08
2.	Electrical Heating.	08
3.	Principles of Arc Welding.	08
4.	Illumination.	12
5.	Industrial Drives.	10
6.	Electric Traction.	14
	TOTAL	**60**

D. COURSE CONTENTS:

1. ELECTROLYTIC PROCESS:

1.1. Definition and Basic principle of Electro Deposition.
1.2. Important terms regarding electrolysis.
1.3. Faradays Laws of Electrolysis.
1.4. Definitions of current efficiency, Energy efficiency.
1.5. Principle of Electro Deposition.
1.6. Factors affecting the amount of Electro Deposition.
1.7. Factors governing the electro deposition.
1.8. State simple example of extraction of metals.
1.9. Application of Electrolysis.

2. ELECTRICAL HEATING:

2.1. Advantages of electrical heating.
2.2. Mode of heat transfer and Stephen's Law.
2.3. Principle of Resistance heating. (Direct resistance and indirect resistance heating.)
2.4. Discuss working principle of direct arc furnace and indirect arc furnace.
2.5. Principle of Induction heating.
    2.5.1. Working principle of direct core type, vertical core type and indirect core type Induction furnace.
    2.5.2. Principle of coreless induction furnace and skin effect.
2.6. Principle of dielectric heating and its application.
2.7. Principle of Microwave heating and its application.

3. PRINCIPLES OF ARC WELDING:

3.1. Explain principle of arc welding.
3.2. Discuss D. C. & A. C. Arc phenomena.
3.3. D.C. & A. C. arc welding plants of single and multi-operation type.
3.4. Types of arc welding.
3.5. Explain principles of resistance welding.
3.6. Descriptive study of different resistance welding methods.

4. ILLUMINATION:

4.1. Nature of Radiation and its spectrum.
4.2. Terms used in Illuminations. [Lumen, Luminous intensity, Intensity of illumination, MHCP, MSCP, MHSCP, Solid angle, Brightness, Luminous efficiency.]
4.3. Explain the inverse square law and the cosine law.
4.4. Explain polar curves.
4.5. Describe light distribution and control. Explain related definitions like maintenance factor and depreciation factors.
4.6. Design simple lighting schemes and depreciation factor.
4.7. Constructional feature and working of Filament lamps, effect of variation of voltage

on working of filament lamps.

4.8. Explain Discharge lamps.
4.9. State Basic idea about excitation in gas discharge lamps.
4.10. State constructional factures and operation of Fluorescent lamp. (PL and PLL Lamps)
4.11. Sodium vapor lamps.
4.12. High pressure mercury vapor lamps.
4.13. Neon sign lamps.
4.14. High lumen output & low consumption fluorescent lamps.

5. INDUSTRIAL DRIVES:

5.1. State group and individual drive.
5.2. Method of choice of electric drives.
5.3. Explain starting and running characteristics of DC and AC motor.
5.4. State Application of:
  5.4.1. DC motor.
  5.4.2. 3-phase induction motor.
  5.4.3. 3 phase synchronous motors.
  5.4.4. Single phase induction, series motor, universal motor and repulsion motor.

6. ELECTRIC TRACTION:

6.1. Explain system of traction.
6.2. System of Track electrification.
6.3. Running Characteristics of DC and AC traction motor.
6.4. Explain control of motor:
  6.4.1. Tapped field control.
  6.4.2. Rheostatic control.
  6.4.3. Series parallel control.
  6.4.4. Multi-unit control.
  6.4.5. Metadyne control.
6.5. Explain Braking of the following types:
  6.5.1. Regenerative Braking.
  6.5.2. Braking with 1-phase series motor.
  6.5.3. Magnetic Braking.

Syllabus coverage up to Internal assessment

Chapters: 1, 2, 3 and 4.

Learning Resources:			
Sl.No	***Title of the Book***	***Name of Authors***	***Name of the Publisher***
1.	*Utilization of Electrical Energy by Traction*	*G. C. Garg*	*Khanna Publisher*
2.	*Utilization of Electrical Energy*	*E. I. Taylor*	*TMH*
3.	*A Text book on Power system Engineering*	*Soni, Gupta and Bhatnagar*	*Dhanpat Rai & Sons*

TH.5 POWER ELECTRONICS AND PLC

Name of the Course: Diploma in Electrical Engineering			
Course code:	Th.5	Semester:	5th
Total Period:	60 Periods	Examination:	3 Hrs
Theory periods:	4 P / Week	Internal Assessment:	20
Tutorial:	-	End Semester Examination:	80
Maximum marks:	100		

A. Rationale:

The development of high power semiconductor devices has facilitated electronic control techniques for electrical power control in a simple, economic and efficient manner. Thus a new area of power electronics has now emerged which replaced the old and bulky method of power control through the use of small electronic devices. Power electronics application has occupied an indispensible position in industrial applications like heating, welding, uninterrupted power supply, battery charging etc. Industrial drives, lighting control are most efficiently controlled by power electronics devices to achieve optimum performance. The objective of this paper is to familiar students with the principles and operations of Power electronics devices in Industrial applications with drives control.

B. Objectives:

After completion of this subject the student will be able to:

1. Understand construction, working principle & application of various power electronics devices.
2. Know different gate triggering circuits and commutation methods.
3. Understand working principle of phase controlled rectifier.
4. Know the types and working principle of inverter.
5. Understand working principle and voltage control of chopper.
6. Understand frequency variation using Cyclo-converter.
7. Understand control principle of AC & DC industrial drive.
8. Know different application of SCR / Thyristor.
9. Concept in PLC & its Programming

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topics	Periods
1.	Understand The Construction And Working Of Power Electronic Devices	18
2.	Understand The Working Of Converters, Ac Regulators And Choppers.	12
3.	Understand The Inverters And Cyclo-Converters	08
4.	Understand Applications Of Power Electronic Circuits	10
5.	PLC And Its Applications	12
	Total	**60**

D. COURSE CONTENT:

1. UNDERSTAND THE CONSTRUCTION AND WORKING OF POWER ELECTRONIC DEVICES

1.1 Construction, Operation, V-I characteristics & application of power diode, SCR, DIAC,TRIAC, Power MOSFET,GTO &IGBT
1.2 Two transistor analogy of SCR.
1.3 Gate characteristics of SCR.
1.4 Switching characteristic of SCR during turn on and turn off.
1.5 Turn on methods of SCR.
1.6 Turn off methods of SCR (Line commutation and Forced commutation)
  1.6.1 Load Commutation
  1.6.2 Resonant pulse commutation
1.7 Voltage and Current ratings of SCR.
1.8 Protection of SCR
  1.8.1 Over voltage protection
  1.8.2 Over current protection
  1.8.3 Gate protection
1.9 Firing Circuits
  1.9.1 General layout diagram of firing circuit
  1.9.2 R firing circuits
  1.9.3 R-C firing circuit
  1.9.4 UJT pulse trigger circuit
  1.9.5 Synchronous triggering (Ramp Triggering)
1.10 Design of Snubber Circuits

2. UNDERSTAND THE WORKING OF CONVERTERS, AC REGULATORS AND CHOPPERS.

2.1 Controlled rectifiers Techniques(Phase Angle, Extinction Angle control), Single quadrant semi converter, two quadrant full converter and dual Converter
2.2 Working of single-phase half wave controlled converter with Resistive and R-L loads.
2.3 Understand need of freewheeling diode.
2.4 Working of single phase fully controlled converter with resistive and R- L loads.
2.5 Working of three-phase half wave controlled converter with Resistive load
2.6 Working of three phase fully controlled converter with resistive load.
2.7 Working of single phase AC regulator.
2.8 Working principle of step up & step down chopper.
2.9 Control modes of chopper
2.10 Operation of chopper in all four quadrants.

3. UNDERSTAND THE INVERTERS AND CYCLO-CONVERTERS

3.1 Classify inverters.
3.2 Explain the working of series inverter.
3.3 Explain the working of parallel inverter
3.4 Explain the working of single-phase bridge inverter.

3.5 Explain the basic principle of Cyclo-converter.
3.6 Explain the working of single-phase step up & step down Cyclo-converter.
3.7 Applications of Cyclo-converter.

4. UNDERSTAND APPLICATIONS OF POWER ELECTRONIC CIRCUITS

4.1 List applications of power electronic circuits.
4.2 List the factors affecting the speed of DC Motors.
4.3 Speed control for DC Shunt motor using converter.
4.4 Speed control for DC Shunt motor using chopper.
4.5 List the factors affecting speed of the AC Motors.
4.6 Speed control of Induction Motor by using AC voltage regulator.
4.7 Speed control of induction motor by using converters and inverters (V/F control).
4.8 Working of UPS with block diagram.
4.9 Battery charger circuit using SCR with the help of a diagram.
4.10 Basic Switched mode power supply (SMPS) - explain its working & applications

5. PLC AND ITS APPLICATIONS

5.1 Introduction of Programmable Logic Controller(PLC)
5.2 Advantages of PLC
5.3 Different parts of PLC by drawing the Block diagram and purpose of each part of PLC.
5.4 Applications of PLC
5.5 Ladder diagram
5.6 Description of contacts and coils in the following states
i)Normally open ii) Normally closed iii) Energized output iv)latched Output v) branching
5.7 Ladder diagrams for i) AND gate ii) OR gate and iii) NOT gate.
5.8 Ladder diagrams for combination circuits using NAND,NOR, AND, OR and NOT
5.9 Timers-i)T ON ii) T OFF and iii)Retentive timer
5.10 Counters-CTU, CTD
5.11 Ladder diagrams using Timers and counters
5.12 PLC Instruction set
5.13 Ladder diagrams for following
(i) DOL starter and STAR-DELTA starter (ii) Stair case lighting (iii) Traffic light Control (iv) Temperature Controller
5.14 Special control systems- Basics DCS & SCADA systems
5.15 Computer Control–Data Acquisition, Direct Digital Control System (Basics only)

Syllabus coverage up to Internal assessment

Chapters: 1 and 2.

Learning Resources:			
Sl.No	***Title of the Book***	***Name of Authors***	***Name of the Publisher***
1.	*Power Electronics*	*Dr. P. S. Bhimbhra*	*Khanna Publisher*
2.	*Modern Power Electronics*	*B.K.Bose*	*PHI Publisher*

	and AC Drives		
3.	*Power Electronics*	*M. D. Singh and K.B Khanchandani*	*TMH*
4.	*Power Electronics*	*M H Rashid*	PHI Publisher
5.	*Power Electronics*	*P C Sen*	*TMH*
6.	*Power Electronics*	*N Mohan*	*Willey (India)*
7.	*Programmable logic Controllers*	*Frank D. Petruzela*	TMH
8.	*Programme logic controller*	*Dr.M.Mitra&Dr.S.Sengupta*	*Penram*

Pr.1 ELECTRICAL MACHINE LAB-II

Name of the Course: Diploma in Electrical Engineering			
Course code:	Pr.1	Semester	5th
Total Period:	90	Examination	3 hrs
Lab. periods:	6 P / week	Term Work	25
Maximum marks:	75	End Semester Examination:	50

A. RATIONALE:

The sole objective of the subject is to be familiar with machines and different parts. To perform practice of the experiments and become fit to meet the challenges in practical implementation.

In the beginning the faculties have to illustrate all the tools and instruments required/ used in conducting the experiments.

B. OBJECTIVES:

After completion of this Laboratory the student will be able to:

1. To be familiar with constructional features of 3-phase and 1-phase AC machines.
2. Starting, Speed control of 3-phase and 1-phase motors.
3. To determine efficiency, regulations of different machines.
4. To draw and study performance characteristics.
5. To be familiar with relays used in power system.

C. LIST OF EXPERIMENTS:

1. Study of (Manual and Semi automatic) Direct on Line starter, Star-Delta starter, connection and running a 3-phase Induction motor and measurement of starting current.
2. Study of (Manual and Semi automatic) Auto transformer starter and rotor resistance starter connection and running a 3-phase induction motor and measurement of starting current.
3. Study and Practice of connection & Reverse the direction of rotation of Three Phase Induction motor.
4. Study and Practice of connection & Reverse the direction of rotation of Single Phase Induction motor.
5. Heat run test of 3-phase transformer.
6. OC and SC test of alternator and determination of regulation by synchronous impedance method.
7. Determination of regulation of alternator by direct loading.
8. Parallel operation of two alternators and study load sharing.
9. Measurement of power of a 3-phase Load using two wattmeter method and

verification of the result using one 3-phase wattmeter.

10. Connection of 3-phase energy meter to a 3-phase load.
11. Study of an O.C.B.
12. Study of induction type over current / reverse power relay.
13. Study of Buchholz's relay.
14. Study of an earth fault relay.

Pr.2 POWER ELECTRONICS & PLC LAB

Name of the Course: Diploma in Electrical Engineering			
Course code:	Pr.2	Semester	5th
Total Period:	45	Examination	3 hrs
Lab. periods:	3 P / week	Term Work	25
Maximum marks:	75	End Semester Examination:	50

A. RATIONALE: The sole objective of the subject is to be familiar with solid state devices used in power system. To perform experiments for determining the characteristics of components and become fit to meet the challenges in practical implementation.

B. OBJECTIVE:

After completion of this laboratory the student will be able to:

1. Determine characteristic of semiconductor devices.
2. Develop ability to design drive circuit for above.
3. Design low voltage power circuit to be used in electronics circuit.

C. LIST OF EXPERIMENTS

(I) Power Electronics

1. Study of switching characteristics of a power transistor.
2. Study of V-I characteristics of SCR.
3. Study of V-I characteristics of TRIAC.
4. Study of V-I characteristics of DIAC.
5. Study of drive circuit for SCR & TRIAC using DIAC.
6. Study of drive circuit for SCR & TRIAC using UJT.
7. To study phase controlled bridge rectifier using resistive load.
8. To study series Inverter.
9. Study of voltage source Inverter.
10. To perform the speed control of DC motor using Chopper.
11. To study single-phase Cyclo-converter

(II) PLC Programming

1. Introduction/Familiarization PLC Trainer & its Installation with PC
   (a) Learn the basics and hardware components of PLC
   (b) Understand configuration of PLC system
   (c) Study various building blocks of PLC
   (d) Determine the No. of digital I/O & Analog I/O
2. Execute the different Ladder Diagrams
   (a) Demonstrate PLC and Ladder diagram-Preparation downloading and running
   (b) Execute Ladder diagrams for different Logical Gates
   (c) Execute Ladder diagrams using timers & counters
3. Execute the Ladder Diagrams with model applications
   (i) DOL starter (ii)Star- Delta starter
4. Execute Ladder diagrams with model applications (i) Stair case lighting (ii) Traffic light controller

Pr.3 DIGITAL ELECTRONICS & MICROPROCESSOR LAB

Name of the Course: Diploma in Electrical Engineering			
Course code:	Pr.3	Semester	5th
Total Period:	45	Examination	3 hrs
Lab. periods:	3 P / week	Term Work	25
Maximum marks:	75	End Semester Examination:	50

A.RATIONALE

In this practical work students knowledge about the Digital systems will be reinforced. They will become capable of developing and implementing Digital Circuits. They will also be able to acquire skills of operating A/D and D/A converters, counters and display system.

B. OBJECTIVE

On completion of the Lab course the student will able to

1. Understand and comprehended the simple the Digital design Circuits.
2. Assembly Language Program using 8085 instruction
3. Application of 8085 using interfacing

C.COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES

(I) Digital Electronics

1. Verify truth tables of AND, OR, NOT, NOR, NAND, XOR, XNOR gates.
2. Implement various gates by using universal properties of NAND & NOR gates and verify truth table.
3. Implement half adder and Full adder using logic gates.
4. Implement half subtractor and Full subtractor using logic gates.
5. Implement a 4-bit Binary to Gray code converter.
6. Implement a Single bit digital comparator.
7. Study Multiplexer and demultiplexer.
8. Study of flip-flops.
   i) S-R flip flop ii) J-K flip flop iii) flip flop iv) T flip flop
9. Realize a 4-bit asynchronous UP/Down counter with a control for up/down counting.
10. Realize a 4-bit synchronous UP/Down counter with a control for up/down counting.
11. Implement Mode-10 asynchronous counters.
12. Study shift registers.

(II) Microprocessor

(A) General Programming using 8085A development board

1. a. 1'S Complement. b. 2'S Complement.
2. a. Addition of 8-bit number. b. Subtraction of 8-bit number resulting 8/16 bit number.
3. a. Decimal Addition 8-bit number. b. Decimal Subtraction 8-bit number
3. a. Compare between two numbers. b. Find the largest in an Array
5. Block Transfer.

(B) Interfacing using 8085

1. Traffic light control using 8255.
2. Generation of square wave using 8255

Learning Resources:

Electronics Lab premier by Sacikala - (S. Chand)

Pr.4 PROJECT WORK (Phase-I)

Name of the Course: Diploma in Electrical Engineering			
Course code:	Pr.4	Semester	5th
Total Period:	45	Examination	----
Lab. periods:	3 P / week	Term Work	25
Maximum marks:	25	End Semester Examination:	---

A. RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The individual students have different aptitudes and strengths. Project work, therefore, should match the individual strengths of students. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of software engineering/ Hardware design and practices in real life situations, so as to participate and manage a large software engineering projects and /or appropriate Hardware with embedded software in future.

Entire Project shall spread over 5th and 6th Semester. Part of the Project covered in 5th Semester shall be named as *Project Phase-I* and balance portion to be covered in 6th Semester shall be named as *Project Phase-II*.

B. OBJECTIVES

After undergoing the Project Work, the student will be able to:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real practical working environment, preferably in an industrial environment.
- Develop software packages or applications and implement these for the actual needs of the community/industry.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.
- Field computing and to achieve real life experience in software/hardware design.

C. GENERAL GUIDELINES

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (right from beginning of 5th semester).

Students should be allotted a problem of interest to him/her as a project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. Preferably there should not be more than 5 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

Following are the broad suggestive areas of project work

- ✓ Speed control techniques using thyristor.
- ✓ Battery design & its maintenance.
- ✓ Energy management Techniques.
- ✓ Dynamic models of Electrical machine.
- ✓ Solar based cooker, lamp, water heater etc. & Solar operated vehicles.
- ✓ Remote control operated Electrical devices.
- ✓ Advanced energy meter.
- ✓ Design of Illumination techniques using advanced luminaries etc.
- ✓ Dynamic models of Electrical Machine.
- ✓ PLC & Microprocessor based project.
- ✓ Any other related area found worth.

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

Sl. No.	**Performance Criteria**
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self-expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9.	Viva voce

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.
It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organizations to such an exhibition.

D. PROJECT PHASE-I AND PHASE-II

The Project work duration shall cover two semesters (5th and 6th sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 5th sem under Project Phase-I. The students may be allowed to study literature, any existing system and then define the Problem/objective of the Project. Requirements specification, Circuit Diagram with brief description and Design of the system have to be complete in Phase-I. Preliminary analysis/modelling/simulation/experiment/feasibility can also begin in this phase. Project Milestones are to be set so that progress can be tracked. In Phase-II Design, Testing, Documentation have to be complete. Project Report have to be complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable alteration in the schedule.
At the end of Project Phase-I in 5th semester there shall be one presentation by each group to mark to progress and also to judge whether the Project is moving in right direction as per the objective of the Project.

EQUIPMENT LIST

1. 3-phase Squirrel Cage Induction Motor
2. 3-phase Slip Ring Induction Motor
3. DC Shunt Motor coupled with Alternator set with Synchronization panel of Two Alternators
4. 1-phase Capacitor Start Capacitor Run Motor
5. 3-phase Transformer
6. 3-phase wattmeter
7. 1-phase wattmeter
8. 3-Phase Variac
9. DOL starter
10. Star-Delta Starter
11. Rotor Resistance starter
12. Auto Transformer Starter
13. 3-Point Starter
14. Field Regulator
15. DC Voltmeter
16. DC Ammeter
17. AC Voltmeter
18. AC Ammeter
19. 3-Phase Resistive Load Box
20. 3-Phase Energy meter
21. Demonstrational model of Oil Circuit Breaker
22. Reverse Current Relay kit
23. Demonstrational model of Buchholz's Relay Trainer Kit
24. Earth fault relay test kit
25. Power Electronics trainer kit to perform (a) switching characteristics of a power transistor (b) V-I characteristics of SCR, TRIAC, DIAC (c) Drive circuit for SCR & TRIAC using DIAC & UJT (d) phase controlled bridge rectifier using resistive load (e) series Inverter (f) voltage source Inverter (g) speed control of DC motor using Chopper (h) single-phase Cyclo-converter
26. 8085 microprocessor trainer kit
27. Traffic Light controller interfacing module
28. Digital electronics trainer kit
29. PLC trainer kit

5TH SEMESTER ELECTRICAL ENGINEERIN

Pr.1 ELECTRICAL MACHINE LAB-II

SL NO	NAME OF THE EXPERIMENT	APPARATUS REQUIRED / SPECIFICATION	QUANTITY NO.
1	Study of (Manual and Semi automatic) Direct on Line starter, Star-Delta starter, connection and running a 3-phase Induction motor and measurement of starting current.	1-3-ϕInduction Motor (440v,1500 RPM, 3HP) 2- Insulated Combination Pliers(150mm) 3- Screw driver (200mm) 4- Line Tester (1100v, 6) 5- 3-ϕ DOL Starter(440V, 16A) 6- Star-Delta Starter(Manual)(440v,16A) 7- Star-Delta Starter(Semi automatic) (440v,16A) 8-Multimeter 9-Wires 2.5 sq	1NO 1NO 1NO 1NO 1NO 1NO 1NO 1NO As per required
2	Study of (Manual and Semi automatic) Auto transformer starter and rotor resistance starter connection and running a 3-phase induction motor and measurement of starting current.	1-3-ϕInduction Motor(440v, 1500 RPM, 3HP) 2- 3-ϕSlip-ring Induction Motor (440v,1500RPM,3HP) 3-Insulated Combination Pliers (150mm) 4- Screw driver(200mm) 5-Line Tester(1100v, 6) 6-Wire Stripper(150mm) 7-3-ϕ Auto Transformer Starter (440V, 16A) 8-Rotor Resistance Starter(440v,16A) 9- Multimeter 10 -Wires (2.5 sq mm)	1NO 1NO 1NO 1NO 1NO 1NO 1NO 1NO As per required
3	Study and Practice of connection & Reverse the direction of rotation of Three Phase Induction motor.	1-3-ϕInduction Motor (440v, 1500 RPM, 3HP) 2-Insulated Combination Pliers (150mm) 3-Screw driver (200mm) 4 Line Tester (1100v, 6) 5-Wire Stripper (150mm) 6- D O L Starter (440V, 16A) 7-Wires (2.5 sq mm)	1NO 1NO 1NO 1NO 1NO 1NO As per required
4	Study and Practice of connection & Reverse the direction of rotation of Single Phase Induction motor.	1-ϕInduction Motor (220v, 1500 RPM, 1HP) 2-Insulated Combination Pliers (150mm) 3- Screw driver (200mm) 4- Line Tester (1100v, 6") 5 -Wire Stripper (150mm) 6- D O L Starter(220V, 5A) 7- Wires 2.5 sq mm	1NO 1NO 1NO 1NO 1NO 1NO As per required
5	Heat run test of 3-phase transformer.	1 -3-ϕ Transformer (440v, 1 KVA) 2 -Line Tester (1100v, 6) 3 -Wire Stripper(150mm) 4 -Voltmeter (500v) 5 -Ammeter (15A) 6 -Three Phase Variac (440V,15A) 7 -Temperature Indicator 8 -Wires 2.5 sq mm	1NO 1NO 1NO 1NO 1NO 1NO 1NO As per required
6	OC and SC test of alternator and determination of regulation by synchronous impedance method .	1 -DC Motor Coupled to Alternator Motor- 220V DC, 3KW, 1500RPM Alternator- 440V, 3 KVA,50 Hz 1no 2-Line Tester 1100v, 6 3 -Wire Stripper 150mm 4-Voltmeter 500v 5- Ammeter 15A	1NO 1NO 1NO 1NO 1NO

		6 -Rheostat 750ohm, 1.5A 7 Multimeter 7 -Tachometer 0-9999 RPM, Digital 8 -Wires 2.5 sq mm As per required	1NO As per required
7	Determination of regulation of alternator by direct loading .	1-DC Motor Coupled to Alternator Motor(220V DC, 3KW, 1500RPM)Alternator- (440V, 3 KVA,50 Hz) 2- Line Tester (1100v, 6‟) 3- Wire Stripper (150mm) 4- Voltmeter (500v AC) 5- Ammeter (5A AC) 6-Rheostat (750ohm, 1.5A) 7- Multimeter – 7 Tachometer (0-9999 RPM, Digital) 8-Frequency Meter Digital Type 9- Three Phase Resistor Load (440V, 1KΩ) 10- Wires 2.5 sq mm	1NO 1NO 1NO 1NO 4NO 1NO 1NO 1NO 1NO As per required
8	Parallel operation of two alternators and study load sharing.	1- DC Motor Coupled to Alternator Motor- (220V DC, 3KW, 1500RPM) Alternator- (440V, 3 KVA,50 Hz) 2-Line Tester (1100v, 6‟) 3-Wire Stripper (150mm) 4-Voltmeter (500v AC) 5- Ammeter 5A AC 6- Rheostat (750ohm, 1.5A) 7 Multimeter – 7- Frequency Meter Digital Type 8 -Syncchonoscope – 9- Lamps(100W) 10 -Wires 2.5 sq mm	2NO 1NO 1NO 2NO 2NO 2NO 2NO 1NO 2NO 1NO 3NO As per required
9	Measurement of power of a 3-phase Load using two wattmeter method and Page 22 of 30 V- Semester Electrical verification of the result using one 3-phase wattmeter.	1- Wattmeter(250V, 5A) 2- Three Phase Wattmeter(440V, 10A) 3- Line Tester (1100v, 6‟) 4- Wire Stripper (150mm) 5- Voltmeter (0-300)v 6-Ammeter (0-5)A 6- Three Phase Resistive Load (440V,5A) 7- Three Phase Inductive Load 8 Wires 2.5 sq mm	2NO 1NO 1NO 1NO 2NO 2NO 1NO 1NO As per required
10	Connection of 3-phase energy meter to a 3-phase load.	1-Three Phase Energy Meter with four wire(440V, 16A,) 2- Three Phase Resistive Load (440V,5A) 3- Insulated Combination Pliers(150mm) 4-Line Tester (1100v, 6‟‟‟) 5 -Wire Stripper 150mm 6- Wires 2.5 sq mm	1NO 1NO 1NO 1NO 1NO As per required
11	Study of an O.C.B	1- Oil Circuit Breaker (1KVA) 2- Insulated Combination Pliers(150mm) 3-Line Tester (1100v, 6‟) 4-Wire Stripper(150mm) 5-Wires 2.5 sq mm	1NO 1NO 1NO 1NO As per required
12	Study of induction type over current / reverse power relay.	1- Induction Type Over Current Relay (440V, 16A) 2- Insulated Combination Pliers (150mm) 3- Line Tester(1100v, 6’) 4-Wire Stripper (150mm) 5- Wires 2.5 sq mm	1NO 1NO 1NO 1NO As per required

13	Study of Buchholz's relay	1 -Buchholz‟s Relay Testing 2 -Insulated Combination Pliers(150mm) 3- Line Tester (1100v, 6‟) 4-Wire Stripper (150mm) 5- Wires 2.5 sq mm	1NO 1NO 1NO 1NO As per required
14	Study of an earth fault relay	1- Earth Fault Relay Testing Kit 2- Insulated Combination Pliers (150mm) 3 -Line Tester (1100v, 6‟) 4-Wire Stripper (150mm) 5- Wires 2.5 sq mm	1NO 1NO 1NO 1NO As per required

Pr.2 POWER ELECTRONICS & PLC LAB

SL NO	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QUANTITY NO.
1	Study of switching characteristics of a power transistor.	1-CRO 0-20MHz (Dual Channel) 2 -Function Generator (1Hz– 1 MHz) 3-Resistor (1KΩ-100KΩ) 4-Transistor (BC l07) 5-D.C Power Supply (0-30V.) 6-Connecting wires 7-Bread board	1NO 1NO 1NO 1NO 1NO As require 1NO
2	Study of V-I characteristics of SCR	1-SCR Kit 2-Voltmeter (0- 50V DC) 3-Ammeter (0-500 mA DC) 4-Ammeter (0-25mA DC) 5- Resister (100omh) 6- Patch cards	1NO 1NO 1NO 1NO 1NO As per required
3	Study of V-I characteristics of TRIAC.	1-TRIAC KIT 2-Voltmeter (0- 50V DC) 3-Ammeter (0-50 mA DC) 4-Ammeter (0-25mA DC) 5 -Resister (100omh) 6 -Patch cards	1NO 1NO 1NO 1NO 2NO As per required
4	Study of V-I characteristics of DIAC.	1-DIAC KIT 2-Voltmeter (0- 50V DC) 3-Ammeter (0-50 mA DC) 4-Ammeter (0-25mA DC) 5-Resister (100omh) 6-Patch cards	1NO 1NO 1NO 1NO 2NO As per required
5	Study of drive circuit for SCR & TRIAC using DIAC.	1-Drive circuit for SCR and TRIAC using DIAC kit 2-Lamp (50V) 3-CRO	1NO 1NO 1NO
6	Study of drive circuit for SCR & TRIAC using UJT.	1-Drive circuit for SCR and TRIAC using UJT kit 2-Resistive load 25 watt 3-CRO	1NO 1NO 1NO
7	To study phase controlled bridge rectifier using resistive load.	1-Single Phase Fully Controlled Bridge Rectifier module 2 -CRO with probes (20MHz 1) 3 -Resistive load (500Ω,1KΩ 2) 4 -Multi Meter 5- Ammeter (0-1A,MC) 6-RPS , Dual Channel (0-30V) 7-Transformer (230/0-30V 230/00-30V) 8 -Connecting wire	1NO 1NO 2NO 1NO 1NO 1NO 1NO As required
8	To study series Inverter.	1- Series Inverter Module 2 -CRO 30MHz 3 -Capacitor 4 -Inductor 5- Connecting wire	1NO 1NO 2NO 1NO As per required

		6 -Patch cards	As per required
9	Study of voltage source Inverter.	1 inverter kit 1 2 CRO 1	
10	To perform the speed control of DC motor using Chopper	1- Power electronic kit 2- Servo motor 3- DSO 4 -Connecting lead	1NO 1NO 1NO As per required
11	To study single-phase Cyclo-converter	1-Cycloconverter power ckt.with firing ckt. 2-Transformer(230V 150V-15V) 3-Rheostat 100Ω/2A) 4 -Multimeter 5- CRO(30MHz) 6-Connecting wire 7-Patch cards	1NO 1NO 1NO 1NO 1NO As per required As per required

SUB:- Pr.3 DIGITAL ELECTRONICS & MICROPROCESSOR LAB

SL. NO	NAME OF THE EXPERIMENT	APPARATUS REQUIED	QTY. NO
(I) Digital Electronics			
1	Verify truth tables of AND, OR, NOT, NOR, NAND, XOR, XNOR gates	Digital IC Trainer KIT	1
2	Implement various gates by using universal properties of NAND & NOR gates and verify truth table	1- AND gate 7408 2 -OR gate 7432 3 -Not gate 7404 4 -EXOR gate 7486 5- NAND gate 7400 6 -NOR gate 7402 7- EX-NOR gate 4077 8-Patch chords 9 -Trainer Kit	2 2 2 2 2 2 1 Few
3	Implement half adder and Full adder using logic gates.	1- AND gate 7408 2-OR gate 7432 3- NOT gate 7404 4 -EX-ORgate 7486 5- NAND gate 7400 6- NOR gate 7402 7 -EX-NOR gate 4077 8 -Patch chords 9- Trainer Kit	2 2 2 2 2 2 1 Few
4	Implement half subtractor and Full subtractor using logic gates.	1-AND gate 7408 2- OR gate 7432 3- NOT gate 7404 4- EX-OR gate 7486 5- NAND gate 7400 6- NOR gate 7402 7-Patch chords 8- Trainer Kit	1 1 1 3 3 3 Few
5	Implement a 4-bit Binary to Gray code converter.	1-Digital Trainer Kit 2-Patch Chords	1 Few
6	Implement a Single bit digital comparator	1-AND gate 7408 2- EX-OR gate 7486 3- NOT gate 7404 4- Patch chords 5-Trainer Kit	2 1 2 Few
7	Study Multiplexer and demultiplexer.	1- 3 I/P AND gate IC 7411 2- OR gate IC 7432 3- IC 7404 4- Patch chords 5-Trainer Kit	2 1 1 Few 1
8	Study of flip-flops. i) S-R flip flop ii) J-K flip flop iii) flip flop iv) T flip flop	1-FLIP FLOP Trainer Kit	4
9	Realize a 4-bit asynchronous UP/Down counter with a control for	1-Logic trainer kit, 2-Counter ICs- 7490, 3-IC - 7493 wires.	1 1 1

	up/down counting		
10	Realize a 4-bit synchronous UP/Down counter with a control for up/down counting.	1-Logic trainer kit, 2-Counter ICs- 7490, 3-IC - 7493 wires.	1 1 1
11	Implement Mode-10 asynchronous counters.	1-4 Bit synchronous and asynchronous counter Trainer kit	1
12	Study shift registers	1-Logic trainer kit, D Flip-flop IC - 7474 wires.	1
(II) MICROPROCESSOR			
13	(A) General Programming using 8085A development board 1. a. 1'S Complement. b. 2'S Complement. 2. a. Addition of 8-bit number. b. Subtraction of 8-bit number resulting 8/16 bit number. 3. a. Decimal Addition 8-bit number. b. Decimal Subtraction 8-bit number 4. a. Compare between two numbers. b. Find the largest in an Array 5. Block Transfer.	i) PC ii) TASM software	
14	(B) Interfacing using 8085 1. Traffic light control using 8255. 2. Generation of square wave using 8255	8085 Microcontroller	1

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA									
TEACHING AND EVALUATION SCHEME FOR 6th Semester (Electrical)(wef 2020-21)									
Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Electrical Installation And Estimating	4	1	-	20	80	3	100
Th.2		Switch Gear And Protective Devices	4	1	-	20	80	3	100
Th.3		Control System Engineering	4	1	-	20	80	3	100
Th.4		Elective (Any one to be opted) (a) Testing And Maintenance of Electrical Machine (b) Renewable Energy (c) Electric vehicle	4	1		20	80	3	100
		Total	*16*	*04*		*80*	*320*	-	*400*
		Practical							
Pr.1		Electrical Workshop	-	-	6	50	100	3	150
Pr.2		Project Phase- II			8	50	100	3	150
Pr.3		Life Skill	-	-	2	50	-	3	50
		Student Centred Activities(SCA)		-	3	-	-	-	-
		Total	-	-	*19*	*150*	*200*	-	*350*
		Grand Total	**16**	**04**	**19**	**205**	**545**	**-**	**750**
Abbreviations: L-Lecturer, T-Tutorial, P-Practical . Each class is of minimum 55 minutes duration									
Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%									
SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM/Idea Tinkering and Innovation Lab Practice etc. ,Seminar and SCA shall be conducted in a section.									
There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester									

CURRICULLUM OF 6TH SEMESTER

For

DIPLOMA IN ELECTRICAL ENGINEERING

(Effective from 2020-21 Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

Th1. ELECTRICAL INSTALLATION AND ESTIMATING

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4P / week	Class Test:	20
Tutorial:	1 P / week	End Semester Examination:	80
Maximum marks:	100		

A. RATIONALE:

Prior to implementation of a project in the power transmission and distribution sectors, a material estimate is required in various stages: like i) transmission line construction ii) distribution line construction iii) erection of domestic installation iv) service connection to industrial installation etc. In estimating, calculation of quantity of material is estimated by the estimator. This subject 'Electrical Installation and Estimating' is meant for learning the estimation process by the final semester students

B. OBJECTIVE:

After completion of this subject the student will be able:

1. To write down detailed specification and numbers required of different materials.
2. To determine the size and material of conductor and cable from electrical and mechanical consideration. As such to prepare a detailed list of materials with complete specifications.

C. Topic wise distribution of periods:

Sl. No.	Topics	Periods
1.	Indian electricity rules	06
2.	Electrical installations	12
3.	Internal wiring	12
4.	Over head installation	12
5.	Over head service lines	12
6.	Estimating for distribution substations	06
	Total	**60**

D. COURSE CONTENTS

1. INDIAN ELECTRICITY RULES

1.1 Definitions, Ampere, Apparatus, Accessible, Bare, cable, circuit, circuit breaker, conductor voltage (low, medium, high, EH), live, dead, cut-out, conduit, system, danger, Installation, earthing system, span, volt, switch gear, etc.

1.2 General safety precautions, rule 29, 30, 31, 32, 33, 34, 35, 36, 40, 41, 43, 44, 45, 46.

1.3 General conditions relating to supply and use of energy : rule 47, 48, 49, 50, 51, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 70.

1.4 OH lines : Rule 74, 75, 76, 77, 78, 79, 80, 86, 87, 88, 89, 90, 91

2. ELECTRICAL INSTALLATIONS

2. 1 Electrical installations, domestics, industrial, Wiring System, Internal distribution of Electrical Energy. Methods of wiring, systems of wiring, wire and cable, conductor materials used in cables, insulating materials mechanical protection. Types of cables used in internal wiring, multi-stranded cables, voltage grinding of cables, general specifications of cables.

2. 2 ACCESSORIES: Main switch and distribution boards, conduits, conduit accessories and fittings, lighting accessories and fittings, fuses, important definitions, determination of size of fuse – wire, fuse units. Earthing conductor, earthing, IS specifications regarding earthing of electrical installations, points to be earthed. Determination of size of earth wire and earth plate for domestic and industrial installations. Material required for GI pipe earthing.

2. 3 LIGHTING SCHEME: Aspects of good lighting services. Types of lighting schemes, design of lighting schemes, factory lighting, public lighting installations, street lighting, general rules for wiring, determination of number of points (light, fan, socket, outlets), determination of total load, determination of Number of sub-circuits.

3. INTERNAL WIRING

3 . 1 Type of internal wiring, cleat wiring, CTS wiring, wooden casing capping, metal sheathed wiring, conduit wiring, their advantage and disadvantages comparison and applications.

3 . 2 Prepare one estimate of materials required for CTS wiring for small domestic installation of one room and one verandah within 25 m^2 with given light, fan & plug points.

3 . 3 Prepare one estimate of materials required for conduit wiring for small domestic installation of one room and one verandha within 25 m^2 with given light, fan & plug points.

3 . 4 Prepare one estimate of materials required for concealed wiring for domestic installation of two rooms and one latrine, bath, kitchen & verandah within 80m^2 with given light, fan & plug points.

3 . 5 Prepare one estimate of materials required for erection of conduct wiring to a small workshop installation about 30m^2 and load within 10 KW.

4. OVER HEAD INSTALLATION

4.1. Main components of overhead lines, line supports, factors Governing Height of pole, conductor materials, determination of size of conductor for overhead transmission line, cross arms, pole brackets and clamps, guys and stays, conductors configurations, spacing and clearances, span lengths, overhead line insulators, types of insulators, lighting arresters, danger plates, anti-climbing devices, bird guards, beads of jumpers, jumpers, tee-offs, guarding of overhead lines.

4.2. Prepare an estimate of materials required for LT distribution line within load of 100 KW maximum and standard spans involving calculation of the size of conductor (from conductor chart), current carrying capacity and voltage regulation

consideration using ACSR.

4.3. Prepare an estimate of materials required for LT distribution line within load of 100 KW maximum and standard spans involving calculation of the size of conductor (from conductor chart), current carrying capacity and voltage regulation consideration using ACSR.

4.4. Prepare an estimate of materials required for HT distribution line (11 KV) within 2 km and load of 2000 KVA maximum and standard spans involving calculation of the size of conductor (from conductor chart), current carrying capacity and voltage regulation of the size of conductor (from conductor chart), current carrying capacity and voltage regulation consider action using ACSR.

5. OVER HEAD SERVICE LINES

5. 1 Components of service lines, service line (cables and conductors), bearer wire, lacing rod. Ariel fuse, service support, energy box and meters etc.

5. 2 Prepare and estimate for providing single phase supply of load of 5 KW (light, fan, socket) to a single stored residential building.

5. 3 Prepare and estimate for providing single phase supply load of 3KW to each floor of a double stored building having separate energy meter.

5. 4 Prepare one estimate of materials required for service connection to a factory building with load within 15 KW using insulated wire.

5. 5 Prepare one estimate of materials required for service connection to a factory building with load within 15 KW using bare conductor and insulated wire combined.

6. ESTIMATING FOR DISTRIBUTION SUBSTATIONS

6. 1 Prepare one materials estimate for following types of transformer substations.

6.1.1 Pole mounted substation.

6.1.2 Plinth Mounted substation.

Syllabus coverage up to Internal assessment

Chapters: 1, 2 and 3.

Learning Resources:			
Sl.No	**Name of Authors**	**Title of the Book**	**Name of Publisher**
1	Surjit Singh	Electrical Installation and Estimating	Dhanpatrai and sons
2	J B Gupta	A course in Electrical Installation, Estimating and costing	S K Kataria and Sons
3	N. Alagappan S.Ekambaram	Electrical Estimating and Costing	TATA McGRAW HILL

Th2. SWITCH GEAR AND PROTECTIVE DEVICES

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	6th
Total Period:	75	Examination	3 hrs
Theory periods:	4P / week	Class Test:	20
Tutorial:	1P / week	End Semester Examination:	80
Maximum marks:	100		

A. RATIONALE:

Switch gear and protection plays an important role in the protection of electrical power system. Since the demand of electrical power is increasing the job of generation, transmission & distribution of electrical energy is becoming very completed. To maintain the energy supply to the consumer switching producer with protection is to be maintained moreover new models of switch gear and protection circuits are also being developed. The use of interconnection bus with National power grid type of switch gear and protecting devices need to be trained in proper manners. In the subject information on above context has been included so that the updated knowledge can be given to the students.

B. OBJECTIVE:

After completion of this subject the student will be able to know:

1) The basic principles of protection of alternator, transformer and feeders.
2) Fuse and Circuit breaker.
3) Protective Relay.
4) Lighting Arrestor.
5) Calculation of symmetrical fault current.

C. Topic wise distribution of periods:

Sl. No.	Topics	Period
1	Introduction to switchgear	6
2	Fault calculation	10
3	Fuses	6
4	Circuit breakers	10
5	Protective relays	8
6	Protection of electrical power equipment and lines	6
7	Protection against over voltage and lighting	8
8	Static relay	6
	Total:	**75**

D. COURSE CONTENTS:

1. INTRODUCTION TO SWITCHGEAR

1.1 Essential Features of switchgear.
1.2 Switchgear Equipment.
1.3 Bus-Bar Arrangement.
1.4 Switchgear Accommodation.
1.5 Short Circuit.
1.6 Short circuit.
1.7 Faults in a power system.

2. FAULT CALCULATION

2.1 Symmetrical faults on 3-phase system.
2.2 Limitation of fault current.

2.3 Percentage Reactance.
2.4 Percentage Reactance and Base KVA.
2.5 Short – circuit KVA.
2.6 Reactor control of short circuit currents.
2.7 Location of reactors.
2.8 Steps for symmetrical Fault calculations.
2.9 Solve numerical problems on symmetrical fault.

3. FUSES

3.1 Desirable characteristics of fuse element.
3.2 Fuse Element materials.
3.3 Types of Fuses and important terms used for fuses.
3.4 Low and High voltage fuses.
3.5 Current carrying capacity of fuse element.
3.6 Difference Between a Fuse and Circuit Breaker.

4. CIRCUIT BREAKERS

4.1 Definition and principle of Circuit Breaker.
4.2 Arc phenomenon and principle of Arc Extinction.
4.3 Methods of Arc Extinction.
4.4 Definitions of Arc voltage, Re-striking voltage and Recovery voltage.
4.5 Classification of circuit Breakers.
4.6 Oil circuit Breaker and its classification.
4.7 Plain brake oil circuit breaker.
4.8 Arc control oil circuit breaker.
4.9 Low oil circuit breaker.
4.10 Maintenance of oil circuit breaker.
4.11 Air-Blast circuit breaker and its classification.
4.12 Sulphur Hexa-fluoride (SF6) circuit breaker.
4.13 Vacuum circuit breakers.
4.14 Switchgear component.
4.15 Problems of circuit interruption.
4.16 Resistance switching.
4.17 Circuit Breaker Rating.

5. PROTECTIVE RELAYS

5.1 Definition of Protective Relay.
5.2 Fundamental requirement of protective relay.
5.3 Basic Relay operation
  5.3.1. Electromagnetic Attraction type
  5.3.2. Induction type
5.4 Definition of following important terms
5.5 Definition of following important terms.
  5.5.1. Pick-up current.
  5.5.2. Current setting.
  5.5.3. Plug setting Multiplier.
  5.5.4. Time setting Multiplier.
5.6 Classification of functional relays
5.7 Induction type over current relay (Non-directional)
5.8 Induction type directional power relay.
5.9 Induction type directional over current relay.

5.10 Differential relay
5.10.1. Current differential relay
5.10.2. Voltage balance differential relay.
5.11 Types of protection

6. PROTECTION OF ELECTRICAL POWER EQUIPMENT AND LINES

6.1 Protection of alternator.
6.2 Differential protection of alternators.
6.3 Balanced earth fault protection.
6.4 Protection systems for transformer.
6.5 Buchholz relay.
6.6 Protection of Bus bar.
6.7 Protection of Transmission line.
6.8 Different pilot wire protection (Merz-price voltage Balance system)
6.9 Explain protection of feeder by over current and earth fault relay.

7. PROTECTION AGAINST OVER VOLTAGE AND LIGHTING

7.1. Voltage surge and causes of over voltage.
7.2. Internal cause of over voltage.
7.3. External cause of over voltage (lighting)
7.4. Mechanism of lightning discharge.
7.5. Types of lightning strokes.
7.6. Harmful effect of lightning.
7.7. Lightning arresters and Type of lightning Arresters.
7.7.1. Rod-gap lightning arrester.
7.7.2. Horn-gap arrester.
7.7.3. Valve type arrester.
7.8. Surge Absorber

8. STATIC RELAY:

8. 1 Advantage of static relay.
8. 2 Instantaneous over current relay.
8. 3 Principle of IDMT relay.

Syllabus coverage up to Internal assessment

Chapters: 1, 2, 3 and 4.

Learning Resources:

Sl.No	Title of the Book	Name of Authors	Publisher
1	Principle of power system	V. K. Mehta	S Chand
2.	Protection and Swwitchgear	Bhavesh Bhalja R.P Maheshwari Nilesh G. Chothani	OXFORD
2	Electrical power	Soni, Gupta and Bhatnagar	Dhanpat Rai & Sons
3	Power system protection & switch gear	Bhuvanesh Oza	TMH
4	Electrical Power	S. L. Uppal	Khanna Publisher
5	Protection and Switchgear	Raghuraman	SCITECH

Th3.CONTROL SYSTEM ENGINEERING

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	6th
Total Period:	75	Examination	3 hrs
Theory periods:	4 P / week	Class Test:	20
Tutorial:	1 P / week	End Semester Examination:	80
Maximum marks:	100		

A. RATIONALE:

Automatic control has played a vital role in modern Engineering and Science. It has become an indispensable part of modern manufacturing and industrial process. So knowledge of automatic control system is dreadfully essential on the part of an Engineer. Basic approach to the automatic control system has been given in the subjects, so that students can enhance their knowledge in their future professional carrier.

B. OBJECTIVE:

Study of 'Control System' enhances the ability of the student on:

1. Acquire knowledge about Mathematical modeling, Block diagram algebra, signal flow graphs and control system components.
2. Ability to deal with time response analysis of various systems.
3. Finding out steady state error and error constants.
4. Acquire knowledge about the analysis of stability in Root locus technique.
5. Learning about frequency response analysis of control system.
6. To use Bode plot and Nyquist plot for judgments about stability of a system.

C. Topic wise distribution of periods:

Sl. No.	Topics	Periods
1.	Fundamental of control system	04
2.	Mathematical model of a system	04
3.	Control system components	04
4.	Block diagram algebra & signal flow graphs	08
5.	Time response analysis	10
6.	Analysis of stability by root locus technique	10
7.	Frequency response of system	10
8.	Nyquist plot	10
	Total	**60**

D. COURSE CONTENTS

1. FUNDAMENTAL OF CONTROL SYSTEM

1.1. Classification of Control system
1.2. Open loop system & Closed loop system and its comparison
1.3. Effects of Feed back
1.4. Standard test Signals(Step, Ramp, Parabolic, Impulse Functions)
1.5. Servomechanism

2. MATHEMATICAL MODEL OF A SYSTEM

2.1. Transfer Function & Impulse response,
2.2. Properties, Advantages & Disadvantages of Transfer Function
2.3. Poles & Zeroes of transfer Function
2.4. Simple problems of transfer function of network.
2.5. Mathematical modeling of Electrical Systems(R, L, C, Analogous systems)

3. CONTROL SYSTEM COMPONENTS

3.1. Components of Control System
3.2. Gyroscope, Synchros, Tachometer, DC servomotors, Ac Servomotors.

4. BLOCK DIAGRAM ALGEBRA & SIGNAL FLOW GRAPHS

4.1. Definition: Basic Elements of Block Diagram
4.2. Canonical Form of Closed loop Systems
4.3. Rules for Block diagram reduction
4.4. Procedure for of Reduction of Block Diagram
4.5. Simple Problem for equivalent transfer function
4.6. Basic Definition in Signal Flow Graph & properties
4.7. Construction of Signal Flow graph from Block diagram
4.8. Mason's Gain formula
4.9. Simple problems in Signal flow graph for network

5. TIME RESPONSE ANALYSIS.

5 . 1 Time response of control system.
5 . 2 Standard Test signal.
  5.2.1. Step signal,
  5.2.2. Ramp Signal
  5.2.3. Parabolic Signal
  5.2.4. Impulse Signal
5 . 3 Time Response of first order system with:
  5.3.1. Unit step response
  5.3.2. Unit impulse response.
5 . 4 Time response of second order system to the unit step input.
  5.4.1. Time response specification.
  5.4.2. Derivation of expression for rise time, peak time, peak overshoot, settling time and steady state error.

5.4.3. Steady state error and error constants.

5 . 5 Types of control system.[Steady state errors in Type-0, Type-1, Type-2 system]

5 . 6 Effect of adding poles and zero to transfer function.

5 . 7 Response with P, PI, PD and PID controller.

6. ANALYSIS OF STABILITY BY ROOT LOCUS TECHNIQUE.

6 . 1 Root locus concept.

6 . 2 Construction of root loci.

6 . 3 Rules for construction of the root locus.

6 . 4 Effect of adding poles and zeros to G(s) and H(s).

7. FREQUENCY RESPONSE ANALYSIS.

7 . 1 Correlation between time response and frequency response.

7 . 2 Polar plots.

7 . 3 Bode plots.

7 . 4 All pass and minimum phase system.

7 . 5 Computation of Gain margin and phase margin.

7 . 6 Log magnitude versus phase plot.

7 . 7 Closed loop frequency response.

8. NYQUIST PLOT

8.1 Principle of argument.

8.2 Nyquist stability criterion.

8.3 Niquist stability criterion applied to inverse polar plot.

8.4 Effect of addition of poles and zeros to G(S) H(S) on the shape of Niquist plot.

8.5 Assessment of relative stability.

8.6 Constant M and N circle

8.7 Nicholas chart.

Syllabus coverage up to Internal assessment

Chapters: 1, 2, 3, 4 and 5.

Learning Resources:			
Sl.No	**Title of the Book**	**Name of Authors**	**Name of Publisher**
1.	Control System	A. Ananda Kumar	PHI
3.	Control System	K. Padmanavan	IK
2.	Control system Engineering	I. J. Nagarath, M. Gopal	WEN
4.	Control system Engineering	A Natrajan,Ramesh Babu	Scientific
5.	Control Systems	D N Manik	Cengage
6.	Control Systems	S P Eugene Xavier, J Joseph Cyril Babu	S Chand

Th4.TESTING AND MAINTENANCE OF ELECTRICAL MACHINE

(Elective- A)

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	6th
Total Period:	75	Examination	3 hrs
Theory periods:	4 P / week	Class Test:	20
Tutorial:	1 P / week	End Semester Examination:	80
Maximum marks:	100		

A. RATIONALE:

This subject intends to be acquainted with application level technology, normally adopted in Industries, commercial, public utility departments such as Electrical transmission and distribution, Irrigation, Water supply etc. The knowledge in this subject will make the readers able for inspection, testing, installation and commissioning of electrical machines as per IS standards. This will help him to initiate total productive maintenance.

B. OBJECTIVE:

After completion of this subject the student will be able to:

1. To acquire knowledge on safety measures and precautions.
2. Testing of DC and AC rotating machines and transformers.
3. Identify common troubles in Electrical machines and switch gear.
4. Plan and carryout routine and preventive maintenance.
5. Install LV switch gear and maintain it.
6. Ascertain the condition of insulation and varnishing. (if necessary)
7. Initiate total productive maintenance.

C. Topic wise distribution of periods:

Sl. No.	Topics	Periods
1.	Installation, Commissioning and Testing of Machine	15
2.	Installation, Commissioning and Testing of Transformer	15
3.	Installation, Commissioning & Testing of Sub-station.	15
4.	Maintenance	15
	Total	**60**

D. COURSE CONTENTS

1. Installation, Commissioning and Testing of Machine:

1.1. Inspection of arrival of machine and inspection procedure before its installation.
1.2. Generalized procedure of installation of Electrical machines.
1.3. Electric wiring for motors and switch gears.
1.4. General requirement for Electric Installation according to Indian Electricity rules.
1.5. Necessity of starters and relays for both DC and AC machines.
1.6. Testing before giving supply and testing report.

2. Installation, Commissioning and Testing of Transformer:

2. 1 Basic idea on dispatch, inspection, storage and handling of transformer.
2. 2 Civil construction feature regarding connection like ventilation, noise level, space for free movement.
2. 3 Foundation and drainage of oil.
2. 4 Cabling and cable box for transformer.
2. 5 Provision for fire protection.
2. 6 Provision for bushing support location of switch gear.
2. 7 Steps for commissioning fitting of all accessories.
2. 8 Filling of oil, drying out.
2. 9 Charging the breather with fresh silica gel.
2. 10 Cleaning of bushing, fixing of conductor & cables, earthing of tank and cover, neutral earthing.
2. 11 Fixing of protection circuits and setting of relays.

3. Installation, Commissioning & Testing of Sub-station.

3 . 1 Design and planning of indoor substation.
3 . 2 General requirement of layout of indoor substation with key diagram.
3 . 3 Consideration of safe operation of substation
3 . 4 Installation of outdoor substation:
3.4.1 Selection of site, transport & receipt of transformer, checking of insulation resistance of the winding, testing of transformer oil, protection fittings, construction of mounting, earthing arrangement and final commissioning.
3 . 5 Testing and commissioning of substation.
3.5.1. Installation of control and relay panels.
3.5.2. Preliminary preparation.
3.5.3. Sequence card for erection of switch gear equipments.
3.5.4. Location of place
3.5.5. Unpacking
3.5.6. Foundation
3.5.7. Erection
3.5.8. Relays
3 . 6 Bus-bar earthing connection, Earthing.
3.6.1. Connection to main cable.
3.6.2. Safety precaution
3 . 7 Installation of outdoor circuit breaker:
3.7.1. Receipt and storage.

3.7.2. Civil works.
3.7.3. Various steps for installation.
3 . 8 Pre-commissioning tests.

4. Maintenance:

4.1 Fundamental of maintenance.
4.2 Preventive maintenance and planning.
[Daily, Weekly, Monthly, Half-yearly and Yearly maintenance.]
4.3 Advantages of Preventive maintenance:
4.4 Breakdown maintenance: List of tools / instruments and materials used for maintenance.
4.5 Making or Preparing Maintenance schedule of DC machines, Induction machines, Synchronous machines, Transformer, Transmission line, Distribution lines, Underground cables, Circuit breakers, Switch gear and protective relays and substations, SF-6 circuit breakers, Batteries in substation.

Syllabus coverage up to Internal assessment

Chapters: 1, and 2.

Learning Resources:			
Sl.No	**Title of the Book**	**Name of Authors**	**Name of Publisher**
1	Installation Commissioning & Maintenance of Electrical Equipments	Tarlok Singh	S. K. Kataria & Sons
2.	Installation Servicing and Maintenance	S N Bhattacharya	S Chand
3.	Testing Commissioning Operation and Maintenance of Electrical Equipments	S Rao	Khanna Publisher
4.	Hand book of Inspection, for all type of Electrical Instruments	Er. R. N. Sahoo	Orissa Power Generation consultants and services
5.	Installation, Maintenance and Repair of Electrical Machines and Equipments	Madhvi Gupta	Katson Books

Th4. RENEWABLE ENERGY SYSTEMS
(Elective – B)

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	6th
Total Period:	75	Examination	3 hrs
Theory periods:	4 P / week	Class Test:	20
Tutorial:	1 P / week	End Semester Examination:	80
Maximum marks:	100		

A. RATIONALE:

It is well known that a plenty of energy is needed to sustain industrial growth and agricultural production. The existing sources energy such as coal, oil, uranium etc may not be sufficient to meet the ever increasing energy demands. These conventional sources of energy are also depleting and may be exhausted at the end of the century or the beginning of the next century.

Consequently sincere efforts shall have to be made by the scientists and engineers in exploring the possibilities of harnessing energy from several energy sources.

B. OBJECTIVE:

After completion of this subject the student will be able:

1. Power production from pollution free forces and environment friendly resources.
2. Production of power form nature at free of cost.
3. Solar energy conversion is noiseless and cheap.

C. Topic wise distribution of periods:

Sl. No.	Topics	Periods
1.	Introduction to Renewable energy	5
2.	Solar Energy	15
3.	Wind Energy	12
4.	Biomass Power	12
5.	Other Energy Sources	16
	Total	**60**

D. COURSE CONTENTS

1. Introduction to Renewable energy:

1.1. Environmental consequences of fossil fuel use.
1.2. Importance of renewable sources of energy.
1.3. Sustainable Design and development.
1.4. Types of RE sources.
1.5. Limitations of RE sources.
1.6. Present Indian and international energy scenario of conventional and RE sources

2. Solar Energy:

2.1. Solar photovoltaic system-Operating principle.

2.2. Photovoltaic cell concepts

2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT).

2.3. Classification of energy Sources.

2.4. Extra-terrestrial and terrestrial Radiation.

2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant.

2.6. Solar collectors, Types and performance characteristics,

2.7. Applications: Photovoltaic - battery charger, domestic lighting, street lighting, water pumping, solar cooker, Solar Pond.

3. Wind Energy:

3.1. Introduction to Wind energy.

3.2. Wind energy conversion.

3.3. Types of wind turbines

3.4. Aerodynamics of wind rotors.

3.5. Wind turbine control systems; conversion to electrical power:

3.6. Induction and synchronous generators.

3.7. Grid connected and self excited induction generator operation.

3.8. Constant voltage and constant frequency generation with power electronic control.

3.9. Single and double output systems.

3.10. Characteristics of wind power plant.

4. Biomass Power:

4.1. Energy from Biomass.

4.2. Biomass as Renewable Energy Source

4.3. Types of Biomass Fuels - Solid, Liquid and Gas.

4.4. Combustion and fermentation.

4.5. Anaerobic digestion.

4.6. Types of biogas digester.

4.7. Wood gassifier.

4.8. Pyrolysis,.

4.9. Applications: Bio gas, Bio diesel

5. Other Energy Sources

5.1. Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems.

5.2. Ocean Thermal Energy Conversion (OTEC).

5.3. Geothermal Energy – Classification.

5.4. Hybrid Energy Systems.

5.5. Need for Hybrid Systems.

5.6. Diesel-PV, Wind-PV, Microhydel-PV.

5.7. Electric and hybrid electric vehicles.

Syllabus coverage up to Internal assessment

Chapters: 1, 2 and 3.

Learning Resources:			
Sl.No	**Title of the Book**	**Name of Authors**	**Name of Publisher**
1.	*Renewable Energy Sources and Emerging Technologies*	*D.P.Kothari, K.C Singal, Rakesh Ranjan*	*PHI Learning Pvt.Ltd, New Delhi*
2.	*Non-Conventional Energy Resources*	*B.H.Khan*	*Tata McGrawHill*
3	*Non-Conventional Energy Resources*	*J.P Navani & Sonal Sapra*	*S chand*
4.	*Non Conventional Energy sources and Utilisation*	*R K Rajput*	*S Chand*
5	*Wind Electrical Systems*	*S. N. Bhadra, D. Kastha, S. Banerjee*	*Oxford Univ. Press, New Delhi*
6.	*Non Conventional Energy Resources*	*N K Bansal*	*S Chand*

Th4. ELECTRIC VEHICLES

(Elective- C)

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester:	6th
Total Period:	75	Examination:	3 hrs
Theory periods:	4 P / week	Class Test:	20
Tutorial:	1 P / week	End Semester Examination:	80
Maximum marks:	100		

A. RATIONALE:

The sole objective of this subject to be familiar with advanced Electric drive vehicle technology, its economic analysis, comparative study and environmental aspects.

B. OBJECTIVE:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

a) Interpret the salient features of Hybrid electric vehicles.
b) Interpret the Dynamics of hybrid and Electric vehicles
c) Maintain the DC-DC converters in EV applications.
d) Maintain the DC-AC converters in EV applications
e) Select the batteries for EV applications, its charging.

C. Topic wise distribution of periods:

Sl. No.	Topics	Periods
1.	Introduction to Hybrid Electric Vehicles	10
2.	Dynamics of hybrid and Electric vehicles	10
3.	DC-DC Converters for EV and HEV Applications	15
4.	DC-AC Inverter & Motors for EV and HEVs	15
5.	Batteries	10
	Total	**60**

D. COURSE CONTENTS

Unit – I Introduction to Hybrid Electric Vehicles

Evolution of Electric vehicles, Advanced Electric drive vehicle technology Vehicles-Electric vehicles (EV), Hybrid Electric drive (HEV), Plug in Electric vehicle (PIEV), Components used Hybrid Electric Vehicle ,Economic and environmental impacts of Electric hybrid vehicle Parameters affecting Environmental and economic analysis. Comparative study of vehicles for economic, environmental aspects.

Unit – II Dynamics of hybrid and Electric vehicles

General description of vehicle movement, Factors affecting vehicle motion- Vehicle resistance, tyre ground adhesion, rolling resistance, aerodynamic drag, equation of grading resistance, dynamic equation. Drive train configuration, Automobile power train, classification of vehicle power plant. Performance characteristics of IC engine, electric motor, need of gear box. Classification of motors used in Electric vehicles. Basic architecture of hybrid drive trains, types of HEVs Energy saving potential of hybrid drive trains ,HEV Configurations-Series, parallel, Series-parallel, complex.

Unit– III DC-DC Converters for EV and HEV Applications

EV and HEV configuration based on power converters, Classification of converters – unidirectional and bidirectional, Principle of step down operation, Boost and Buck- Boost converters, Principle of Step-Up operation, Two quadrant converters; multi quadrant converters, Electrical Engineering Curriculum Structure 210.

Unit– IV DC-AC Inverter & Motors for EV and HEVs

DC-AC Converters, Principle of operation of half bridge DC-AC inverter (R load, R-L load), Single phase Bridge DC-AC inverter with R load, R-L load, Electric Machines used in EVs and HEVs, principle of operation, working & control , Permanent magnet motors, their drives, switched reluctance motor, Characteristics and applications of above motors.

Unit– V Batteries

Overview of batteries, Battery Parameters, types of batteries, Battery Charging, alternative novel energy sources-solar photovoltaic cells, fuel cells, super capacitors, flywheels , Control system for EVs and HEVs, overview, Electronic control unit ECU, Schematics of hybrid drive train, control architecture Regenerative braking in EVs.

Syllabus coverage up to Internal assessment

Unit: 1,2

Learning Resources:			
Sl.No	**Title of the Book**	**Name of Authors**	**Name of Publisher**
1	Electric & Hybrid Vehicles	A.K. Babu	Khanna Publishing House
2.	A. E. Hybrid Vehicles and the Future of Personal Transportation	Fuhs	CRC Press
3.	I. *Electric and Hybrid Electric Vehicles*	Husain	CRC Press
4.	*Modern Electric Vehicle Technology*	Chan C. C. and K. T. Chau	Oxford Science Publication,
5.	M. H. *Power Electronics: Circuits, Devices and Applications*,	Rashid	3rd edition, Pearson,

Pr1.ELECTRICAL WORKSHOP PRACTICE

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	6th
Total Period:	90	Examination	3 hrs
Lab. periods:	6 P / week	Sessional:	50
Maximum marks:	150	End Semester Examination:	100

A. **RATIONALE:** The sole objective of the subject is skill development among the students after performing practice of the experiments and become fit to meet the challenges in practical installation.
In the beginning all the tools and instruments required/ used in conducting this subject are to be illustrated. The students are required to make a thorough hand on approach in practicing the experiments.

B. **OBJECTIVE:**
After completion of this workshop the student will be able to:
1. To be familiar with different cable and overhead line joints.
2. To be familiar with Electrical installation of residential building and to identify and maintenances of different electrical gadgets.
3. Fault finding, repairing of DC and AC machines with their accessories.

C. **LIST OF EXPERIMENT:**
1. Identification of single core (SC), twin core (TC), three cores (3c), four cores (4c); copper and aluminum PVC, VIR & Weather proof (WP) wire and prepare Britannia T-joint and Married joint.
2. Cutting copper and aluminum cable and crimping lug to them from 2.5mm^2 to 6 mm^2 cross section.
3. Connection and testing of fluorescent tube light, high pressure M.V. lamp, sodium vapor lamp, M.H lamp, CFL and latest model lamps – measure inductance, Lux/ lumens (intensity of illumination) in each case-prepare lux table .
4. Study battery charger and make charging of lead acid battery (record charging voltage, current and specific gravity).
5. Erection of residential building wiring by CTS and conduit wiring system using main two points and test installation by test lamp method and a meggar.
6. Fault finding & repairing of Ceiling Fan – prepare an inventory list of parts.
7. Find out fault of D.C. generator, repair and test it to run.
8. Find out fault of D.C. motor starters and A.C motor starter – prepare an inventory list of parts used in different starters.
9. Dismantle, over haul and assemble a single phase induction motor. Test and run it. – prepare an inventory list.
10. Dismantle over haul and assemble a three phase squirrel cage and phase wound motor. Test and run them.
11. Overhaul a single phase and 3-phase variac.

Pr2. PROJECT Phase - II

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	6th
Total Period:	120	Examination	3 hrs
Lab. periods:	8 P / week	Sessional	50
Maximum marks:	150	End Sem Examination	100

RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of Electrical engineering and practices in real life situations, so as to participate and manage a large Electrical engineering projects, in future. Entire Project spreads over 5th and 6th Semester. Part of the Project covered in 5th Semester was named as *Project Phase-I* and balance portion to be covered in 6th Semester shall be named as *Project Phase-II*.

OBJECTIVES

After undergoing the Project Work, the student will be able to:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real practical working environment, preferably in an industrial environment.
- Develop software packages or applications and implement these for the actual needs of the community/industry.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.
- To achieve real life experience in Project design.
- To develop the skill of writing Project Report

Project Phase-I and Phase-II

The Project work duration covers 2 semesters(5th and 6th sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group was done in the beginning of 5th semester under Project Phase-I. The students were allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work and Design of the system also have to be complete in Phase-I. Development may also begin in this phase. Project Milestones are to be set so that progress can be tracked .

In Phase-II Development, Testing, Documentation and Implementation have to be complete. Project Report have to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable

alteration in the components of Task and schedule.
At the end of Project Phase-II in 6th semester there shall be one presentation by each group on whole Project work undertaken by them.

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

Sl. No.	**Performance Criteria**
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9	Viva voce

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.
It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations to such an exhibition.

The Project Report need to be prepared as per standard format and following is the indicative format. The Teacher Guide may make minor alteration keeping the sense in tact.

Organization of Project Report

1. Cover page:
   It should contain the following (in order)
   (i) Title of the Project
   (ii) "Submitted in partial fulfillment of the requirements for the Diploma in <Branch Name>"
   (iii) By Name of the Student(s)
   (iv) Logo of the Institution
   (v) Branch Name/Depart Name and Institution Name with Address
   (vi) Academic Year
2. 1st Inner page
   Certificate:

It should contain he following

"This is to certify that the work in this Project Report entitled <Project Title> by <Name of student(s)> has been carried out under my supervision in partial fulfillment of the requirements for the Diploma in <Branch Name>" during session <session > in <Branch /Department Name> of <Institute name> and this work is the original work of the above student(s).

Seal and signature of the Supervisor/Guide with date

3. 2nd Inner Page
   Acknowledgement by the Student(s)
4. Contents.
5. Chapter wise arrangement of Reports
6. Last Chapter: Conclusion
   It should contain
   (i) Conclusion
   (ii) Limitations
   (iii) Scope for further Improvement
7. References

Pr-3 LIFE SKILL

(Common to All Branches)

Practical	**2 Periods/ week**	**Sessional**	**50 Marks**
Total Periods	**30 Periods**	**Total Marks**	**50 Marks**

Objective: After completion of this course the student will be able to**:**

- Develop team spirit i.e. concept of working in team
- Apply problem solving skills for a given situation
- Use effective presentation techniques
- Apply task management techniques for given projects
- Enhance leadership traits
- Resolve conflict by appropriate method
- Survive self in today's competitive world
- Face interview without fear

DETAIL CONTENTS:

1. SOCIAL SKILL

Society, Social Structure, Develop Sympathy and Empathy
Swot Analysis – Concept, How to make use of SWOT
Inter personal Relation**:** Sources of conflict, Resolution of conflict ,
Ways to enhance interpersonal relation

2. PROBLEM SOLVING

Steps of Problem solving**:**

- Identify and clarify the problem,
- Information gathering related to problem,
- Evaluate the evidence,
- Consider alternative solutions and their implications,
- Choose and implement the best alternative,
- Review
- Problem solving techniques:

1) Trial and error, 2) Brain storming, 3) Lateral (Out of Box) thinking

3. PRESENTATION SKILL

Body language , Dress like the audience
Posture, Gestures, Eye contact and facial expression. STAGE FRIGHT,
Voice and language – Volume, Pitch, Inflection, Speed, Pause
Pronunciation, Articulation, Language, Practice of speech.
Use of AV aids such as Laptop with LCD projector, white board etc.

4. GROUP DISCUSSION AND INTERVIEW TECHNIQUES

Group Discussion:
Introduction to group discussion, Ways to carry out group discussion,

Parameters— Contact, body language, analytical and logical thinking,
decision making
Interview Technique :
Dress, Posture, Gestures, facial expression, Approach
Tips for handling common questions.

5. WORKING IN TEAM

Understand and work within the dynamics of a groups.
Tips to work effectively in teams,
Establish good rapport, interest with others and work effectively with them
to meet common objectives,
Tips to provide and accept feedback in a constructive and considerate way ,
Leadership in teams, Handling frustrations in group.

6. TASK MANAGEMENT

Introduction, Task identification, Task planning ,
organizing and execution, Closing the task

PRACTICAL

List of Assignment: *(Any Five to be performed including Mock Interview)*

1. SWOT analysis:-

Analyse yourself with respect to your strength and weaknesses, opportunities and threats. Following points will be useful for doing SWOT.

a) Your past experiences,
b) Achievements,
c) Failures,
d) Feedback from others etc.

2. Solve the True life problem assigned by the Teacher.

3. Working in a Team

Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation, environment protection, camps on awareness like importance of cleanliness in slum area, social activities like giving cloths to poor etc.(One activity per group where Team work shall be exhibited)

4. Mock Interview

5. Discuss a topic in a group and prepare minutes of discussion.

6. Deliver a seminar for 5 minutes using presentation aids on the topic given by your teacher.

7. Task Management

Decide any task to be completed in a stipulated time with the help of teacher. Write a report considering various steps in task management (with Break up into sub tasks and their interdependencies and Time)

Note: -1. Please note that these are the suggested assignments on given contents/topic. These assignments are the guide lines to the subject teachers. However the subject teachers are free to design any assignment relevant to the topic.

Note: -2. The following Topics may be considered for Seminar/GD in addition to other Topics

at the discretion of the Teacher.

(Comparison with developed countries, Occupational Safety, Health Hazard, Accident & Safety, First-Aid, Traffic Rules, Global Warming, Pollution, Environment, Labour Welfare Legislation, Labour Welfare Acts, Child Labour Issues, Gender Sensitisation ,Harassment of Women at Workplace)

METHODOLOGY:

The Teacher is to explain the concepts prescribed in the contents of the syllabus and then assign different Exercises under Practical to the students to perform.

Books Recommended:-

Sl.No	Name of Authors	Title of the Book	Name of the Publisher
01	E.H. Mc Grath , S.J	Basic Managerial Skills for All	PHI
02	Lowe and Phil	Creativity and problem solving	Kogan Page (I) P Ltd
03	Adair, J	Decision making & Problem Solving	Orient Longman
04	Bishop , Sue	Develop Your Assertiveness	Kogan Page India
05	Allen Pease	Body Language	Sudha Publications Pvt. Ltd.

EQUIPMENT LIST OF ELECTRICAL WORKS PRACTICE

Sl NO	EQUIPMENT LIST
1.	Single Core,Twin Core,Three Core,Four Core Copper and Aluminium PVC,VIR,and Weatherproof Wire
2.	Copper and Aluminium Cable ,Crimping Lug
3.	Flourescent Tube Light
4.	High Pressure M.V Lamp
5.	Sodium Vapour Lamp
6.	M.H Lamp
7.	CFL
8.	Battery Charger and Lead Acid Battery
9.	Single Phase Motor(Fan)
10.	DC Generator
11.	DC Motor with Starter
12.	AC Motor with Starter
13.	L.T And H.T Aluminium Cable
14.	Crimping Tools and Lug
15.	Single Phase Induction Motor
16.	Three Phase Squirrel Cage Induction Motor
17.	Phase Wound Motor
18.	Single Phase/ Three phase Variac
19.	Megger

6th SEMESTER ELECTRICAL ENGINEERING

SUB:- ELECTRICAL WORKSHOP PRACTICE(Pr-1)

SL NO	NAME OF THE EXPERIMENT	APPARATUS REQUIRED	QUANTITY NO.
1	Identification of single core(SC),twin core(TC),three core(3C),four core(4C);copper and aluminium PVC,VIR &Weather proof(WP) wire and prepare Britannia T-joint and Married joint.	1. Electrician Knife 2. Sand paper 3. Combinational pliers 4. Side cutting pliers 5. Steel ruler 6. Try square 7. PVC wire	01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. As Per Reqd.
2	Cutting copper and aluminium cable and crimping lug to them from 4mm2 to 25mm2, cross section.	1. Copper wire 2. Aluminium wire 3. Crimping lug 4. Cable cutter	As Per Reqd. As Per Reqd. 01 NO. 01 NO.
3	Connection and testing of fluorescent tube light, high pressure M.V. lamp , sodium vapour lamp, M.H. lamp, CFL and latest model lamp-measure inductance, Lux/lumens(intensity of illumination) in each case -prepare lux table.	1. Fixing channel along with tube light holder at two ends of the channel 2. Choke 3. Blow type starter 4. Fluorescent tube 5. Electrician Knife 6. Insulated pliers 7. Insulated screw driver 8. Insulated cutter 9. Tester 10. Connecting wire	01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. As Per Reqd.
4	Study battery charger and make charging of lead acid battery (record charging voltage, current and specific gravity).	1. Bridge rectifier 2. Resistors 3. Diodes 4. NPN transistor 5. LED 6. Potentiometer	01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO.
5	Erection of residential building wiring by CTS and conduit Wiring system using main two points and test installation by test lamp method and a megger.	1. Main switch 2. Single way switch 3. Three- pin socket 4. FAN regulator 5. Ceiling rose 6. Cupper wire 7. Earth wire 8. Wooden screw	01 NO. 01 NO. 01 NO. 01 NO. 01 NO. As Per Reqd. As Per Reqd. As Per Reqd.

		9. Angle Holder 10. Batten holder 11. Switch 12. Lamp 13. Fuse	01 NO. 01 NO. 01 NO. 01 NO. As Per Reqd.
6	Fault finding & repairing of fan -prepare an inventory list of parts.	1. Ceiling Fan 2. Insulated Plier 3. Screw Driver 4. Tester	01 NO. 01 NO. 01 NO. 01 NO.
7	Find out fault of DC generator, repair and test it to run.	1. DC Generator 2. Prime mover 3. Voltmeter 4. Ammeter 5. Multimeter 6. Rheostat 7. Tachometer 8. Insulation tester 9 .Connecting Wires	01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. As Per Reqd.
8	Find out fault of DC motor starters and AC motor starter-prepare an inventory list of parts used in different starters.	1. Series lamp 2. Multimeter 3. Tester 4.Connecting Wire	01 NO. 01 NO. 01 NO. As Per Reqd.
9	Dismantle, over haul and assemble a single phase induction motor .Test and run it prepare an inventory list.	1. Phase induction motor. 2. Series lamp 3. Multimeter 4. Neon Tester 5. Combination plier 6. Screw Driver 7. Spanner 8. Electrician Knife 9. Insulation Tape 10. Connecting Wire	01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. As Per Reqd.
10	Dismantle over and assemble a three phase squirrel cage and phase wound motor. Test and run them.	1. 3phase squirrel cage motor 2. Phase wound motor 3. Series lamp 4. Multimeter 5. Tester 6. Combination Plier 7. Screw driver 8. Electrician knife 9. Connecting wire	01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. 01 NO. As Per Reqd.
11	Overhaul a single phase /3 phase variac.	1. Single phase variac 2. 3 phase variac	01 NO. 01 NO.

DIPLOMA CURRICULUM OF MECHANICAL ENGINEERING (SECOND YEAR) (3rd Semester)

(To be implemented from 2025-26)

Prepared by;

National Institute of Technical Teachers' Training & Research Kolkata
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Vetted by:
Domain experts from Polytechnics of Odisha

State Council for Technical Education & Vocational Training
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PROGRAMME TITLE: MECHANICAL ENGINEERING

SEMESTER - III

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme				Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory		Practical			
					L	T	P	End Exam	Progressive Assessment	End Exam	Progressive Assessment		
1	Programme core	MEPC201 TH:1	Manufacturing Processes		3	0	0	70	30	-	-	100	3
2		MEPC203 TH:2	Strength of Materials		3	0	0	70	30	-	-	100	3
3		MEPC205 TH:3	Material Science and Engineering		3	0	0	70	30	-	-	100	3
4		MEPC207 TH:4	Fluid Mechanics & Fluid Power		3	0	0	70	30	-	-	100	3
5		MEPC209 TH:5	Thermal Engineering-I		3	0	0	70	30	-	-	100	3
6		MEPC211 PR:1	Manufacturing Engineering Lab-I		0	0	4	-	-	15	35	50	2
7		MEPC213 PR:2	Material Testing and Metallography Lab		0	0	4	-	-	15	35	50	2
8		MEPC215 PR:3	Fluid mechanics & Fluid Power Lab		0	0	4	-	-	15	35	50	2
9		MEPC217 PR:4	Thermal Engineering-I Lab		0	0	4	-	-	15	35	50	2
10	**Summer Internship**	SI201	Summer internship – I*		0	0	0	-	-	15	35	50	2
TOTAL					**15**	**0**	**16**	**350**	**150**	**75**	**175**	**750**	**25**

*3 to 4-weeks after 2nd Semester

***The best of 2 IA conducted in a subject out of 20 marks to be considered. Assignment/ quiz etc. of 10 marks to be treated as part of IA. Besides this, Monthly Test to be conducted for each subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester. Club/Innovation/ Idea Tinkering Activities etc. shall be encouraged to be performed by students beyond the above stipulated hours.**

SEMESTER – III COURSES

TH:1- MANUFACTURING PROCESSES

L	T	P		
3	0	0		**Course Code: MEPC201**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE: Engineering basically means production of goods and services for human consumption The knowledge of various manufacturing processes leads to production of components, which are made from different metallic and non-metallic materials. These parts are produced using a variety of manufacturing processes with requisite strength, surface finish, size and shape. As a mechanical technician/ engineer, one should have the knowledge of these manufacturing processes, which will be very helpful for discharging his duties in manufacturing or maintenance.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Illustrate the importance of cutting fluids & lubricants in machining.
- Study various types of basic production processes. To select, operate and control the appropriate processes for specific applications.
- Define the concept of gear making and list various gear materials.
- Describe the importance of press tools and various die operations.
- Explain grinding and finishing processes.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Cutting Fluids & Lubricants:** Introduction; Types of cutting fluids, Fluids and coolants required in turning, drilling, shaping, sawing & broaching; Selection of cutting fluids, methods of application of cutting fluid; Classification of lubricants (solid, liquid, gaseous), Properties and applications of lubricants. **Lathe Operations:** Types of lathes – light duty, medium duty and heavy duty geared lathe, CNC lathe; Specifications; Basic parts and their functions; Operations and tools – Turning, parting off, Knurling, facing, Boring, drilling, threading, step turning, taper turning, Nomenclature of single point cutting tool of lathe.	10
II	**Broaching Machines:** Introduction to broaching; Types of broaching machines – Horizontal type (Single ram & duplex ram), Vertical type, pull up, pull down, and push down; Elements of broach tool; broach teeth details; Nomenclature; Tool materials. **Drilling:** Classification; Basic parts and their functions; Radial drilling machine; Types of operations; Specifications of drilling machine; Types of drills and reamers.	9

III	**Welding:** Classification; Gas welding techniques; Types of welding flames; Arc Welding – Principle, Equipment, Applications; Shielded metal arc welding; Submerged arc welding; TIG / MIG welding; Resistance welding - Spot welding, Seam welding, Projection welding; Welding defects; Brazing and soldering: Types, Principles, Applications. **Milling:** Introduction; Types of milling machines: plain, Universal, vertical; constructional details – specifications; Milling operations: simple, compound and differential indexing; Milling cutters – types; Nomenclature of teeth; Teeth materials; Tool signature of milling cutter; Tool & work holding devices.	9
IV	**Gear Making:** Manufacture of gears – by Casting, Moulding, Stamping, Coining Extruding, Rolling, Machining; Gear generating methods: Gear Shaping with pinion cutter & rack cutter; Gear hobbing; Description of gear hob; Operation of gear hobbing machine; Gear finishing processes; Gear materials and specification; Heat treatment processes applied to gears. **Press working:** Types of presses and Specifications, Press working operations - Cutting, bending, Drawing, punching, blanking, notching, lancing; Die set components- punch and die shoe, guide pin, bolster plate, stripper, stock guide, feed stock, pilot; Punch and die clearances for blanking and piercing, effect of clearance.	9
V	**Grinding and finishing processes:** Principles of metal removal by Grinding; Abrasives – Natural & Artificial; Bonds and binding processes: Vitrified, silicate, shellac, rubber, Bakelite; Factors affecting the selection of grind wheels: size and shape of wheel, kind of abrasive, grain size, grade and strength of bond, structure of grain, spacing, kinds of bind material; Standard marking systems: Meaning of letters & numbers sequence of marking, Grades of letters; Grinding machines classification-: Cylindrical, Surface, Tool & Cutter grinding machines; Construction details; Principle of centerless grinding; Advantages & limitations of centerless grinding; Finishing by grinding: Honing, Lapping, Super finishing; Electroplating: Basic principles, Plating metals, applications; Hot dipping: Galvanizing, Tin coating, Parkerizing, Anodizing; Metal spraying: wire process, powder process and applications; Organic coatings: Oil base Paint, Lacquer base, Enamels, Bituminous paints, rubber base coating; Finishing specifications.	8

REFERENCES:

1. Manufacturing technology – P N Rao, Tata McGraw-Hill Publications
2. Elements of workshop Technology (Volume I & II) – S. K. Hajra Chaudary, Bose & Roy, Media Promoters and Publishers Limited.
3. Production Technology (Volume I & II) – O. P. Khanna & Lal, Dhanpat Rai Publications.
4. Fundamental of metal cutting and machine tools– B. L. Juneja, New age international limited.
5. Manufacturing Technology, Metal Cutting & Machine tools– P. N. Rao, Tata McGraw-Hill Publications

TH:2- STRENGTH OF MATERIALS

L	T	P		
3	0	0		**Course Code: MEPC203**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE:

Strength of materials deals with the internal behavior of solid bodies loaded in different manner. The common solid bodies e.g. shafts, bars, beams, plates and columns are the basic components of structures and machines. This subject primarily focuses on mechanical properties of materials, analysis of stress, strain and evaluation of deformation. Hence all students should have acquainted with strength of materials to become successful technician

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Apply the concept of Simple Stresses and Strains.
- Describe the concept of Strain Energy.
- Define the concept of Shear Force and Bending Moment Diagrams.
- Apply the concept of Theory of Simple Bending and Deflection of Beams.
- Outline the concept of Torsion in Shafts and Springs.
- Illustrate the concept of Thin Cylindrical Shells.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Simple Stresses and Strains:** Types of forces; Stress, Strain and their nature; Mechanical properties of common engineering materials; Significance of various points on stress – strain diagram for M.S. and C.I. specimens; Significance of factor of safety; Relation between elastic constants; Stress and strain values in bodies of uniform section and of composite section under the influence of normal forces; Thermal stresses in bodies of uniform section and composite sections; Related numerical problems on the above topics. **Strain Energy:** Strain energy or resilience, proof resilience and modulus of resilience; Derivation of strain energy for the following cases: i) Gradually applied load, ii) Suddenly applied load, iii) Impact/ shock load; Related numerical problems.	10
II	**Shear Force & Bending Moment Diagrams:** Types of beams with examples: a) Cantilever beam, b) Simply supported beam, c) Over hanging beam, d) Continuous beam, e) Fixed beam; Types of Loads – Point load, UDL and UVL; Definition and explanation of shear force and bending moment; Calculation of shear force and bending moment and drawing the S.F and B.M. diagrams by the analytical method only for the following cases: a) Cantilever with point loads, b) Cantilever with uniformly distributed load, c) Simply supported beam with point loads, d) Simply supported beam with UDL, e) Over hanging beam with point loads, at the center and at free ends, f) Over hanging beam with UDL throughout, g) Combination of point and UDL for the above; Related numerical problems.	9

III	**Theory of Simple Bending and Deflection of Beams:** Explanation of terms: Neutral layer, Neutral Axis, Modulus of Section, Moment of Resistance, Bending stress, Radius of curvature; Assumptions in theory of simple bending; Bending Equation $M/I = \sigma/Y = E/R$ with derivation; Problems involving calculations of bending stress, modulus of section and moment of resistance; Calculation of safe loads and safe span and dimensions of cross-section; Definition and explanation of deflection as applied to beams; Deflection formulae without proof for cantilever and simply supported beams with point load and UDL only (Standard cases only); Related numerical problems.	9
IV	**Torsion in Shafts and Springs:** Definition and function of shaft; Calculation of polar M.I. for solid and hollow shafts; Assumptions in simple torsion; Derivation of the equation $T/J=f_S/R=G\theta/L$; Problems on design of shaft based on strength and rigidity; Numerical Problems related to comparison of strength and weight of solid and hollow shafts; Classification of springs; Nomenclature of closed coil helical spring; Deflection formula for closed coil helical spring (without derivation); stiffness of spring; Numerical problems on closed coil helical spring to find safe load, deflection, size of coil and number of coils.	9
V	**Unit-V: Thin Cylindrical Shells:** Explanation of longitudinal and hoop stresses in the light of circumferential and longitudinal failure of shell; Derivation of expressions for the longitudinal and hoop stress for seamless and seam shells; Related numerical Problems for safe thickness and safe working pressure.	8

REFERENCES:

1. Strength of Materials – D.S. Bedi, Khanna Book Publishing Co. (P) Ltd., Delhi, 2017
2. Strength of Materials – B.C.Punmia, Ashok Kumar Jain & Arun Kumar Jain, Laxmi Publica- tions, New Delhi, 2013
3. Strength of Materials – R.S. Khurmi, S.Chand Company Ltd. Delhi

TH:3- MATERIAL SCIENCE & ENGINEERING

L	T	P		Course Code: MEPC205	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PC	

RATIONALE:

Engineering Materials play an important role as the vital tool for solving the problems of material selection and application in the production and manufacturing of equipment/machines, devices, tools, etc. Therefore, an engineering diploma student must be conversant with the properties, composition and behavior of materials from the point of view of reliability and performance of the product. Subject is concerned with the changes in structure and properties of matter. Many of the processes which are involved to bring out these changes, forms the basis of engineering activities. The study of basic concepts of material science and metallurgy will help the students understanding engineering subjects where the emphasis is laid on the application of these materials.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Explain about crystal structures and atomic bonds.
- Describe about classification of ferrous metals and their properties.
- Explain about non-ferrous metals, cutting tool materials and composites along with their properties.
- Describe about the various metallic failures and knowledge in testing of materials.
- Explain the principle of corrosion, their types, its prevention methods along with the various surface engineering processes.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Crystal structures and Bonds:** Unit cell and space lattice: Crystal system: The seven basic crystal systems; Crystal structure for metallic elements: BCC, FCC and HCP; Coordination number for Simple Cubic, BCC and FCC; Atomic radius: definition, atomic radius for Simple Cubic, BCC and FCC; Atomic Packing Factor for Simple Cubic, BCC, FCC and HCP; Simple problems on finding number of atoms for a unit cell. **Bonds in solids:** Classification - primary or chemical bond, secondary or molecular bond; Typesof primary bonds: Ionic, Covalent and Metallic Bonds; Types of secondary bonds: Dispersion bond, Dipole bond and Hydrogen bond	10
II	**Unit-II: Phase diagrams, Ferrous metals and its Alloys:** Isomorphs, eutectic and eutectoid systems; Iron-Carbon binary diagram; Iron and Carbon Steels; flow sheet for production of iron and steel; Iron ores – Pig iron: classification, composition and effects of impurities on iron; Cast Iron: classification, composition, properties and uses; Wrought Iron: properties, uses/applications of wrought Iron; comparison of cast iron, wrought iron and mild steel and high carbon steel; standard commercial grades of steel as per BIS and AISI; Alloy Steels – purpose of alloying; effects of alloying elements – Important alloysteels: Silicon steel, High Speed Steel (HSS), heat resisting steel, spring steel,Stainless Steel (SS): types of SS, applications of SS – magnet steel – composition, properties and uses	9

III	**Non-ferrous metals and its Alloys:** Properties and uses of aluminum, copper, tin, lead, zinc, magnesium and nickel; Copper alloys: Brasses, bronzes – composition, properties and uses; Aluminum alloys: Duralumin, hindalium, magnelium – composition, properties and uses; Nickel alloys: Inconel, monel, nicPerome – composition, properties and uses. Anti-friction/Bearing alloys: Various types of bearing bronzes - Standard commercial grades as per BIS/ASME.	9
IV	**Failure analysis & Testing of Materials:** Introduction to failure analysis; Fracture: ductile fracture, brittle fracture; cleavage; notch sensitivity; fatigue; endurance limit; characteristics of fatigue fracture; variables affecting fatigue life; creep; creep curve; creep fracture; Destructive testing:Tensile testing; compression testing; Hardness testing: Brinell, Rockwell; bend test; torsion test; fatigue test; creep test. Non-destructive testing: Visual Inspection; magnetic particle inspection; liquid penetrant test; ultrasonic inspection; radiography.	9
V	**Corrosion & Surface Engineering:** Nature of corrosion and its causes; Electro chemical re-actions; Electrolytes; Factors affecting corrosion: Environment, Material properties and physical conditions; Types of corrosion; Corrosion control: Material selection, environment control and design; Surface engineering processes: Coatings and surface treatments; Cleaning and mechanical finishing of surfaces; Organic coatings; Electroplating and Special metallic plating; Electro polishing and photo-etching ;– Conversion coatings: Oxide, phosphate and chromate coatings; Thin film coatings: PVD and CVD; Surface analysis; Hard-facing, thermal spraying and high-energy processes; Process/mate-rial selection. Pollution norms for treating effluents as per standards.	8

REFERENCES:

1. Material Science –GBS Narang-Khanna Publishers, New Delhi
2. Material Science –R.K.Rajput –Lakshmi Publication , New Delhi
3. Material Science-R.S.Khurmi,R,S.Sedha-S.Chand,Publication
4. Material Science and Metallurgy –D.S.Nutt-S.K,Katariya and Sons,New Delhi
5. Material Science and Engineering -V.Raghavan-EEE Edition,Prentice Hall ,New Delhi

TH:4- FLUID MECHANICS & FLUID POWER

L	T	P		Course Code: MEPC207	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PC	

RATIONALE: Use of fluids in engineering field is of great importance. It is therefore necessary to study the physical properties and characteristic of fluids which have very important use and application in automobile engineering. Fluid power plays dominant role in industrial world knowledge of which is essential for mechanical engineering students. Actual use of or action by various liquids like water and oil can be realized by a group of machines called fluid machines. Mechanical students should be conversant with design, operation and use of these fluid machines.

LEARNING OUTCOMES:

After completion of the course, the students will be able

- Identify the properties of a fluid and hydrostatics.
- Explain the basic kinematics and dynamics of fluid mechanics
- Describe the flow through orifices, notches and pipes.
- Classify different types of turbines and pumps.
- Applythe knowledge of fluid power.

DETAILED CONTENT

Unit No.	Content	Time Allotted (Hrs.)
I	**PROPERTIES OF A FLUID AND HYDROSTATICS:** Definition of a fluid, classification of fluids, various fluid properties such as density, specific weight, specific gravity, viscosity and surface tension and state the units, fluid pressure, total pressure (hydrostatic force) and location of centre of pressure on vertical, horizontal , inclined and curved surfaces by fluid, working of various measuring devices for pressure, the principle of manometers of simple, differential and inverted types, principle of buoyancy and floatation. Simple numericals on Manometer.	**9**
II	**KINEMATICS AND DYNAMICS OF FLUID MECHANICS** Various types of flow, circulation and vorticity, stream-line, path line and streak-line, various energies of fluid, law of conservation of mass, energy equation -Bernoulli's theorem, the limitations of same-application of Bernoulli's equation, the working of venturimeter, pitot tube, equation of flow rate and velocity with respect to venturimeter and pitot tube respectively, the working of flowmeter: current meter, Simple numericals.	**6**
III	**FLOW THROUGH ORIFICES AND NOTCHES, PIPES:** Definition –orifice, orifice coefficient such as Cc, Cv, Cd, Relationship between orifice coefficients, weir and notch, Discharge over rectangular notch and weir, triangular notch. Simple numericals. Definition of a pipe. laws of fluid friction, Equation of loss of head through pipe due to friction, Darcy's formula and Chezy's formula, hydraulic gradient and total energy line, Nozzle and its application, Power transmission through nozzle The condition of maximum power transmission through nozzle, Expression for diameter of nozzle for maximum power transmission.	**9**

IV	**Turbines and Pumps:** Classification of hydraulic turbines, Selection of turbine on the basis of head and discharge available, Construction and working principle of Pelton wheel, Francis and Kaplan turbines. Draft tubes – types and construction, Concept of cavitation in turbines, Calculation of Work done, Power, efficiency of turbines. Simple numericals **Centrifugal Pumps:** Principle of working and applications, Types of casings and impellers, Concept of multistage, Priming and its methods, Manometric head, Work done, Manometric efficiency, Overall efficiency. Simple numericals **Reciprocating Pumps:** Construction, working principle and applications of single and double acting reciprocating pumps, Concept of Slip, Negative slip, Cavitation and separation. Simple numericals	**12**
V	**FLUID POWER:** Definition of fluid power, classification – hydraulic power and pneumatic power, Hydraulic Systems -Basic principle of enclosed hydraulic system – Pascal's law, Oil hydraulic system – reservoir, filter pressure limiting valves, direction control valves, flow control valves, actuators (linear and rotary), accumulator, pipes and fittings, various positive displacement pumps-gear, vane, piston, drawing of hydraulic circuits - extension and retraction of linear actuator, motion of rotary actuator, holding a job, hydraulic press etc.	**9**

REFERENCES:

1. Fluid Mechanics and Hydraulic Machines – R. K. Bansal, Laxmi Publications, New Delhi.
2. Fluid Mechanics and Hydraulic Machines, S.S. Rattan, Khanna Publishing House, New Delhi.
3. Hydraulics and fluid mechanics including Hydraulic machines – Modi P.N. and Seth S.M., Standard Book House. New Delhi.
4. Hydraulics and Fluid Mechanics - Jagadish Lal- Metropolitan Book
5. Fluid Power with Applications - Anthony Esposito -Pearson Education Limited.
6. Hydraulic, fluid mechanics and fluid machines – S. Ramamrutham, Dhanpat Rai and Sons, New Delhi.

TH:5- THERMAL ENGINEERING I

L	T	P		**Course Code: MEPC209**	
3	0	0			
Total Contact Hours			**Total Marks: 100**	**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PC	

RATIONALE: Thermal-engineering is a crucial field that helps learners to understand and harness the power of heat transfer and energy conversion. From power generation to automotive engineering, the principles of thermal engineering have a wide range of applications in various industries.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Describe various sources of Energy and their applications.
- Classify I.C. engines and their working and constructional features.
- Draw the energy flow diagram of an I.C. engine and evaluate its performance.
- Describe the constructional features of air compressor and working of different air compressors.
- Describe the applications of refrigeration and Classify air-conditioning systems.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Introduction to Thermodynamics:** Thermodynamic Systems (closed, open, isolated) ; Thermodynamic properties of a system (pressure, volume, temperature, entropy, enthalpy, Internal energy and units of measurement) ; Intensive and extensive properties ; Define thermodynamic processes, path, cycle , state, path function, point function; Thermodynamic Equilibrium ; Quasi-static Process ; Laws of thermodynamics (statements only) **Sources of Energy:** Brief description of energy Sources: Classification of energy sources: Renewable, Non-Renewable; Fossil fuels (CNG & LPG) ; Solar Energy: Flat plate and concentrating collectors & its applications (working principles of Solar Water Heater, Photovoltaic Cell, Solar Distillation);Definitions of Wind Energy; Tidal Energy; Ocean Thermal Energy; Geothermal Energy; Biogas, Biomass, Bio-diesel; Hydraulic Energy, Nuclear Energy; Fuel cell.	10

II	**Internal Combustion Engines:** Assumptions made in air standard cycle analysis; Brief description of Carnot, Otto and Diesel cycles with P-V and T-S diagrams; Internal and external combustion engines; advantages of I.C. engines over external combustion engines; classification of I.C. engines; neat sketch of I.C. engine indicating component parts; Function of each part and materials used for the component parts - Cylinder, crank case, crank pin, crank, crank shaft, connecting rod, wrist pin, piston, cooling pins cylinder heads, exhaust valve, inlet valve; Working of four-stroke and two stroke petrol and diesel engines; Comparison of two stroke and four stroke engines; Comparison of C.I. and S.I. engines; Valve timing and port timing diagrams for four stroke and two stroke engines.	9
III	**I.C. Engine Systems:** Fuel system of Petrol engines; Principle of operation of simple and Zenith carburettors; Fuel system of Diesel engines; Types of injectors and fuel pumps; Cooling system: air cooling, water cooling system with thermo siphon method of circulation and water cooling system with radiator and forced circulation (description with line diagram). Comparison of air cooling and water cooling system; Ignition systems – Battery coil ignition and magneto ignition (description and working). Comparison of two systems; Types of lubricating systems used in I.C. engines with line diagram; Types of governing of I.C. engines – hit and miss method, quantitative method, qualitative method and combination methods of governing; their applications; Objective of super charging.	9
IV	**Performance of I.C. Engines:** Brake power; Indicated power; Frictional power; Brake and Indicated mean effective pressures; Brake and Indicated thermal efficiencies; Mechanical efficiency;Relative efficiency; Performance test; Morse test; Heat balance sheet; Methods of determination of B,P., I.P. and F.P.; Simple numerical problems on performance of I.C. engines.	9
V	**Unit-V: Air Compressors:** Functions of air compressor; Uses of compressed air; Types of air compressors; Single stage reciprocating air compressor - its construction and working (with line diagram) using P-V diagram; Multi stage compressors – Advantages over single stage compressors; Rotary compressors: Centrifugal compressor, axial flow type compressor and vane type compressors. **Refrigeration & Air-conditioning:** Refrigeration; Refrigerant; COP; Air Refrigeration system: components, working & applications; Vapour Compression system: components, working & applications; Air conditioning; Classification of Air-conditioning systems; Comfort and Industrial Air-Conditioning; Window Air-Conditioner; Summer Air-Conditioning system, Winter Air-Conditioning system, Year-round Air-Conditioning system.	**8**

REFERENCES:

1 Introduction to Renewable Energy– Vaughn Nelson, CRC Press

2. Thermal Engineering – P. L. Ballaney, Khanna Publishers, 2002

3. A Course in Thermal Engineering – S. Domkundwar & C.P. Kothandaraman, Dhanpat Rai.

4. Thermal Engineering – R. S. Khurmi and J.K. Gupta, 18th Edition, S. Chand & Co, New Delhi.

5. Thermal Engineering – R. K. Rajput, 8th Edition, Laxmi publications Pvt Ltd, New Delhi.

PR:1- MANUFACTURING ENGINEERING LAB-I

L	T	P			
0	0	4		**Course Code: MEPC211**	
Total Contact Hours				**Practical Assessment**	
Practical		:60Hrs	**Total Marks: 50**	End Term Exam	15
				Progressive Assessment	35
Pre Requisite		:			
Credit		**2**		Category of Course : PC	

RATIONALE: Manufacturing Engineering Lab-I provides hands-on experience with machining, welding, and fabrication processes, enhancing technical skills for industrial applications. It helps students understand manufacturing techniques, safety standards, and quality control essential for mechanical engineering careers.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Prepare a mould sand mix and molten metal and calculate the amount of metal to be poured in the mould
- Centre the job and select the proper tool to perform the job on lathe machine.
- Calculate the taper angle and practice different taper turning methods on lathe.
- Prepare the edges for welding and select the suitable electrode, voltage and current.
- Operate the welding transformer and generator to perform various weld joint operations.

List of Experiments

S.No.	Topics for practice
1.	Moulding & casting of (i) Connecting rod (ii) Solid bearing (iii) V-Pulley/Gear Pulley
2.	Arc welding (i) Lap Joint (ii) Butt Joint (iii) T- Joint
3.	Gas welding (i) Lap Joint (ii) Butt Joint
4.	Spot welding (i) Lap Joint
5.	Turning Exercise (i) Facing, Step Turning & Chamfering (ii) Step Turning & Taper Turning (iii) Step Turning & Groove Cutting (iv) Step Turning & & Knurling (v) Step Turning & Thread Cutting (vi) Turning and Drilling
6.	Grinding the Lathe Cutting tools to the required angles
7.	Study of Lathe, Drilling machine, shaping machine and slotting machine
8.	The dismantling some of the components of lathe and then assemble the same
9.	List the faults associated with lathe and its remedies
10.	The routine and preventive maintenance procedure for lathe

REFERENCES:

1. Elements of Workshop Technology (Volume I & II) – Hajra Chowdry & Bhattacharaya, MediaPromoters, 11th Edition, 2007
2. Introduction of Basic Manufacturing Processes and Workshop Technology – Rajendersingh,New age International (P) Ltd. NewDelhi, 2006
3. Workshop Technology – Raghuwanshi, Khanna Publishers. Jain &Gupta, New Delhi, 2002
4. Production Technology – Jain & Gupta, Khanna Publishers, New Delhi, 2006.
5. Production Technology – HMT, 18th edition, Tata McGraw Hill, New Delhi
6. Manufacturing process – Myro N Begman, 5th edition, Tata McGraw Hill, New Delhi

PR:2- MATERIAL TESTING AND METALLOGRAPHY LAB

L	T	P		
0	0	4		**Course Code: MEPC213**
Total Contact Hours				**Practical Assessment**
Practical		:60Hrs	**Total Marks: 50**	End Term Exam 15
				Progressive Assessment 35
Pre Requisite		:		
Credit		**2**		Category of Course : PC

RATIONALE: Material Testing and Metallography Lab helps students understand the mechanical properties of materials through tests like hardness, tensile, and impact testing. It also provides hands-on experience in metallographic techniques for analyzing microstructures, ensuring quality control in engineering applications.

LEARNING OUTCOMES:

After completion of the course, the students will be able to
to identify the type of material based on its grain structure
to learn the procedure for identifying the cracks in the material
to Illustrate various material testing methods to determine mechanical properties such asyield stress, Ultimate stress, percentage elongation, Young's Modulus etc.

Sl. No.	**Topics for practice**
I	Prepare a specimen and examine the microstructure of the Ferrous and Non- ferrous metals using the Metallurgical Microscope.
II	Detect the cracks in the specimen using (i) Visual inspection and ring test (ii) Die penetration test (iii) Magnetic particle test.
III	Determination of Rockwell's Hardness Number for various materials like mild steel, high carbon steel, brass, copper and aluminium.
IV	Finding the resistance of materials to impact loads by Izod test and Charpytest.
V	Torsion test on mild steel – relation between torque and angle of twist determination ofshear modulus and shear stress.
VI	Finding Young's Modulus of Elasticity, yield points, percentage elongation and percentagereduction in area, stress strain diagram plotting, tests on mild steel.
VII	Determination of modulus of rigidity, strain energy, shear stress and stiffness by load deflection method (Open & Closed coil spring)
VIII	Single or double Shear test on M.S. bar to finding the resistance of material to shear load.

REFERENCES:

1. Measurement system (Application and Design) – Ernest O Doebelin.
2. Strength of Materials – R. S. Khurmi, S. Chand Company Ltd. Delhi
3. A Text Book strength of Material– R.K. Bansal, Laxmi Publication New Delhi

PR:3- FLUID MECHANICS & FLUID POWER LAB

L	T	P		Course Code: MEPC215	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		:60Hrs	**Total Marks: 50**	End Term Exam	15
				Progressive Assessment	35
Pre Requisite		:			
Credit		**2**		Category of Course : PC	

RATIONALE: Fluid Mechanics & Fluid Power Lab helps students understand fluid properties, flow behavior, and hydraulic and pneumatic systems. It provides hands-on experience with flow measurement, pump testing, and fluid power applications essential for mechanical engineering.

LEARNING OUTCOMES

After completion of the course, the students will be able to

- Measure various properties such as pressure, velocity, flow rate using various instruments.
- Calculate different parameters such as co-efficient of friction, power, efficiency etc. of various systems.
- Illustrate the need and importance of calibration of pressure gauges.
- Describe the construction and working of turbines and pumps.
- Test the performance of turbines and pumps and Plot characteristics curves.
- Study the hydraulic and pneumatic circuits,

List of Experiments

Sl. No.	Topics for practice
1	Verification of Bernoulli's theorem.
2	Determination of Coefficient of Discharge of Venturi meter.
3	Determination of Coefficient of Discharge, coefficient of contraction and coefficient of velocity of Orifice meter.
4	Determination of coefficient of friction of flow through pipes.
5	Determination of force exerted by the jet of water on the given vane.
6	Determination of minor losses of flow through pipes.
7	Calibration of pressure gauge using dead weight pressure gauge tester.
VIII	Trial on centrifugal pump to determine overall efficiency.
IX	Trial on reciprocating pump to determine overall efficiency.
X	Trial on Pelton wheel /Francis/Kaplan turbine to determine overall efficiency.
XI	Analysis of Hydraulic circuits in a hydraulic trainer
XII	Analysis of pneumatic circuits in a pneumatic trainer

REFERENCES:

1. Fluid Mechanics and Machinery Laboratory Manual- N. Kumara Swamy, Charotar Publishing House Pvt. Ltd., ANAND 388 001, Ed. 2008

2. Fluid Power with Applications - Anthony Esposito -Pearson Education Limited.

PR:4- THERMAL ENGINEERING-I LAB

L	T	P		Course Code: MEPC217	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		:60Hrs	**Total Marks: 50**	End Term Exam	15
				Progressive Assessment	35
Pre Requisite		:			
Credit		**2**		Category of Course : PC	

RATIONALE: Thermal Engineering-I Lab helps students understand the IC engine performance through practical experiments. It provides hands-on experience with engines, compressors, and calorimeters essential for thermal system analysis.

LEARNING OUTCOMES

After completion of the course, the students will be able to

- Determine the flash and fire point of a given sample of fuel using given apparatus (Abels, Cleveland & Penesky martin)
- Find out the viscosity of a given sample of oil using given apparatus.
- Calculate the calorific value of a given sample of fuel using given apparatus.
- Determine the amount of carbon residue of a given sample of petroleum product.
- Draw VTD /PTD of given I.C. Engine and understand how the processes are controlled during its operation.
- Describe the functions of various parts of IC engines and the working of IC engines.

Course Content

Sl. No.	Topics for practice
1	Flash & Fire point tests using Able's/Cleveland/Pensky Martin Apparatus
2	Viscosity measurement usi/Saybolt viscometer
3	Calorific value tests using Bomb Calorimeter (Solid and Liquid fuels) and Junkers Gas Calorimeter (Gaseous fuels)
4	Carbon residue test using Conradson's apparatus.
5	Assembling and disassembling of I.C. Engines
6	Port timing diagram of Petrol engine
7	Port timing diagram of Diesel engine
8	Valve timing diagram of Petrol engine
9	Valve timing diagram of Diesel engine
10	Study of petrol and diesel engine components and Models

REFERENCES:

1. Thermal Engineering – P.L. Ballaney, Khanna Publishers, 2002
2. A Course in Thermal Engineering – S. Domkundwar & C.P. Kothandaraman, Dhanpat Rai & Publication New Delhi
3. Thermal Engineering – R.S. Khurmi and J.K. Gupta, 18th Edition, S. Chand & Co, New Delhi

SUMMER INTERNSHIP – I

L	T	P		Course Code: SI201	
0	0	0			
Total Contact Hours				Internship Assessment	
Practical		0	Total Marks: 50	End Term Exam	15
				Progressive Assessment	35
Pre Requisite		: Nil			
Credits		2		Category of Course : SI	

Duration: 3-4 weeks during summer vacation after 2nd Semester.

RATIONALE

Summer Internship - I is to offer a structured and practical learning experience that prepares individuals for their future careers, helps them make informed career choices, and equips them with the skills and knowledge necessary to succeed in their chosen field. This course provides opportunities to students for hands-on industry experience.

LEARNING OUTCOMES

After completion of the course, the students will be able to:

- Apply theoretical knowledge gained in their academic coursework to real-world situations.
- Enhance specific skills relevant to their field.
- Gain hands-on experience in a professional network by interacting with mentors and industry professionals.
- Manage time effectively.
- Clarify career goals.

DETAILED COURSE CONTENTS

SUGGESTED ACTIVITIES:

I Orientation:

- Introduction to the organization's mission, values, and culture.
- Familiarization with workplace policies, procedures, and safety guidelines.
- Orientation to the team and organizational structure.

II Project-Based Learning:

- Description of the main project or tasks the intern will be working on during the internship.
- Detailed project goals and objectives.
- Training and guidance on project-specific tools, technologies, or methodologies.

III Technical and Skill Development:

- Training sessions or workshops to enhance technical skills relevant to the internship role (e.g., programming languages, software tools, laboratory techniques).
- Soft skills development, including communication, teamwork, problem solving, and time management

IV Mentorship and Supervision:

- Regular meetings with a designated mentor or supervisor for guidance, feedback, and support.
- Mentorship objectives and expectations.

V Professional Development:

- Sessions on professional etiquette, networking, and building a personal brand
- Resume writing and interview preparation workshops.

VI Industry and Field-Specific Knowledge:

- Lectures, seminars, or presentations on industry trends, best practices, and emerging technologies.
- Guest speakers from the field to share insights and experiences.

VII Reporting and Documentation:

- Training on how to document project progress, results, and findings.
- Practice in creating reports, presentations, or other deliverable.

VIII Ethics and Professionalism:

- Discussions on ethical considerations within the field.
- Scenarios and case studies related to ethical decision-making

IX Feedback and Evaluation:

- Regular performance evaluations and feedback sessions.
- Self-assessment and goal-setting exercises.

X Networking and Industry Exposure:

- Opportunities to attend industry conferences, webinars, or networking events.
- Encouragement to connect with professionals in the field.

NOTE

As per AICTE guidelines, in Summer Internship-I, students are required to be involved in Inter/ Intra Institutional Activities viz;

- Training with higher Institutions;
- Soft skill training organized by Training and Placement Cell of the respective institutions;
- contribution at incubation/ innovation /entrepreneurship cell of the institute;
- participation in conferences/ workshops/ competitions etc.;
- Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop;
- Working for consultancy/ research project within the institutes and
- Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

3rd SEMESTER MECHANICAL ENGG.

PR:1- MANUFACTURING ENGINEERING LAB-I

SL NO.	AIM OF THE EXPERIMENT	APPARATUS REQUIRED	NO OF QTY.
1.	Moulding & casting of (i) Connecting rod (ii) Solid bearing (iii) V-Pulley/Gear Pulley	Pattern, Sand moulding equipment, crucible, Ladle, Sand sieve,	5
2.	Arc welding (i) Lap Joint (ii) Butt Joint (iii) T- Joint	Arc welding machine, Electrodes, mild steel work piece ,Chipping hammer, Wire brush, Steel rule, safety gloves,googles,welding nozzle tip	6
3.	Gas welding (i) Lap Joint (ii) Butt Joint	Oxy-Acetylene welding set, Filler rods, mild steel work piece, hammer, Wire brush, Steel rule,safety gloves,eye screen glass,spark lighter	6
4.	Spot welding (i) Lap Joint	Spot welding machine, Electrodes holder, Mild steel work piece, Wire brush, Steel rule, safety gloves,eye screen glass,chipping hammer,	5
5.	Turning Exercise (i) Facing, Step Turning & Chamfering (ii) Step Turning & Taper Turning (iii) Step Turning & Groove Cutting (iv) Step Turning & & Knurling (v) Step Turning & Thread Cutting (vi) Turning and Drilling	Centre lathe machine, Mild steel work piece, Tool bits, Vernier caliper, Steel Rule,	5
6.	Grinding the Lathe Cutting tools to the required angles	Electric grinding machine, work piece, Vernier caliper	3
7.	Study of Lathe, Drilling machine, shaping machine and slotting machine	Lathe, Drilling machine, shaping machine and slotting machine	4
8.	The dismantling some of the components of lathe and then assemble the same	Centre lathe machine, hand tool, torque wrench, Vernier caliper , Measuring tape	5
9.	List the faults associated with lathe and its remedies	Centre lathe machine	1
10.	The routine and preventive maintenance procedure for lathe	Centre lathe machine	1

PR:2- MATERIAL TESTING AND METALLOGRAPHY LAB

SL NO.	AIM OF THE EXPERIMENT	APPARATUS REQUIRED	NO OF QTY.
1	Prepare a specimen and examine the microstructure of the Ferrous and Non- ferrous metals using the Metallurgical Microscope.	Metallurgical Microscope, specimen sample (brass and mild steel)	2
2	Detect the cracks in the specimen using (i) Visual inspection and ring test (ii) Die penetration test (iii) Magnetic particle test.	(i)Test specimen, Hammer, Magnifying glass (ii)Test specimen , penetrant dye, developer spray, UV lamp, Stopwatch (iii)ferromagnetic specimen , portable yoke , Field indicator, demagnetizer	12
3	Determination of Rockwell's Hardness Number for various materials like mild steel, high carbon steel, brass, copper and aluminium.	Rockwell hardness testing machine, Indenter, Test specimen ,Micrometer	3
4	Finding the resistance of materials to impact loads by Izod test and Charpy test.	Impact testing machine, V notch specimen ,Specimen vice, Vernier caliper	4
5	Torsion test on mild steel – relation between torque and angle of twist determination of shear modulus and shear stress.	Torsion testing machine , Mild steel specimen, Vernier caliper, Graph sheet	4
6	Finding Young's Modulus of Elasticity, yield points, percentage elongation and percentage reduction in area, stress strain diagram plotting, tests on mild steel.	Universal testing machine ,Mild steel specimen, Vernier caliper, Steel rule, Flat file	5
7	Determination of modulus of rigidity, strain energy, shear stress and stiffness by load deflection method (Open & Closed coil spring)	Spring testing machine, Load weights, Dial gauge, Vernier caliper, Steel rule	5
8	Single or double Shear test on M.S. bar to finding the resistance of material to shear load.	Universal testing machine, Mild steel specimen, Vernier caliper, shear test fixture.	4

PR:3- FLUID MECHANICS & FLUID POWER LAB

SL NO.	AIM OF THE EXPERIMENT	APPARATUS REQUIRED	NO OF QTY.
1	Verification of Bernoulli's theorem	Hydraulic bench, Stop watch, measuring tape	3
2	Determination of Coefficient of Discharge of Venturi meter.	Hydraulic bench, Stop watch, measuring tape	3
3	Determination of Coefficient of Discharge, coefficient of contraction and coefficient of velocity of Orifice meter.	Hydraulic bench, Stop watch, measuring tape	3
4	Determination of coefficient of friction of flow through pipes	Hydraulic bench, Stop watch, measuring tape	3
5	Determination of force exerted by the jet of water on the given vane	Hydraulic bench, Stop watch, measuring tape	3
6	Determination of minor losses of flow through pipes.	Hydraulic bench, Stop watch, measuring tape	3
7	Calibration of pressure gauge using dead weight pressure gauge tester.	Dead weight pressure gauge tester, Spirit level, Stop watch	3
8	Trial on centrifugal pump to determine overall efficiency	Centrifugal pump test rig, Stop watch, steel rule	3
9	Trial on reciprocating pump to determine overall efficiency.	Reciprocating pump test rig, Stop watch, steel rule,	3
10	Trial on Pelton wheel /Francis/Kaplan turbine to determine overall efficiency.	Pelton wheel turbine, Francis turbine, Kaplan turbine, Stop watch	4
11	Analysis of Hydraulic circuits in a hydraulic trainer	Hydraulic trainer bench	1
12	Analysis of pneumatic circuits in a pneumatic trainer	Pneumatic trainer bench	1

PR:4- THERMAL ENGINEERING-I LAB

SL NO.	AIM OF THE EXPERIMENT	APPARATUS REQUIRED	NO OF QTY.
1	Flash & Fire point tests using Able's/Cleveland/Pensky Martin Apparatus	Cleveland flash point and fire point, Kerosene, Stopwatch	3
2	Viscosity measurement usi/Saybolt viscometer	Saybolt universal viscometer, Petrol, Stopwatch	3
3	Calorific value tests using Bomb Calorimeter (Solid and Liquid fuels) and Junkers Gas Calorimeter (Gaseous fuels)	Bomb calorimeter, Charcoal, Diesel, Junker gas calorimeter, LPG, Stopwatch	6
4	Carbon residue test using Conradson's apparatus.	Conradson's apparatus, Diesel, Stop watch	3
5	Assembling and disassembling of I.C. Engines	Single cylinder petrol engine, Hand tool, Torque wrench, Feeler gauge, Vernier calliper, dial gauge, Wire brush	7
6	Port timing diagram of Petrol engine	Petrol engine, Port timing indicator, Hand tool, Graph paper, Stop watch	5
7	Port timing diagram of Diesel engine	Diesel engine, Port timing indicator, Hand tool, Graph paper, Stop watch	5
8	Valve timing diagram of Petrol engine	Petrol engine, Valve timing indicator, Hand tool, Graph paper, Stop watch	5
9	Valve timing diagram of Diesel engine	Diesel engine, valve timing indicator, Hand tool, Graph paper, Stop watch	5
10	Study of petrol and diesel engine components and Models	Petrol & Diesel engine model	2

DIPLOMA CURRICULUM OF MECHANICAL ENGINEERING (SECOND YEAR) (4th Semester)

(To be implemented from 2025-26)

Prepared by;

National Institute of Technical Teachers' Training & Research Kolkata
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Vetted by:
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PROGRAMME TITLE: MECHANICAL ENGINEERING

SEMESTER - IV

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme				Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory		Practical			
					L	T	P	End Exam	Progressive Assessment	End Exam	Progressive Assessment		
1	Programme core	MEPC202 TH:1	Theory of machines & mechanism		3	0	0	70	30	-	-	100	3
2		MEPC204 TH:2	Thermal Engineering-II		3	0	0	70	30	-	-	100	3
3		MEPC206 TH:3	Computer-integrated Manufacturing (CIM)		3	0	0	70	30	-	-	100	3
4		MEPC208 PR:1	Theory of machines & mechanism lab		0	0	4	-	-	15	35	50	2
5		MEPC210 PR:2	Thermal Engineering-II lab		0	0	4	-	-	15	35	50	2
6		MEPC212 PR:3	CAD/CAM Lab		0	0	4	-	-	15	35	50	2
7	Programme elective	MEPE202 (Any one) TH:4	(a). Refrigeration and Air Conditioning (b). Renewable Energy Technologies c) Hydraulics & Pneumatics		3	0	0	70	30	-	-	100	3
8		MEPE204 (Any one) TH:5	(a). Computer-Aided Design and Manufacturing (b). Tool Engineering (c). Mechatronics		3	0	0	70	30	-	-	100	3
9	Minor Project	PR202 PR:4	MINOR PROJECT		0	0	4	-	-	30	70	100	2
10	Mandatory	AU202	Essence of Indian knowledge and tradition		**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL					**17**	0	**16**	**350**	**150**	**75**	**175**	**750**	**23**

The best of 2 IA conducted in a subject out of 20 marks to be considered. Assignment/ quiz etc. of 10 marks to be treated as part of IA. Besides this, Monthly Test to be conducted for each subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester. Club/Innovation/ Idea Tinkering Activities etc. shall be encouraged to be performed by students beyond the above stipulated hours

SEMESTER - IV COURSES

TH:1- THEORY OF MACHINES & MECHANISM

L	T	P		**Course Code: MEPC202**	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PC	

RATIONALE: This course provides foundational knowledge in machine elements and mechanical systems, focusing on the motion, design, and analysis of mechanisms. It equips students with the skills to apply kinematics, dynamics, and innovation in real-world mechanical applications.

LEARNING OUTCOMES:

After the completion of the course, the student shall be able to

- Explain different machine elements and mechanisms.
- Analyze kinematics and dynamics of various machines and mechanisms.
- Select suitable drives and mechanisms for specific applications.
- Apply the concepts of balancing and vibration in mechanical systems.
- Develop the ability to generate innovative mechanical design ideas.
- Identify different types of cams and their motions.

DETAILED COURSE CONTENTS

Unit	Topic/Subtopic	Hours
I	**Simple mechanism:** Link ,kinematic pair and types (Lower pair and higher pair) , kinematic chain, mechanism, Inversion, four bar link mechanism and its inversion **Cams and Followers:** Concept; Definition and application of Cams and Followers; Classification of Cams and Followers; Different follower motions and their displacement diagrams like uniform velocity, SHM, uniform acceleration and Retardation;	7
II	**Power Transmission:** Types of Drives – Belt, Chain, Rope, Gear drives & their comparison; Belt Drives - flat belt, V– belt & its applications; Material for flat and V-belt; Angle of lap, Belt length. Slip and Creep; Determination of Velocity Ratio, Ratio of tight side and slack side tension; Centrifugal tension and Initial tension; Condition for maximum power transmission (Simple numerical); Chain Drives – Advantages & Disadvantages; Selection of Chain & Sprocket wheels; Methods of lubrication; Gear Drives – Spur gear terminology; Types of gears and gear trains, their selection for different applications; Train value & Velocity ratio for compound, reverted and simple epicyclic gear train; Methods of lubrication; Law of gearing; Rope Drives – Types, applications, advantages & limitations of Steel ropes.	11

III	**Flywheel and Governors:** Flywheel - Concept, function and application of flywheel with the help of turning moment diagram for single cylinder 4-Stroke I.C. Engine (no Numerical); Coefficient of fluctuation of energy, Coefficient of fluctuation of speed and its significance; Governors - Types and explanation with neat sketches (Centrifugal, Watt and Porter);Concept, function and applications & Terminology of Governors (sensitivity, stability and isochronisms); Simple numerical on Watt and Porter Governor. Comparison between Flywheel and Governor	10
IV	**Brakes, Dynamometers, Clutches & Bearings**: Function of brakes and dynamometers; Types of brakes and Dynamometers; Comparison between brakes and dynamometers; Construction and working of i) shoe brake, ii) Band Brake, Numerical problems to find braking force and braking torque for shoe & band brakes; Concept of Self Locking & Self energizing brakes Construction and working of i) Rope Brake Dynamometer, ii) Hydraulic Dynamometer Clutches- Uniform pressure and Uniform Wear theories; Function of Clutch and its application; Construction and working of i) Single plate clutch, ii) Multiplate clutch, iii) Centrifugal Clutch iv) Cone clutch and v) Diaphragm clutch. (Simple numerical on single and Multiplate clutch) Bearings – i) Simple Pivot, ii) Collar Bearing, iii) Conical pivot. Torque & power lost in friction (no derivation). Simple numerical.	10
V	**Balancing & Vibrations:** Concept of balancing; Balancing of single rotating mass; Graphical method for balancing of several masses revolving in same plane; Concept and terminology used in vibrations, Causes of vibrations in machines; their harmful effects and remedies.	7

REFERENCES:

1. Theory of machines – S.S .Rattan ,Tata McGraw-Hill publications.
2. Theory of machines – R.K.Bansal ,Laxmi publications
3. Theory of machines – R.S. Khurmi & J.K.Gupta , S.Chand publications.
4. Dynamics of Machines – J B K Das, Sapna Publications.
5. Theory of machines – Jagdishlal, Bombay Metro – Politan book Ltd.

TH:2- THERMAL ENGINEERING-II

L	T	P		
3	0	0		**Course Code: MEPC204**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs		End Term Exam : 70
			Total Marks: 100	Progressive Assessment : 30
Pre Requisite		**:** Thermal Engineering- I (MEPC209)		
Credit		**: 3**		Category of Course: PC

RATIONALE:

Subject knowledge of thermal engineering is required in many industries. The objective of this course is to establish basic fundamental and practical knowledge in the field of gas turbines, jet propulsion, properties of steam, steam generator etc. These are major fields of mechanical engineering. Student will be able to understand different systems and apply its competencies in major fields in related industries. Knowledge of alternate fuels is required as emerging field and today's need of society which will be provided by the course content.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Explain the working cycle of gas turbines, and the working of Jet and Rocket Engines apart from identifying the fuels used for Jet and Rocket propulsion.
- Compute the work done, enthalpy, internal energy and entropy of steam at given conditions using steam tables and Mollier chart.
- Distinguish between water tube and fire-tube boilers and explain the function all the mountings and accessories.
- Calculate Velocity of steam at the exit of nozzle in terms of heat drop analytically and by using Mollier chart.
- State the necessity of governing and compounding of a turbine.
- Explain the principle of working of a steam turbine and distinguish between the impulse turbines and reaction turbines.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Gas Turbines:** Air-standard Brayton cycle; Description with p-v and T-S diagrams; Gas turbines Classification: open cycle gas turbines and closed cycle gas turbines; comparison of gas turbine with reciprocating I.C. engines and steam turbines. Applications and limitations of gas turbines; General lay-out of Open cycle constant pressure gas turbine; P-V and T-S diagrams and working; General lay-out of Closed cycle gas turbine; P-V and T-S diagrams and working. **Jet Propulsion:** Principle of jet propulsion; Fuels used for jet propulsion; Applications of jet propulsion; Working of a turbojet engine; Principle of Ram effect; Working of a Ram jet engine; Principle of Rocket propulsion; Working principle of a rocket engine; Applications of rocket propulsion; Comparison of jet and rocket propulsions.	10

II	**Properties of Steam:** Formation of steam under constant pressure; Industrial uses of steam; Basic definitions: saturated liquid line, saturated vapor line, liquid region, vapor region, wet region, superheat region, critical point, saturated liquid, saturated vapor, saturation temperature, sensible heat, latent heat, wet steam, dryness fraction, wetness fraction, saturated steam, superheated steam, degree of superheat; Determination of enthalpy, internal energy, internal latent heat, entropy of wet, dry and superheated steam at a given pressure using steam tables and Mollier chart for the following processes: Isochoric process, Isobaric process, Hyperbolic process, Isothermal process, Isentropic process, Throttling process, Polytropic process; Simple direct problems on the above using tables and charts; Steam calorimeters: Separating, throttling, Combined Separating and throttling calorimeters – problems.	10
III	**Steam Generators:** Function and use of steam boilers; Classification of steam boilers with examples; Brief explanation with line sketches of Cochran, Babcock and Wilcox Boilers; Comparison of water tube and fire tube boilers; Description with line sketches and working of modern high pressure boilers Lamont and Benson boilers; Boiler mountings: Pressure gauge, water level indicator, fusible plug, blow down cock, stop valve, safety valve, (dead weight type, spring loaded type, high pressure and low water safety alarm); Boiler accessories: feed pump, economizer, super heater and air preheater; Study of steam traps & separators; Explanation of the terms: Actual evaporation, equivalent evaporation, factor of evaporation, boiler horse power and boiler efficiency; Formula for the above terms without proof; Simple direct problems on the above; Draught systems (Natural, forced & induced).	8
IV	**Steam Nozzles:** Flow of steam through nozzle; Velocity of steam at the exit of nozzle in terms of heat drop using analytical method and Mollier chart; Discharge of steam through nozzles; Critical pressure ratio; Methods of calculation of cross-sectional areas at throat and exit for maxi- mum discharge; Effect of friction in nozzles and Super saturated flow in nozzles; Working steam jet injector; Simple numerical problems.	10
V	**Steam Turbines:** Classification of steam turbines with examples; Difference between impulse & reaction turbines; Principle of working of a simple De-lave turbine with line diagrams- Velocity diagrams; Expression for work done, axia thrust, tangential thrust, blade and diagram efficiency, stage efficiency, nozzle efficiency; Methods of reducing rotor speed; compounding for velocity, for pressure or both pressure and velocity; Working principle with line diagram of a Parson's Reaction turbine–velocity diagrams; Simple problems on single stage impulse turbines (without blade friction) and reaction turbine including data on blade height. Bleeding, re-heating and re-heating factors(Problems omitted); Governing of steam turbines: Throttle, By-pass & Nozzle control governing.	7

REFERENCES:

1. A Course in Thermal Engineering – S. Domkundwar & C. P. Kothandaraman, Dhanpat Rai & Publication, New Delhi
2. Thermal Engineering – R. K. Rajput, Laxmi Publication New Delhi
3. Thermal Engineering – P. L. Ballaney, Khanna Publishers, 2002
4. Treatise on Heat Engineering in MKS and SI Units – V. P. Vasandani & D.S. Kumar, Metropolitan Book Co. Pvt. Ltd, New Delhi.

TH:3- COMPUTER-INTEGRATED MANUFACTURING (CIM)

L	T	P		**Course Code: MEPC206**	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PC	

RATIONALE: Computer Integrated Manufacturing (CIM) encompasses the entire range of product development and manufacturing activities with all the functions being carried out with the help of dedicated software packages. CIM is considered a natural evolution of the technology of CAD/CAM. The product data is created during design and this data is transferred from the modeling software to manufacturing software without any loss of data.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Describe basic components and networks involved in CIM.
- Illustrate hardware, software and product modeling at industry level
- Apply process planning and program coding of task.
- Design a manufacturing cell and cellular manufacturing system.
- Design automated material handling and storage systems for a typical production system.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	Concept of Computer Integrated Manufacturing (CIM); Basic components of CIM; Distributed database system; distributed communication system, computer networks for manufacturing; future automated factory; social and economic factors.	10
II	Computer Aided Design (CAD): CAD hardware and software; product modelling, automatic drafting; engineering analysis; FEM design review and evaluation; Group Technology Centre.	10
III	Computer Aided Manufacturing (CAM), Computer assisted NC part programming for plain turning and step turning; Computer assisted robot programming; computer aided process planning (CAPP); computer aided material requirements planning (MRP)	8
IV	Computer aided production scheduling; computer aided inspection planning; computer aided inventory planning, Flexible manufacturing system (FMS); concept of flexible manufacturing.	10
V	Integrating NC machines, robots, AGVs, and other NC equipment; Computer aided quality control; business functions, computer aided forecasting; office automation	7

REFERENCES:

1. CAD, CAM, CIM by P. Radhakrishnan and S. Subramanyan, New Age International Publishers.
2. Computer Integrated Manufacturing by Paul G. Rankey, Prentice Hall.
3. Robotics Technology and Flexible Automation – S.R. Deb, TMH

PR:1- THEORY OF MACHINES & MECHANISM LAB

L	T	P		
0	0	4		**Course Code: MEPC208**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 50**	End Exam 15
				Progressive Assessment 35
Pre Requisite		**: Nil**		
Credit		**2**		Category of Course: PC

RATIONALE: This lab provides hands-on experience in analyzing and understanding the motion of various machine mechanisms. It enhances the students' ability to apply theoretical concepts in kinematics and dynamics to real-world mechanical systems.

LEARNING OUTCOMES:

After the completion of the course, the student shall be able to

- Identifyvarious links in popular mechanisms.
- Select suitable mechanismfor various applications.
- Analyzethe motion of cams and followers.
- Select relevant belts, chains anddrives for different applications.
- Select relevant brakes and clutches for various applications
- Select suitableflywheel and governor for various applications.

DETAILED COURSE CONTENTS

Sl. No.	List of Experiments
1.	Measure the ratio of time of cutting stroke to the return stroke in shaping machine available in institute's workshop by varying the stroke length.
2.	Estimate important kinematic data related to following mechanisms and sketch them (any one) a. Bicycle free wheel sprocket mechanism b. Geneva mechanism c. Ackerman's steering gear mechanism d. Foot operated air pump mechanism
3.	Study of construction and working principle of Eddy current Dynamometers
4.	Determine velocity and acceleration of various links of the given mechanism (any two) by relative velocity method for analysis of motion of links size drawing sheet).
5.	Determine velocity and acceleration in an I. C. engine's slider crank mechanism by Kleins's construction
6.	Drawing of profile of radial cam with knife-edge and roller follower with offset reciprocating motion (graphical method).
7.	Drawing of profile of radial cam with knife-edge and roller follower without offset reciprocating motion (graphical method).
8.	Estimate slip, length of belt, angle of contact in an open and cross belt drive.
9.	Calculate braking torque at different speeds and load situations of i) Internal expanding shoe brake ii) Disc Brake
10.	Assemble and dissemble different clutches.

11.	Measure radius and height of any two types of governors for different rotational speeds, mass of balls and spring stiffness (in spring loaded governors)
12.	Perform balancing of rotating unbalanced system

REFERENCES:

6. Theory of machines – S.S .Rattan ,Tata McGraw-Hill publications.
7. Theory of machines – R.K.Bansal ,Laxmi publications
8. Theory of machines – R.S. Khurmi & J.K.Gupta , S.Chand publications.
9. Dynamics of Machines – J B K Das, Sapna Publications.
10. Theory of machines – Jagdishlal, Bombay Metro – Politan book Ltd.

PR:2- THERMAL ENGINEERING-II LAB

L	T	P		**Course Code: MEPC210**	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs	**Total Marks: 50**	End Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course: PC	

RATIONALE: Thermal Engineering-II Lab provides hands-on experience with heat exchangers, boilers, steam turbines, and refrigeration systems. It helps students understand energy conversion, efficiency analysis, and thermal system performance in practical applications.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Evaluate the performance characteristics of single cylinder diesel/petrol engine at different loads and draw the heat balance sheet.
- Find the indicated power of individual cylinders of an engine by using morse test.
- Evaluate the performance characteristics Multi stage air compressor
- Evaluate the co efficient of performance of refrigerator
- Find the thermal conductivity of material

LIST OF EXPERIMENTS

1. Study of high-pressure boiler with model
2. Study of boiler mountings and accessories
3. Conduct performance test on VCR test rig to determine COP of the refrigerator
4. Conduct performance test on multi stage reciprocating compressor
5. Conduct Morse test to determine the indicated power of individual cylinders
6. Conduct Performance test on 2-S CI/SI engine.
7. Conduct Performance test on 4-S CI/SI engine.
8. Conduct Heat balance test on CI/SI engine.
9. Conduct Economical speed test on 4-S CI/SI engine.
10. Thermal conductivity test on 1) Thick slab 2) Composite wall 3) Thick cylinder
11. Leak detection of refrigeration equipment
12. Conduct performance test on A/C test rig to determine COP of the refrigerator

REFERENCES

1. Thermal Engineering – P.L. Ballaney, Khanna Publishers, 2002
2. A Course in Thermal Engineering – S. Domkundwar & C.P. Kothandaraman, Dhanpat Rai & Publication New Delhi
3. Thermal Engineering – R.S. Khurmi and J.K. Gupta, 18th Edition, S. Chand & Co, NewDelhi

PR:3- CAD/CAM LAB

L	T	P		**Course Code: MEPC212**	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs	**Total Marks: 50**	End Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course: PC	

RATIONALE: CAD/CAM Lab provides hands-on experience in computer-aided design (CAD) and computer-aided manufacturing (CAM) for product modeling and machining. It helps students develop skills in 3D modeling, CNC programming, and simulation for modern manufacturing applications.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Explain the 3D commands and features of a CAD software
- Create 3D solid model and find the mass properties of simples solids
- Demonstrate the working of CNC turning and milling machine
- Develop the part program using simulation software for Lathe and Milling
- Assess the part program, edit and execute in CNC turning and machining centre

LIST OF EXPERIMENTS

S. No.	**Topics for practice**
PART-A	Introduction: Part modelling; Datum Plane; constraint; sketch; dimensioning; extrude; revolve; sweep; blend; protrusion; extrusion; rib; shell; hole; round; chamfer; copy; mirror; assembly; align; orient. Exercises: 3D Drawings of 1). Geneva Wheel; 2). Bearing Block; 3). Bushed bearing: 4). Gib and Cotter joint; 5). Screw Jack; 6). Connecting Rod: Note: Print the orthographic view and sectional view from the above assembled 3D drawing.
PART-B	CNC Programming and Machining: Introduction; 1). Study of CNC lathe, milling; 2). Study of international standard codes: G-Codes and M-Codes; 3). Format – Dimensioning methods; 4). Program writing – Turning simulator – Milling simulator, IS practice – commands menus; 5). Editing the program in the CNC machines; 6). Execute the program in the CNC machines; Exercises: Note: Print the Program from the Simulation Software and make the Component in the CNC Machine. CNC Turning Machine: (Material: Aluminium/Acrylic/Plastic rod) 1. Using Linear and Circular interpolation - Create a part program and produce component in the Machine. 2. Using Stock removal cycle – Create a part program for multiple turning operations

	and produce component in the Machine. 3. Using canned cycle - Create a part program for thread cutting, grooving and pro duce component in the Machine. CNC Milling Machine (Material: Aluminium/ Acrylic/ Plastic) 1. Using Linear interpolation and Circular interpolation – Create a part program for grooving and produce component in the Machine. 2. Using canned cycle - Create a part program for drilling, tapping, counter sinking and produce component in the Machine. 3. Using subprogram - Create a part program for mirroring and produce component in the Machine.

REFERENCES

1. Machine Drawing – P.S. Gill S. K. Kataria & Sons, Delhi., 17th Revised edition, 2001
2. Mechanical Draughtsmanship - G.L. Tamta Dhanpat Rai & Sons, Delhi, 1992
3. Inside AutoCAD – D. Raker and H. Rice, BPB Publications, New Delhi, 1985
4. CAD/CAM/CIM – P. Radhakrishnan, S. Subramaniyan & V. Raju, New Age International Pvt. Ltd., New Delhi, 3rd Edition,
5. Engineering AutoCAD, A.P. Gautam & Pradeep Jain, Khanna Book Publishing Co., Delhi

TH:4(A)- REFRIGERATION AND AIR CONDITIONING

L	T	P		**Course Code: MEPE202(A)**	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PE	

RATIONALE: Main objective of the course in refrigeration and air conditioning is to make the students understand the basics of Refrigeration cycles. The basics of vapor compression and vapor absorption systems, components and refrigerants and lubricants of a refrigeration system, control strategies for refrigeration system and air conditioning systems are elaborated in this course.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Define refrigeration and types of Refrigeration cycles
- Explain Vapor Compression and Vapor Absorption System working principles
- Identify the components required for refrigeration system.
- Identify the controlling components for a refrigeration system.
- Explain the working principles of Air-conditioning.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	Introduction to Refrigeration: Definition of Refrigeration; Refrigerating effect- unit of refrigeration- Coefficient of performance; Types of Refrigeration-Ice, dry ice, Steam jet, Throttling, Liquid nitrogen refrigeration; Carnot refrigeration Cycle; Air refrigeration- Bell - Coleman cycle, PV& TS diagram; Advantage and disadvantages in air refrigeration; Simple problems	10
II	Refrigeration systems: Basic Components, Flow diagram of working of Vapour compression cycle; Representation of the vapour compression cycle on P-H, T-S & P-V Diagram; Expression for Refrigerating effect, work done and power required; Types of Vapour Compression cycle; Effects of super heating and under cooling, its advantages and disadvantages; Simple Vapour absorptions cycle and its flow diagram; Simple Electrolux system for domestic units; Comparison of Vapour absorption and vapour compression system; Simple problems on vapour compression cycle.	10
III	Refrigeration equipment: Compressor - types of compressors; Hermetically sealed and Semi hermetically sealed compressor; Condensers - Air Cooled, water cooled, natural and forced draught cooling system; Advantages and disadvantages of air cooled and water cooled condensers; Evaporators -natural, convection, forced convection types.	8
IV	Refrigerant flow controls: Capillary tube; Automatic Expansion valve; Thermo-static expansion valve; High side and low side float valve; Solenoid valve; Evaporator pressure regulator. Application of refrigeration: Slow and quick freezing; Cold storage and Frozen storage; Dairy refrigeration; Ice making industry; Water coolers.	8

V	**Air conditioning:** Introduction to Air conditioning; Factors affecting Air conditioning; Psychometric chart and its use; Psychometric process-sensible heating and cooling, Humidifying and dehumidifying; Adiabatic saturation process; Equipment used in air conditioning cycle; Air conditioning units and plants. **Refrigeration and Air-conditioning tools:** Tools used in refrigeration and Air conditioner installation; Installation procedure; Faults in refrigeration and air conditioning system; Servicing procedure.	9

REFERENCES:

1. Refrigeration and Air Conditioning – Sadhu Singh, Khanna Book Publishing Co., New Delhi
2. Refrigeration and Air Conditioning – S. Domakundawar, Dhanpat Rai publications.
3. Refrigeration and Air Conditioning – A.S.Sarao & G.S. Gabi, 6th edition, Satya Prakashan publications, New Delhi, 2004.
4. Principles of Refrigeration – Roy J.Dossat, 5th edition, Pearson Publications, 2001.
5. Refrigeration and Air Conditioning – M.Zakria Baig, Premier/ Radiant Publishing House.
6. Refrigeration and Air Conditioning – C.P Arora, Tata McGraw Hill Education, 2000.

TH:4(B)- RENEWABLE ENERGY TECHNOLOGIES

L	T	P		
3	0	0		**Course Code: MEPE202(B)**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course: PE

RATIONALE: The knowledge of renewable energy technologies is very much needed for diploma holders of mechanical engineering. The course is designed to give knowledge of various renewable energy sources, systems and applications in the present context and need.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Illustrate importance of renewable energy sources
- Describe various types of renewable energy technologies
- State applications of different renewable energy sources

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	Scenario of Renewable Energy (RE) Sources: Needs of renewable energy, advantages and limitations of RE, present energy scenario of conventional and RE sources. Solar Energy: Energy available from the sun, spectral distribution, solar radiation outside the earth's atmosphere and at the earth's surface, solar radiation geometry, Instruments for solar radiation measurements, empirical equations for prediction of availability of solar radiation, radiation on tilted surface solar energy conversion into heat, types of solar collectors, evacuated and non-evacuated solar air heater, concentrated collectors, thermal analysis of liquid flat plate collector, air heater and cylindrical parabolic collector, solar energy thermal storage, heating and cooling of buildings, solar pumping, solar cooker, solar still, solar drier, solar refrigeration and air conditioning, solar pond, heliostat, solar furnace photovoltaic system for power generation, solar cell modules and arrays, solar cell types, material, applications, advantages and disadvantages	10
II	Wind Energy: Energy available from wind, basics of lift and drag, basics of wind energy conversion system, effect of density, angle of attack and wind speed, windmill rotors, horizontal and vertical axes rotors, drag, lift, torque and power coefficients, tip speed ratio, solidity of turbine, wind turbine performance curves, wind energy potential and site selection, basics of wind farm	10

III	Bio Energy : Types of biogas plants, biogas generation, factors affecting biogas generation, advantages and disadvantages, biomass energy, energy plantation, gasification, types and applications of gasifiers, concept of green energy.	8
IV	Ocean Energy: OTEC principle, open, closed and hybrid cycle OTEC system, Energy from tides, estimation of tidal power, tidal power plants, single and double basin plants, site requirements, advantages and limitations, wave energy, wave energy conversion devices, advantages and disadvantages, ocean thermal energy	10
V	Geothermal energy: Introduction, vapor and liquid dominated systems, binary cycle, hot dry rock resources, magma resources, advantages and disadvantages, applications	7

REFERENCES:

1. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, McGraw Hill Education
2. Solar Engineering of Thermal Processes, John A. Duffie, William A. Beckman, John Wiley, New York
3. Non-conventional energyresources, Shobh Nath Singh, Pearson India
4. Solar Energy Engineering, Soteris Kalogirou, Elsevier/Academic Press
5. Principles of Solar Energy, Frank Krieth & John F Kreider, John Wiley, New York

TH:4(C)- HYDRAULICS & PNEUMATICS

L	T	P		
3	0	0		**Course Code: MEPE202(C)**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course: PE

RATIONALE: The course aims to provide students with knowledge of fluid power applications in industry and an understanding of hydraulic and pneumatic components and systems. It covers topics like fluid properties, pumps, actuators, control valves, hydraulic circuits, pneumatic systems, troubleshooting, and applications. The course objectives are to teach fluid power principles, hydraulic and pneumatic components, circuit design, and applications in industrial processes.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Describe the working principles of fluid power systems.
- Illustrate the fluids and components used in modern industrial fluid power system.
- Develop the design, construction, and operation of fluid power circuits.
- Explain working principles of a pneumatic power system and its components
- Applythe troubleshooting methods in fluid power systems.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Fluid Power Principles and Hydraulic Pumps** Introduction to Fluid Power – Advantages and Applications – Fluid power systems – Types of fluids Properties of fluids and selection – Basics of Hydraulics – Pascal's Law – Principles of flow – Friction loss – Work, Power, and Torque- Problems, Sources of Hydraulic power: Pumping Theory – Pump Classification – Construction, Working, Design, Advantages, Disadvantages, Performance, Selection criteria of pumps – Fixed and Variable displacement pumps – Problems.	10
II	**Hydraulic Actuators and Control Components-**Hydraulic Actuators: Cylinders – Types and construction, Application, Hydraulic cushioning – Rotary Actuators-Hydraulic motors – Control Components: Direction Control, Flow control and pressure control valves – Types, Construction, and Operation – Accessories: Reservoirs, Pressure Switches – Filters –types and selection- Applications – Fluid Power ANSI Symbols – Problems.	10
III	**Hydraulic Circuits and Systems-**Accumulators, Intensifiers, Industrial hydraulic circuits – Regenerative, Pump Unloading, Double-Pump, Pressure Intensifier, Air-over oil, Sequence, Reciprocation, Synchronization, Fail-Safe, Speed Control, Deceleration circuits, Sizing of hydraulic systems, Hydrostatic transmission, Electro-hydraulic circuits, –Servo and Proportional valves – Applications- Mechanical, hydraulic servo systems.	8

IV	**Pneumatic and Electro Pneumatic Systems**-Properties of air –Air preparation and distribution – Filters, Regulator, Lubricator, Muffler, Air Control Valves, Quick Exhaust Valves, Pneumatic actuators, Design of Pneumatic circuit – classification- single cylinder and multi-cylinder circuits-Cascade method – Integration of fringe circuits, Electro Pneumatic System – Elements – Ladder diagram – timer circuits-Problems, Introduction to fluidics and pneumatic logic circuits.	10
V	**Trouble Shooting and Applications**-Installation, Selection, Maintenance, Trouble Shooting and Remedies in Hydraulic and Pneumatic systems, Conditioning of hydraulic fluids Design of hydraulic circuits for Drilling, Planning, Shaping, Surface grinding, Press and Forklift applications- mobile hydraulics; Design of Pneumatic circuits for metalworking, handling, clamping counter and timer circuits. – Low-cost Automation – Hydraulic and Pneumatic power packs, IOT in Hydraulics and pneumatics.	7

REFERENCES:

1. Fluid Power with Applications- Anthony Esposito, Prentice Hall, 2009.
2. Fluid Power Theory and Applications-James A. Sullivan, Fourth Edition, Prentice Hall, 1997.
3. Pneumatics Concepts, Design and Applications -Jagadeesha. T., Universities Press, 2015.
4. Oil Hydraulics Systems – Principles and Maintenance S.R. Mujumdar-Tata McGraw Hill, 2001
5. Hydraulic and Pneumatic Controls- R., Srinivasan. Vijay Nicole Imprints, 3rd edition,2019.

TH:5(A)- COMPUTER-AIDED DESIGN AND MANUFACTURING

L	T	P		**Course Code:** MEPE204(A)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PE	

RATIONALE: This subject focuses on the use of computer technology for designing and manufacturing products. It covers CAD for creating detailed 2D and 3D models, and CAM for automated machining and production processes. These subject helps students understand modern design techniques, CNC programming, simulation, and integration of digital tools in manufacturing industries.

LEARNING OUTCOMES:

After completion of the course, the students will be able

- Provide an outline of how computers are being used in mechanical component design.
- Illustrate the application of computers in various aspects of Manufacturing
- Program the CNC machines
- Describe the concept of flexible manufacturing

DETAILED COURSE CONTENTS

Unit No.	**Topic/Sub-Topic**	**Allotted Time (Hours)**
I	INTRODUCTION Product cycle- Design process- sequential and concurrent engineering- Computer aided design — CAD system architecture- Computer graphics — co-ordinate systems- 2D and 3D transformations- homogeneous coordinates — Line drawing -clipping- viewing transformation-brief introduction to CAD and CAM — Manufacturing Planning, Manufacturing control- Introduction to CAD/CAM – CAD/CAM concepts —-Types of production — Manufacturing models and Metrics — Mathematical models of Production Performance	10
II	GEOMETRIC MODELING Representation of curves- Hermite curve- Bezier curve- B-spline curves-rational curves-Techniques for surface modeling — surface patch- Coons and bicubic patches- Bezier and B-spline surfaces. Solid modeling techniques- CSG and B-rep.	10

III	CAD STANDARDS Standards for computer graphics- Graphical Kernel System (GKS) — standards for exchange images- Open Graphics Library (OpenGL) — Data exchange standards — IGES, STEP, CALS etc. — communication standards.	8
IV	FUNDAMENTAL OF CNC AND PART PROGRAMING Introduction to NC systems and CNC — Machine axis and Co-ordinate system- CNC machine tools- Principle of operation CNC- Construction features including structure- Drives and CNC controllers- 2D and 3D machining on CNC- Introduction of Part Programming, types — Detailed Manual part programming on Lathe & Milling machines using G codes and M codes- Cutting Cycles, Loops, Sub program and Macros- Introduction of CAM package.	10
V	CELLULAR MANUFACTURING AND FLEXIBLE MANUFACTURING SYSTEM (FMS) Group Technology(GT), Part Families–Parts Classification and coding–Simple Problems in Opitz Part Coding system–Production flow Analysis–Cellular Manufacturing–Composite part concept–Types of Flexibility — FMS — FMS Components — FMS Application & Benefits — FMS Planning and Control — Quantitative analysis in FMS ME8691 Computer Aided Design and Manufacturing	7

REFERENCES:

1. Mastering CAD CAM -Ibrahim Zeid -Tata McGraw-Hill Publishing Co. 2007.
2. Automation, Production Systems and Computer Integrated Manufacturing -Mikell. P. Groover - Prentice Hall of India, 2008.
3. CAD/CAM/CIM- P, Radhakrishnan, S..Subramanian and V Raju.- 2nd Edition, New Age International (P) Ltd, New Delhi, 2000.
4. CAD/CAM Principles -Chris McMahon and Jimmie Browne -Practice and Manufacturing management" Second Edition, Pearson Education, 1999.
5. Principles of Computer Graphics-William M Neumann and Robert F.Sproul, McGraw Hill Book Co. Singapore, 1989.
6. Computer Graphics-Donald Hearn and M. Pauline Baker. Prentice Hall, Inc, 1992.
7. Computer graphics principles & practice- Foley, Wan Dam, Feiner and Hughes –Pearson Education – 2003.

TH:5(B)- TOOL ENGINEERING

L	T	P		**Course Code: MEPE204(B)**	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PE	

RATIONALE: Tool Engineering is a subject that focuses on the design, development, and application of cutting tools, jigs, fixtures, and dies used in manufacturing. It covers tool materials, tool design, machining processes, and optimization techniques to enhance production efficiency, precision, and quality in industrial applications.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Illustrate concepts, principles and procedures of tool engineering
- Classify and explain various tools and tool operations
- Select proper tool and a die for a given manufacturing operation to achieve highest produc- tivity
- Estimate tool wear and tool life

DETAILED COURSE CONTENTS

Unit No.	**Topic/Sub-Topic**	**Allotted Time (Hours)**
I	Metal Cutting: Mechanics of Metal cutting; requirements of tools; cutting forces; types of chips; chip thickness ratio; shear angle ; simple numerical only; types of metal cutting process; or- thogonal; oblique and form cutting; Cutting fluids: types; characteristics and applications. Tool wear: Types of wear; Tool life; Tool life equations.	10
II	Machinability: definition; factors affecting machinability; machinability index. Tool materials: Types; characteristics; applications; Heat treatment of tool steels; Specification of carbide tips; Types of ceramic coatings. Cutting Tool Geometry: Single point cutting tool; drills; reamers; milling; cutters.	10
III	Types of dies and construction: Simple Die; Compound Die; Progressive Die; Combination Die. Punch & Die mountings: pilots; strippers; misfeed detectors; Pressure Pads; Knock outs; stock guide; Feed-Stop; guide bush; guide pins.	8
IV	Die Design Fundamentals: Die Operations; blanking; piercing; shearing; cropping; notchng; lancing; coining; embossing; stamping; curling; drawing; bending; forming; Die set; Die shoe; Die area; Calculation of clearances on die and punch for blanking and piercing dies; Strip layout; Calculation of material utilization factor.	10

V	Forming Dies: Bending methods; Bending Dies; bend allowance; spring back; spanking; bending pressure; pressure pads; development of blank length. Drawing: operations; Metal flow during drawing; Calculation of Drawing blank size; variables affecting metal flow during drawing; single action and double action dies; combination dies. Fundamentals of other Tools: Constructional features of - Pressure Die casting dies; metal extrusion dies; injection molding dies; forging dies; plastic extrusion dies.	7

REFERENCES:

1. Tool Design - Donaldson Anglin, Tata McGraw Hill.
2. Production Technology- H.M.T.Jain, Tata McGraw Hill.
3. A Text Book of Production engineering – P.C. Sharma, S.Chand & Co.
4. Production Technology, R.K.Jain, Khanna Publishers.

TH:5(C)- MECHATRONICS

L	T	P		Course Code: MEPE204(C)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PE	

RATIONALE: It is an interdisciplinary subject that integrates mechanical engineering, electronics, computer control, and automation. It covers sensors, actuators, microcontrollers, PLCs, and robotics, helping students understand modern automated systems used in industrial and manufacturing applications.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Describe about various types of sensors and transducers.
- Explain the concept of various mechanical, electrical and pneumatic actuation systems.
- Explain the basic mathematical building blocks for mechanical, electrical, thermal and fluid actuation system and its interfacing of input/output requirements.
- Illustrate the basic PLC architecture and PLC programming concepts.
- Describe the design examples of mechatronics system. Explain the condition monitoring of production systems using sensors.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	Introduction to Mechatronics: Mechatronics; Importance of Mechatronics; Systems: Mea- surement systems; Control systems and their types; Closed-loop control System; Automatic water level controller; Sequential controllers-washing machine Measurement System terminology: Displacement, Position & Proximity Sensors; Velocity and Mo- tion Sensors; Force Sensors; Fluid Pressure Sensors; Flow Sensors; Liquid Level Sensors; Tempera- ture Sensors; Light Sensors; Selection of Sensors.	10
II	Mechanical Actuation Systems: Types of motion; Freedom and constraints; Loading; Gear Trains; Pawl & Ratchet; Belt & Chain drives; Bearings: Selection, Ball & Roller bearings; Mechanical aspects of motor selection. Electrical Actuation Systems: Switches & Relays; Solenoids; D.C Motors; A.C.Motors; Stepper Mo- tors: Specifications and Control of stepper motors; Servomotors: D.C Servomotor and A.C Servomotor. Pneumatic & Hydraulic Systems: Power supplies; DCV; PCV; Cylinders; Rotary actuators.	10
III	Mathematical Model: Introduction to Mathematical model; Mechanical System building blocks; Electrical System building blocks; Fluid System building blocks; Thermal System building blocks. System Model: Engineering.Systems: Rotational, Translational Systems; Electro-Mechanical System; Hydro-Mechanical System.	8

	Input/Output Systems: Interfacing; Input/output ports; Interface requirements: Buffers, Hand- shaking, Polling and interrupts, Serial interfacing; Introduction to PIA; Serial communications inter- face; Example of interfacing of a seven-segment display with a decoder.	
IV	Programmable Logic Controller (PLC): Definition; Basic block diagram and structure of PLC; Input/Output processing; PLC Programming: Ladder diagram, its logic functions, Latching and Sequencing; PLC mnemonics; Timers; Internal relays and Counters; Shift registers; Master and Jump Controls; Data handling; Analog input/output; Selection of PLC.	10
V	Design Examples & Advanced Applications in Mechatronics: Design process stages;Traditional Vs Mechatronics designs; Possible design solutions: Timed switch, Wind-screen wiper motion, Bath room scale; Case studies of Mechatronics systems: A pick-and-place robot, Car park barrier, Car engine management system, Automatic Camera and Automatic Washing Machine only.Sensors for Condition Monitoring Systems of Production Systems: Examples of Monitoring methods: Vibration monitoring, Temperature monitoring, Wear behavior monitoring; Mechatronics control in automated manufacturing: Monitoring of Manufacturing processes, On-line quality moni- toring, Model based systems, Hardware in-the-loop simulation, Supervisory control in manufacturing inspection, Integration of heterogeneous systems	7

REFERENCES:

1. Mechatronics – W. Bolton, Pearson Education India.
2. A Text Book on Mechatronics – R.K.Rajput, S.Chand& Co, New Delhi.
3. Mechatronics – M.D.Singh & Joshi, Prentice Hall of India.
4. Mechatronics – HMT, Tata McGraw Hill, New Delhi.
5. Mechatronics System – Devadas Shetty, PWS Publishing
6. Exploring Programmable Logic Controllers with applications – Pradeep Kumar Srivastava, BPB Publications.

PR:4- MINOR PROJECT

L	T	P		Course Code: PR202	
0	0	4			
Total Contact Hours				Project Assessment	
Practical		: 60Hrs	Total Marks: 100	End Exam	30
				Progressive Assessment	70
Pre Requisite		: Nil			
Credit		2		Category of Course: Project	

RATIONALE:

A Minor project generally requires a larger amount of effort and more independent work than that involved in a normal assignment. It requires students to undertake their own fact-finding and analysis. The students will select the topic, perform and design work. Minor project is as preparation for the students to take on more responsibilities and bigger project in the future. It is a learning experience, which aims to provide students with the opportunity to synthesize knowledge from different areas of learning, and critically and creatively apply it to real life situations. The leadership quality, co-ordination of job and maintaining good communal harmony is an important factor of this type of activity.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Plan a Minor Project
- Execute a Minor Project with team.
- Implement hardware/software/analytical/numerical techniques, etc. based on project requirements.
- Optimize time related works through sharing of work responsibility
- Develop cost awareness and utilisation of fund.
- Prepare a technical report on the project.

GUIDELINES FOR MINOR PROJECT

- Minimum three and maximum five students can form a group for the minor project.
- Project type can include
    - Development of a simple prototype system/product.
    - Investigation of performance of some systems using experimental method
    - Analysis of components/systems/devices using suitable software
    - Investigation of optimum process/material for product development using market survey.
    - Solution for society/industry problems
- Project domain may not be limited to the specific area / discipline.
- Project report to be prepared and submitted by the students with following components:
    1. Title
    2. Objectives
    3. Relevance and significance
    4. Methodology
    5. Analysis-Simulation/experimentation/survey/testing etc.
    6. Result and Discussion
    7. Conclusion

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

L	T	P		Course Code: AU202	
2	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		**: 30Hrs**	**Total Marks: NA**	**End Term Exam**	**0**
				Progressive Assessment*	**0**
Pre Requisite		**: Nil**			
Credit		**0**		**Category of Course: Mandatory**	

***Mandatory Audit Courses will be assessed only for confirmation of student learning without reflecting in the total scores or Credit.**

RATIONALE:

Considering the need of protecting Indian knowledge and tradition, the diploma level students of Automobile Engineering should be facilitated the concepts Indian traditional knowledge and to make them understand the importance of roots of knowledge system and methods of application in today's life and how to protect traditional knowledge system. Interpretation of the concepts of Intellectual property to protect the traditional knowledge as well as importance of Traditional knowledge in Agriculture and Medicine must be known.

COURSE OUTCOME:

On successful completion of the course, students will be able to

- Discuss the concepts of traditional Indian knowledge and roots of knowledge system and indigenous knowledge system
- Explain the technique of protection of traditional Indian knowledge
- Discuss legal frameworks of traditional knowledge
- State intellectual property rights
- State traditional knowledge in Different Sectors

DETAILED COURSE CONTENTS

UNIT	TOPIC/SUB-TOPIC	Allotted HRS.
1	Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge (Unani / Siddha/ Ayurveda), Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge of Odisha	07
2	Protection of traditional knowledge (TK): The need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.	07
3	Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.	06
4	Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, Geographical Indications (GI).	04

5	Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK	06

REFERENCES:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. "Knowledge Traditions and Practices of India" Kapil Kapoor.
3. Madhya Himalayi Sanskriti mein Gyan, Vigyan evam Paravigyan by Prof PC Pandey.

Suggested Online Link:

Web Links:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/12110600/

4TH SEMESTER MECHANICAL ENGG.

PR:1- THEORY OF MACHINES & MECHANISM LAB

SL NO.	AIM OF THE EXPERIMENT	APPARATUS REQUIRED	NO OF QTY.
1	Measure the ratio of time of cutting stroke to the return stroke in shaping machine	Shaper Machine, Stop Watch, Work piece, Cutting Tool	4
2	Estimate important kinematic data related to following mechanisms and sketch them (a). Ackerman's steering gear mechanism	Ackermann steering gear mechanism model, Measuring scale, Graph sheet, Drawing instrument	4
3	Study of construction and working principle of Eddy current Dynamometers	Eddy current Dynamometers	1
4	Determine velocity and acceleration of various links of the given mechanism (any two) by relative velocity method for analysis of motion of links size drawing sheet).	Four bar mechanism, Quick return mechanism, Drawing sheet, Drawing instrument, steel rule, Stop watch, calculator, Graph paper	8
5	Determine velocity and acceleration in an I. C. engine's slider crank mechanism by Kleins's construction	Kinematic model of slider crank mechanism, Drawing sheet, Drawing instruments, Steel rule, Stop watch, Calculator, Graph paper	7
6	Drawing of profile of radial cam with knife-edge and roller follower with offset	Drawing sheet, Drawing instruments, Steel rule, Graph paper, Mini Drafter, calculator	6
7	Reciprocating motion (graphical method). Drawing of profile of radial cam with knife-edge and roller follower without offset reciprocating motion (graphical method).	Drawing sheet, Drawing instruments, Steel rule, Graph paper, Mini Drafter, calculator	6
8	Estimate slip, length of belt, angle of contact in an open and cross belt drive.	Belt drive setup, Steel ruler, Stop watch, measuring tape, Calculator	5
9	Calculate braking torque at different speeds and load situations of i) Internal expanding shoe brake ii) Disc Brake	Internal expanding shoe brake setup, Disc brake setup, Measuring tape, Calculator	4
10	Assemble and dissemble different clutches.	Single plate clutch and Multi plate clutch model	2
11	Measure radius and height of any two types of governors for different rotational speeds, mass of balls and spring stiffness (in spring loaded governors)	Governors test rig, Vernier caliper, Calculator	3
12	Perform balancing of rotating unbalanced system	Static and dynamic Balancing machine, steel rule, Calculator	3

PR:2- THERMAL ENGINEERING-II LAB

SL NO.	AIM OF THE EXPERIMENT	APPARATUS REQUIRED	NO OF QTY.
1	Study of high-pressure boiler with model	Boiler model	1
2	Study of boiler mountings and accessories	Boiler model	1
3	Conduct performance test on VCR test rig to determine COP of the refrigerator	VCR test rig, Stop watch	2
4	Conduct performance test on multi stage reciprocating compressor	Multi stage reciprocating compressor, Stop watch	2
5	Conduct Morse test to determine the indicated power of individual cylinders	Multi cylinder petrol engine, Stop watch	2
6	Conduct Performance test on 2-S CI/SI engine.	2-s si engine, Stop watch	2
7	Conduct Performance test on 4-S CI/SI engine.	4-s ci engine, stop watch	2
8	Conduct Heat balance test on CI/SI engine.	4-s ci engine, stop watch	2
9	Conduct Economical speed test on 4-S CI/SI engine.	4-s si engine, stop watch	2
10	Thermal conductivity test on 1) Thick slab 2) Composite wall 3) Thick cylinder Leak	Thick slab, Sample specimen, Stop watch	3
11	detection of refrigeration equipment Conduct performance test on A/C test rig to	VCR test rig, Stop watch	2
12	determine COP of the refrigerator	VCR test rig, Stop watch	2

PR:3- CAD/CAM LAB

SL NO.	AIM OF THE EXPERIMENT	APPARATUS REQUIRED	NO OF QTY.
PART-A	Introduction: Part modelling; Datum Plane; constraint; sketch; dimensioning; extrude; revolve; sweep; blend; protrusion; extrusion; rib; shell; hole; round; chamfer; copy; mirror; assembly; align; orient. Exercises: 3D Drawings of 1). Geneva Wheel; 2). Bearing Block; 3). Bushed bearing: 4). Gib and Cotter joint; 5). Screw Jack; 6). Connecting Rod: Note: Print the orthographic view and sectional view from the above assembled 3D drawing.	Autocad software,	1
PART-B	CNC Programming and Machining: Introduction; 1). Study of CNC lathe, milling; 2). Study of international standard codes: G-Codes and M-Codes; 3). Format – Dimensioning methods; 4). Program writing – Turning simulator – Milling simulator, IS practice – commands menus; 5). Editing the program in the CNC machines; 6). Execute the program in the CNC machines; Exercises: Note: Print the Program from the Simulation Software and make the Component in the CNC Machine. CNC Turning Machine: (Material: Aluminium/Acrylic/Plastic rod) 1. Using Linear and Circular interpolation - Create a part program and produce component in the Machine. 2. Using Stock removal cycle – Create a part program for multiple turning operations and produce component in the Machine. 3. Using canned cycle - Create a part program for thread cutting, grooving and produce component in the Machine. CNC Milling Machine (Material: Aluminium/ Acrylic/ Plastic) 1. Using Linear interpolation and Circular interpolation – Create a part program for grooving and produce component in the Machine. 2. Using canned cycle - Create a part program for drilling, tapping, counter sinking and produce component in the Machine. 3. Using subprogram - Create a part program for mirroring and produce component in the Machine.	Cnc Lathe machine, Cnc milling machine	2

CURRICULLUM OF 5TH SEMESTER

For

DIPLOMA IN MECHANICAL ENGINEERING

(Effective FROM 2020-21 Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA									
TEACHING AND EVALUATION SCHEME FOR 5th Semester (Mechanical.) (wef 2020-21)									
Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Entrepreneurship and Management & Smart Technology	4		-	20	80	3	100
Th.2		Design of Machine elements	4		-	20	80	3	100
Th.3		Hydraulic Machines &Industrial Fluid Power	4		-	20	80	3	100
Th.4		Mechatronics	4			20	80	3	100
Th.5		Refrigeration and air-conditioning	4			20	80	3	100
		Total	20			100	400	-	500
		Practical							
Pr.1		Refrigeration and Air conditioning lab	-	-	4	25	50	3	75
Pr.2		Hydraulic machines &Industrial Fluid power lab	-	-	4	25	50	3	75
Pr.3		CAD/CAM LAB	-	-	4	25	50	3	75
Pr.4		Project Work Phase -I		-	4	25	-	-	25
		Student Centered Activities (SCA)			3				
		Total	-	-	*19*	*100*	*150*	-	*250*
		Grand Total	**20**	**-**	**19**	**200**	**550**	**-**	**750**
Abbreviations: L-Lecturer, T-Tutorial, P-Practical. Each class is of minimum 55 minutes duration									
Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%									
SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM etc. ,Seminar and SCA shall be conducted in a section.									
There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester									

Th1. ENTREPRENEURSHIP and MANAGEMENT & SMART TECHNOLOGY

(Common to All Branches)

Theory	**4 Periods per week**	**Internal Assessment**	**20 Marks**
Total Periods	**60 Periods**	**End Sem Exam**	**80 Marks**
Examination	**3hours**	**Total Marks**	**100Marks**

Topic Wise Distribution of Periods

Sl No.	Topic	Periods
1	Entrepreneurship	10
2	Market Survey and Opportunity Identification(Business Planning)	8
3	Project report Preparation	4
4	Management Principles	5
5	Functional Areas of Management	10
6	Leadership and Motivation	6
7	Work Culture, TQM & Safety	5
8	Legislation	6
9	Smart Technology	6
	TOTAL	60

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students, so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mind set with managerial skill helps the student in the job market. The students can also be introduced with Startup and Smart Technology concept, which shall radically change the working environment in the coming days in the face of Industry 4.0

In this subject, the Students shall be introduced/ exposed to different concepts and Terminologies in brief only, so that he/she can have broad idea about different concepts/items taught in this subject. Solving numerical problem on any topic/item is beyond the scope of this subject.

OBJECTIVES

After undergoing this course, the students will be able to :

- Know about Entrepreneurship, Types of Industries and Startups
- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- know the management Principles and functional areas of management
- Inculcate leadership qualities to motivate self and others.
- Maintain and be a part of healthy work culture in an organisation.
- Use modern concepts like TQM
- Know the General Safety Rules
- Know about IOT and its Application in SMART Environment.

DETAILED CONTENTS

1. **Entrepreneurship**
   - Concept /Meaning of Entrepreneurship
   - Need of Entrepreneurship
   - Characteristics, Qualities and Types of entrepreneur, Functions
   - Barriers in entrepreneurship
   - Entrepreneurs vrs. Manager
   - Forms of Business Ownership: Sole proprietorship, partnership forms and others
   - Types of Industries, Concept of Start-ups
   - Entrepreneurial support agencies at National, State, District Level(Sources): DIC, NSIC,OSIC, SIDBI, NABARD, Commercial Banks, KVIC etc.
   - Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

2. **Market Survey and Opportunity Identification (Business Planning)**

   - Business Planning
   - SSI, Ancillary Units, Tiny Units, Service sector Units
   - Time schedule Plan, Agencies to be contacted for Project Implementation
   - Assessment of Demand and supply and Potential areas of Growth
   - Identifying Business Opportunity
   - Final Product selection

3. **Project report Preparation**

   - Preliminary project report
   - Detailed project report, Techno economic Feasibility
   - Project Viability

4. **Management Principles**
   - Definitions of management
   - Principles of management
   - Functions of management (planning, organising, staffing, directing and controlling etc.)
   - Level of Management in an Organisation

5. **Functional Areas of Management**
   a) Production management
      - Functions, Activities
      - Productivity
      - Quality control
      - Production Planning and control

   b) Inventory Management
      - Need for Inventory management
      - Models/Techniques of Inventory management

   c) Financial Management
      - Functions of Financial management
      - Management of Working capital
      - Costing (only concept)
      - Break even Analysis
      - Brief idea about Accounting Terminologies: Book Keeping, Journal entry, Petty Cash book, P&L Accounts, Balance Sheets(only Concepts)

   d) Marketing Management
      - Concept of Marketing and Marketing Management
      - Marketing Techniques (only concepts)
      - Concept of 4P s (Price, Place, Product, Promotion)

   e) Human Resource Management
   - Functions of Personnel Management
   - Manpower Planning, Recruitment, Sources of manpower, Selection process, Method of Testing, Methods of Training & Development, Payment of Wages

6. **Leadership and Motivation**
   a) Leadership

- Definition and Need/Importance
- Qualities and functions of a leader
- Manager Vs Leader
- Style of Leadership (Autocratic, Democratic, Participative)

b) Motivation

- Definition and characteristics
- Importance of motivation
- Factors affecting motivation
- Theories of motivation (Maslow)
- Methods of Improving Motivation
- Importance of Communication in Business
- Types and Barriers of Communication

7. **Work Culture, TQM & Safety**

- Human relationship and Performance in Organization
- Relations with Peers, Superiors and Subordinates
- TQM concepts: Quality Policy, Quality Management, Quality system
- Accidents and Safety, Cause, preventive measures, General Safety Rules , Personal Protection Equipment(PPE)

8. **Legislation**

a) Intellectual Property Rights(IPR), Patents, Trademarks, Copyrights
b) Features of Factories Act 1948 with Amendment (only salient points)
c) Features of Payment of Wages Act 1936 (only salient points)

9. **Smart Technology**

- Concept of IOT, How IOT works
- Components of IOT, Characteristics of IOT, Categories of IOT
- Applications of IOT- Smart Cities, Smart Transportation, Smart Home, Smart Healthcare, Smart Industry, Smart Agriculture, Smart Energy Management etc.

Syllabus to be covered before IA: Chapter 1,2,3,4

RECOMMENDED BOOKS

1. Entrepreneurship Development and Management by R.K Singhal, Katson Books., New Delhi
2. Entrepreneurship Development and Management by U Saroj and V Mahendiratta, Abhishek Publications, Chandigarh
3. Entrepreneurship Development and Management by Vasant Desai, Himalaya Pub.House
4. Industrial Engineering and Management by O.P Khanna ,Dhanpat Rai and Sons
5. Industrial Engineering and Management by Banga and Sharma, Khanna Publications
6. Internet of Things by Jeeva Jose, Khanna Publications, New Delhi
7. Online Resource on Startups and other concepts
8. https://www.fundable.com/learn/resources/guides/startup

TH.2 DESIGN OF MACHINE ELEMENTS

Name of the Course: Diploma in MECHANICAL ENGINEERING			
Course code:		**Semester**	**5th**
Total Period:	**60**	**Examination**	**3 hrs.**
Theory periods:	**4 P/W**	**I.A:**	**20**
Maximum marks:	**100**	**End Semester Examination:**	**80**

A. RATIONALE:

Machine design is the art of planning or devising new or improved machines to accomplish specific purposes. Idea of design is helpful in visualizing, specifying and selection of parts and components which constitute a machine. Hence all mechanical engineers should be conversant with the subject.

B. COURSE OBJECTIVES

At the end of the course the students will be able to

1. Understanding the behaviours of material and their uses.
2. Understanding the design of various fastening elements and their industrial uses.
3. Understanding the different failures of design elements.
4. Understanding the change of design to accomplish the different field of applications.
5. Design shafts, keys, couplings required for power transmission.
6. Design closed coil helical spring

C. CHAPTER WISE DISTRIBUTION OF PERIORDS

Sl.No.	Topic	Periods
01	INTRODUCTION	12
02	DESIGN OF FASTENING ELEMENTS	12
03	DESIGN OF SHAFT AND KEYS	12
04	DESIGN OF COUPLING	12
05	DESIGN OF CLOSED COIL HELICAL SPRING	12
	TOTAL	60

D. COURSE CONTENTS

1.0 Introduction:

1.1 Introduction to Machine Design and Classify it.
1.2 Different mechanical engineering materials used in design with their uses and their mechanical and physical properties.
1.3 Define working stress, yield stress, ultimate stress & factor of safety and stress –strain curve for M.S & C.I.
1.4 Modes of Failure (By elastic deflection, general yielding & fracture)
1.5 State the factors governing the design of machine elements.
1.6 Describe design procedure.

2.0 Design of fastening elements:

2.1 Joints and their classification**.**
2.2 State types of welded joints .
2.3 State advantages of welded joints over other joints.
2.4 Design of welded joints for eccentric loads.
2.5 State types of riveted joints and types of rivets.
2.6 Describe failure of riveted joints.
2.7 Determine strength & efficiency of riveted joints.
2.8 Design riveted joints for pressure vessel.
2.9 Solve numerical on Welded Joint and Riveted Joints.

3.0 Design of shafts and Keys:

3.1 State function of shafts.
3.2 State materials for shafts.
3.3 Design solid & hollow shafts to transmit a given power at given rpm based on
   a) Strength: (i) Shear stress, (ii) Combined bending tension;
   b) Rigidity: (i) Angle of twist, (ii) Deflection, (iii) Modulus of rigidity
3.4 State standard size of shaft as per I.S.
3.5 State function of keys, types of keys & material of keys.
3.6 Describe failure of key, effect of key way.
3.7 Design rectangular sunk key considering its failure against shear & crushing.
3.8 Design rectangular sunk key by using empirical relation for given diameter of shaft.
3.9 State specification of parallel key, gib-head key, taper key as per I.S.
3.10 Solve numerical on Design of Shaft and keys.

4.0 Design of Coupling:

4.1 Design of Shaft Coupling
4.2 Requirements of a good shaft coupling
4.3 Types of Coupling.
4.4 Design of Sleeve or Muff-Coupling.
4.5 Design of Clamp or Compression Coupling.
4.6 Solve simple numerical on above.

5.0 Design a closed coil helical spring:

5.1 Materials used for helical spring.
5.2 Standard size spring wire. (SWG).
5.3 Terms used in compression spring.
5.4 Stress in helical spring of a circular wire.
5.5 Deflection of helical spring of circular wire.
5.6 Surge in spring.
5.7 Solve numerical on design of closed coil helical compression spring.

Syllabus covered up to I.A-Chapters 1,2 &3

LEARNING RESOURCES

SL.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER
01	PANDYA AND SHAH	MACHINE DESIGN	CHAROTAR PP
02	R.S.KHURMI &J.K.GOPTA	A TEXT BOOK OF MACHINE DESIGN	S.CHAND
03	P.C.SHARMA &D.K AGRAWAL	A TEXT BOOK OF MACHINE DESIGN	S.K.KATARIYA
04	V.B.BHANDARI	DESIGNOF MACHINE ELEMENTS	TMH
05	S.MD.JALAUDEEN	DESIGN DATA BOOK	ANURADHA PUBLICATION

TH.3 HYDRAULIC MACHINES &INDUSTRIAL FLUID POWER

Name of the Course: Diploma in MECHANICAL ENGINEERING			
Course code:		**Semester**	**5TH**
Total Period:	**60**	**Examination**	**3 hrs.**
Theory periods:	**4 P/W**	**Class Test:**	**20**
Maximum marks:	**100**	**End Semester Examination:**	**80**

A. RATIONALE:

Use of fluids can be realized by a group of machines called hydraulic machine and use of hydraulic control and pneumatic control system in automation and in earth movers.

B. COURSE OBJECTIVES:

At the end of the course the students will be able to

1.Distinguish the working principle of pumps and turbines
2.Explain the working of centrifugal pumps and gear pumps.
3.Compare pneumatic system with hydraulic system.
4.Draw pneumatic circuits for industrial application.
5.State the properties of hydraulic system.
6.Develop hydraulic circuit for machine tool operation.

C. CHAPTERWISE DISTRIBUTION OF PERIORDS.

SL.NO	TOPICS	PERIORDS
01	HYDRAULIC TURBINES	15
02	CENTRIFUGAL PUMPS	05
03	PNEUMATIC SYSTEM	20
04	HYDRAULIC SYSTEM	20
	TOTAL	60

D.COURSE CONTENTS

1.0 HYDRAULIC TURBINES.

1.1 Definition and classification of hydraulic turbines
1.2 Construction and working principle of impulse turbine.
1.3 Velocity diagram of moving blades, work done and derivation of various efficiencies of impulse turbine.
1.4 Velocity diagram of moving blades, work done and derivation of various efficiencies of Francis turbine.
1.5 Velocity diagram of moving blades, work done and derivation of various efficiencies of Kaplan turbine

1.6 Numerical on above
1.7 Distinguish between impulse turbine and reaction turbine.

2.0 CENTRIFUGAL PUMPS

2.1 Construction and working principle of centrifugal pumps
2.2 work done and derivation of various efficiencies of centrifugal pumps.
2.3 Numerical on above

3.0 RECIPROCATING PUMPS

.
3.1 Describe construction & working of single acting reciprocating pump.
3.2 Describe construction & working of double acting reciprocating pump.
3.3 Derive the formula foe power required to drive the pump (Single acting & double acting)
3.5 Define slip.
3.5 State positive & negative slip & establish relation between slip & coefficient of discharge.
3.6 Solve numerical on above

4.0 PNEUMATIC CONTROL SYSTEM

4.1Elements –filter-regulator-lubrication unit
4.2 Pressure control valves

4.2.1 Pressure relief valves
4.2.2 Pressure regulation valves

4.3 Direction control valves

4.3.1 3/2DCV,5/2 DCV,5/3DCV
4.3.2 Flow control valves
4.3.3. Throttle valves

4.4 ISO Symbols of pneumatic components

4.5. Pneumatic circuits

4 .5.1 Direct control of single acting cylinder
4.5.2 Operation of double acting cylinder
4.5.3 Operation of double acting cylinder with metering in and metering out control

5.0 HYDRAULIC CONTROL SYSTEM

5.1 Hydraulic system, its merit and demerits

5.2 Hydraulic accumulators

5.3.1 Pressure control valves
5. 3.2 Pressure relief valves
5.3.3 Pressure regulation valves

5.3 Direction control valves
5.3.1 3/2DCV,5/2 DCV,5/3DCV
5.3.2 Flow control valves
5.3.3 Throttle valves

5.4 Fluid power pumps

5.4.1 External and internal gear pumps
5.4.2 Vane pump
5.4.3 Radial piston pumps

5.5 ISO Symbols for hydraulic components.

5.6 Actuators

5.7 Hydraulic circuits

5.7.1 Direct control of single acting cylinder
5.7.2 Operation of double acting cylinder
5.7.3 Operation of double acting cylinder with metering in and metering out control

5.8 Comparison of hydraulic and pneumatic system

Syllabus to be covered up to I.A –CHAPTER 1.,2, &3

LEARNING RESOURCES

SL.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER
01	DR.JAGDISH LAL	HYDRAULIC MACHINES	METROPOLITAN BOOK CO
02	ANDREW	HYDRAULICS	
03	K SHANMUGA, SUNDARAM	HYDRAULIC &PNEUMATIC CONTROL	S.CHAND
04	MAJUMDAR	HYDRAULIC &PNEUMATIC CONTROL	TMH
05	J.F. BLACKBURN, G.REETHOF &J.L SHEARER	FLUID POWER CONTROL	

TH.4 MECHATRONICS

Name of the Course: Diploma in Mechanical Engg.			
Course code:		Semester	5th
Total Period:	60	Examination	3 hrs.
Theory periods:	4 P/W	I.A:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE:

Day by day, engineering and technology experiences a tremendous growth. Mechatronics plays a major role in developing engineering and technology. It can be defined as the applications of electronics and computer technology to control the motions of mechanical systems. With the help of microelectronics and sensor technology, mechatronics systems are providing high levels of precision and reliability.

B. COURSE OBJECTIVES:

At the end of the course the students will be able to

1. To study the definition and elements of mechatronics system.
2. To learn how to apply the principle of mechatronics for the development of productive systems.
3. To learn the CNC technology and applications of mechatronics in manufacturing automation.
4. Define different type of system and Sensors and solve the simple problems.
5. Explain the concept of Mechanical actuation, Electrical actuation and solve the simple problems.
6. Find out the various types of System Models & Input /Output parts and solve the problems.
7. Describe the programmable Logic Controller and develop programme in PLC.
8. To learn the Industrial robotics

C. CHAPTERWISE DISTRIBUTION OF PERIORDS

Sl No.	Topic	Periods
01	Introduction to Mechatronics	05
02	Sensors and Transducers	10
03	Actuators-Mechanical, Electrical	10
04	Programmable logic controllers	15
05	Elements of CNC Machines	15
06	Robotics	05

D.COURSE CONTENTS

1.0 INTRODUCTION TO MECHATRONICS

1.1 Definition of Mechatronics
1.2 Advantages & disadvantages of Mechatronics
1.3 Application of Mechatronics
1.4 Scope of Mechatronics in Industrial Sector
1.5 Components of a Mechatronics System
1.6 Importance of mechatronics in automation

2.0 **SENSORS AND TRANSDUCERS**

2.1Defination of Transducers

2.2 Classification of Transducers

2.3 Electromechanical Transducers

2.4 Transducers Actuating Mechanisms

2.5 Displacement &Positions Sensors
2.6 Velocity, motion, force and pressure sensors.
2.7 Temperature and light sensors.

3.0 ACTUATORS-MECHANICAL, ELECTRICAL

3.1Mechanical Actuators
- 3.1.1 Machine, Kinematic Link, Kinematic Pair
- 3.1.2 Mechanism, Slider crank Mechanism
- 3.1.3 Gear Drive, Spur gear, Bevel gear, Helical gear, worm gear
- 3.1.4 Belt & Belt drive
- 3.1.5 Bearings

3.2 Electrical Actuator
- 3.2.1 Switches and relay
- 3.2.2 Solenoid
- 3.2.3 D.C Motors
- 3.2.4 A.C Motors
- 3.2.5 Stepper Motors
- 3.2.6 Specification and control of stepper motors
- 3.2.7 Servo Motors D.C & A.C

4.0 PROGRAMMABLE LOGIC CONTROLLERS(PLC)

4.1 Introduction

4.2 Advantages of PLC

4.3 Selection and uses of PLC

4.4 Architecture basic internal structures

4.5 Input/output Processing and Programming

4.6 Mnemonics

4.7 Master and Jump Controllers

5.0 ELEMENTS OF CNC MACHINES

5.1 Introduction to Numerical Control of machines and CAD/CAM

5.1.1 NC machines

5.1.2 CNC machines

5.1.3.CAD/CAM

5.1.3.1 CAD

5.1.3.2 CAM

5.1.3.3 Software and hardware for CAD/CAM

5.1.3.4 Functioning of CAD/CAM system

5.1.3.4 Features and characteristics of CAD/CAM system

5.1.3.5 Application areas for CAD/CAM

5.2 elements of CNC machines

5.2.1 Introduction

5.2.2 Machine Structure

5.2.3 Guideways/Slide ways

5.2.3.1 Introduction and Types of Guideways

5.2.3.2 Factors of design of guideways

5.2.4 Drives

5.2.4.1 Spindle drives

5.2.4.2 Feed drive

5.2.5 Spindle and Spindle Bearings

6.0 **ROBOTICS**

6.1 Definition, Function and laws of robotics

6.2Types of industrial robots

6.3 Robotic systems

6.4 Advantages and Disadvantages of robots

Syllabus to be covered up to 1st I.A : Chapters 1,2,3 & 4

LEARNING RESOURCES:

SL.NO.	AUTHOR	TITLE OF THE BOOK	PUBLISHER
1	W. Bolton	Mechatronics	Pearson Education India
2	R.K Rajput	Text book of Mechatronics	S. Chand
3	R. RADHAKRISHNA, S,SUBRAMANIAN	CAD/CAM/CIM	NEW AGE INTERNATIONAL PVT.LTD
4	MIKELL GROVER	CAD/CAM	

Th.5 REFRIGERATION AND AIR CONDITIONING

Name of the Course: Diploma in MECHANICAL ENGINEERING			
Course code:		**Semester**	**5th**
Total Period:	**60**	**Examination**	**3 hrs**
Theory periods:	**4 P/W**	**I.A:**	**20**
Maximum marks:	**100**	**End Semester Examination:**	**80**

A. RATIONALE:

Food Preservation is the basic need of food industry to improve effective utilization of food. Hence the study of Refrigeration and Air-conditioning is essential. Comfort is the basic requirement of customers and machines through air conditioning & hence learning the concept of air-conditioning and methods of air-conditioning facilities quality design of air conditioning.

B. COURSE OBJECTIVE:

At the end of the course the students will be able to

1.Explain the working of open & closed air system of air refrigeration system

2.Describe the working and construction of compressor, Condenser, evaporator, expansion valve used for air conditioning and refrigeration.

3.Explain Vapor Compression refrigeration system.

4.Explain Vapor Absorption refrigeration system.

5.Compare different refrigerants properties.

6.Describe equipment for air conditioning.

7.Explain the cooling load for the given requirement.

C. CHAPTER WISE DISTRIBUTION OF PERIODS

Sl.No.	Topic	Periods
01	**AIR REFRIGERATION CYCLE**	05
02	**SIMPLE VAPOUR COMPRESSION REFRIGERATION SYSTEM**	10
03	**VAPOUR ABSORPTION REFRIGERATION SYSTEM**	07
04	**REFRIGERATION EQUIPMENTS**	08
05	**REFRIGERANT FLOW CONTROLS, REFRIGERANTS & APPLICATION OF REFRIGERANTS**	10
06	**PSYCHOMETRICS &COMFORT AIR CONDITIONING SYSTEMS**	10
07	**AIR CONDITIONING SYSTEMS**	10
	TOTAL	60

D.COURSE CONTENTS

1.0 AIR REFRIGERATION CYCLE.

1.1 Definition of refrigeration and unit of refrigeration.
1.2 Definition of COP, Refrigerating effect (R.E)
1.3 Principle of working of open and closed air system of refrigeration.
1.3.1 Calculation of COP of Bell-Coleman cycle and numerical on it.

2.**0 SIMPLE VAPOUR COMPRESSION REFRIGERATION SYSTEM**

2.1 schematic diagram of simple vapors compression refrigeration system'
2.2 Types
2.2.1 Cycle with dry saturated vapors after compression.
2.2.2 Cycle with wet vapors after compression.
2.2.3 Cycle with superheated vapors after compression.
2.2.4 Cycle with superheated vapors before compression.
2.2.5 Cycle with sub cooling of refrigerant
2.2.6 Representation of above cycle on temperature entropy and pressure enthalpy diagram
2.2.7 Numerical on above (determination of COP,mass flow)

3.0 VAPOUR ABSORPTION REFRIGERATION SYSTEM

3.1 Simple vapor absorption refrigeration system
3.2 Practical vapor absorption refrigeration system
3.3 COP of an ideal vapor absorption refrigeration system
3.4.Numerical on COP.

4.0 REFRIGERATION EQUIPMENTS

4.1 REFRIGERANT COMPRESSORS

4.1.1 Principle of working and constructional details of reciprocating and rotary compressors.

4.1.2 Centrifugal compressor only theory

4.1.3 Important terms.

4.1.4 Hermetically and semi hermetically sealed compressor.

4.2 CONDENSERS

4.2.1 Principle of working and constructional details of air cooled and water cooled condenser
4.2.2 Heat rejection ratio.
4.2.3 Cooling tower and spray pond.

4.3 EVAPORATORS

1.6.1 Principle of working and constructional details of an evaporator.
1.6.2 Types of evaporator.
1.6.3 Bare tube coil evaporator, finned evaporator, shell and tube evaporator.

5.0 REFRIGERANT FLOW CONTROLS, REFRIGERANTS & APPLICATION OF REFRIGERANTS

5.1 EXPANSION VALVES

5.1.1 Capillary tube

5.1.2 Automatic expansion valve

5.1.3 Thermostatic expansion valve

5.2 REFRIGERANTS

5.2.1 Classification of refrigerants

5.2.2 Desirable properties of an ideal refrigerant.

5.2.3 Designation of refrigerant.

5.2.4 Thermodynamic Properties of Refrigerants.

5.2.5 Chemical properties of refrigerants.

5.2.6 commonly used refrigerants, R-11, R-12, R-22, R-134a, R-717

5.2.7 Substitute for CFC

5.3 Applications of refrigeration

5.3.1 cold storage

5.3.2 dairy refrigeration

5.3.3 ice plant

5.3.4 water cooler

5.3.5 frost free refrigerator

6.0 PSYCHOMETRICS &COMFORT AIR CONDITIONING SYSTEMS

6.1 Psychometric terms

6.2 Adiabatic saturation of air by evaporation of water

6.3 Psychometric chart and uses.

6.4 Psychometric processes

6.4.1 Sensible heating and Cooling

6.4.2 Cooling and Dehumidification

6.4.3 Heating and Humidification

6.4.4 Adiabatic cooling with humidification

6.4.5 Total heating of a cooling process

6.4.6 SHF, BPF,

6.4.7 Adiabatic mixing

6.4.8 Problems on above.

6.5 Effective temperature and Comfort chart

7.0 AIR CONDITIONING SYSTEMS

7.1 Factors affecting comfort air conditioning. .
7.2 Equipment used in an air-conditioning.
7.3 Classification of air-conditioning system
7.4 Winter Air Conditioning System
7.5 Summer air-conditioning system.
7.6 Numerical on above

Syllabus to be covered up to I.A- Chapters1.2&3.

LEARNING RESOURCES

SL.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER
01	C.P ARRORA	REFRIGERATION AND AIR CONDITIONING	TMH
02	R.S.KHURMI &J.K.GOPTA	REFRIGERATION AND AIR CONDITIONING	S.CHAND
03	P.L BALLANY	REFRIGERATION AND AIR CONDITIONING	KHANNA PUBLISHER
04	DOMKUNDRA AND ARORA	REFRIGERATION AND AIR CONDITIONING	DHANPAT RAY AND SONS

Pr.1 REFRIGERATION AND AIR CONDITIONING LAB

Name of the Course: Diploma in Mechanical Engg.			
Course code:		Semester	5th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Sessional:	25
Maximum marks:	100	End Semester Examination:	50

COURSE OBJECTIVES

At the end of the course the students will be able to

1.Study the construction features of Domestic Refrigerator, water cooler, Window Air Conditioner, Split Air Conditioner

2.Determining the capacity, COP, of Refrigerator Test Rig, Window air Conditioner, Split Air Conditioner, Water cooler.

3.Evacuating the entire system

4.Locating the leakage in refrigerating system

5.Charging of the refrigerating system

List of Practicals

1. Study the construction features of Domestic Refrigerator.
2. Study the construction features of water cooler.
3. Study the construction features of window air conditioner
4. Study the construction features of split air conditioner
5.Determine the capacity and cop of vapour compression Refrigerator test rig
6.Determine the capacity and cop of water cooler
7.Determine the capacity and cop of window air conditioner
8.Determine the capacity and cop of split air conditioner
9. Determine the capacity and cop of vapour absorption Refrigerator test rig.
10.Complete charging of a domestic refrigerator and its leak test.

Pr 2. HYDRAULIC MACHINES &INDUSTRIAL FLUID POWER LAB

Name of the Course: Diploma in Mechanical Engg.			
Course code:		Semester	5th
Total Period:	60	Examination	3 hrs.
Theory periods:	4 P/W	Sessional:	25
Maximum marks:	100	End Semester Examination:	50

COURSE OBJECTIVES

At the end of the course the students will be able to

1.0 Conducting performance test on impulse and reaction turbine

2.0 Conducting performance test on centrifugal pump

3.0 Designing &operating pneumatic circuits

4.0 Designing &operating industrial fluid power circuits

List of Practicals

1.0 Performance test on impulse turbine and to find out the efficiency

2.0 Performance test on Kaplan turbine and to find out the efficiency

3.0 Performance test on Francis turbine and to find out the efficiency

4.0 Performance test on centrifugal pump and to find out the characteristic curves

5.0 Direct operation of single &double acting pneumatic cylinder.

6.0 Operating double acting pneumatic cylinder with quick exhaust valve

7.0 Speed control double acting pneumatic cylinder using metering in and metering out circuits.

8.0 Direct operation of single &double acting hydraulic cylinder

9.0 Direct operation of hydraulic motor

10.0 Speed control double acting hydraulic cylinder using metering in & metering out circuits.

Pr.3 CAD/CAM LAB

Name of the Course: Diploma in Mechanical Engg.			
Course code:		Semester	5th
Total Period:	60	Examination	3 Hrs
Theory periods:	4 P/W	Sessional:	25
Maximum marks:	75	End Semester Examination:	50

OBJECTIVES

At the end of the course the students will be able to

1.To understand the fundamentals and use of CAD.

2.To conceptualize drafting and modelling in CAD.

3.To interpret the various features in the menu of solid modelling package.

4.To synthesize various parts or components in an assembly.

5.Toprepare CNC programmes for various jobs

COURSE CONTENTS

PART-A.

INTRODUCTION:

Part modelling, Datum plane, Datum plane; constraint; dimensioning; extrude; revolve; sweep; protrusion; extrusion; rib; shell; hole; round; chamfer; copy; mirror; assembly; align; orient.

EXERCISES:

2D Drawings of Rectangle, circle, polygon and its dimensioning

3D Drawings of;

1.Gib and cutter joint

2.Screw Jack;

3.Connecting Rod;

4.Bearing Block.

Print the orthographic view from the above assembled 3Ddrawing

PART-B.

CNC Programming and Machining

INTRODUCTION;

1.Study of CNC lathe, milling;

2.Study of international codes; G-Codes and M –Codes

3.Format –Dimensioning methods;

4.Programme writing –Turning Simulator-Milling simulator IS practice-commands menus

5.Editing the programme in the CNC MACHINES;

6.Execute the programme in the CNC machines;

Exercise;

1. Print the programme and make the component in the CNC machine;

2.Using canned cycle-create a part programme for thread cutting, grooving and produce component in the CNC Turning Machine

3.Using Linear interpolation and Circular Interpolation-Create a part programme for grooving and produce component in the CNC Milling Machine

Pr 4. PROJECT WORK (Phase-I)

Course code:		Semester	5th
Total Period:	60	Examination :	-
Theory periods:	4P / week	Sessional Marks	25
		TOTAL Marks	25

RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of mechanical engineering practices in real life situations, so as to participate and manage a large mechanical engineering projects in future. *Entire Project shall spread over 5th and 6th Semester*. Part of the Project covered in 5th Semester shall be named as *Project Phase-I* and balance portion to be covered in 6th Semester shall be named as *Project Phase-II*.

OBJECTIVES

After undergoing the Project Work, the student will be able to:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real life working environment, preferably in an industrial environment.
- Develop working models or applications and implement these for the actual needs of the community/industry.
- Explain the working of industrial environment and its work ethics.
- Explain what entrepreneurship is and how to become an entrepreneur.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.
- Find latest ideas on robotics, automation and mechatronics based projects.

General Guidelines

The individual students have different aptitudes and strengths and also areas of interest. Project work, therefore, should match the strengths and interest of the students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (right from beginning of 5th semester). Students should be allotted a problem of interest to him/her as a project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. Preferably there should not be more than 5 students, if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

Following are the broad suggestive areas of project work

- ✓ Automobile based projects.
- ✓ Refrigeration based &Air conditioning based projects.
- ✓ Hydraulic control &Pneumatic control based automation projects
- ✓ Fabrication based projects.
- ✓ Wind mill
- ✓ Solar energy based projects.
- ✓ Thermal power plant using steam.
- ✓ Hydel power dam.
- ✓ Cooling tower.

- ✓ Solenoid based hammer.
- ✓ Unmanned railway crossing.
- ✓ Engine based air compressor.
- ✓ Mobile all round year air conditioner
- ✓ Driverless car.
- ✓ Hybrid motorbike.
- ✓ Any other areas found suitable.
- ✓ Torque testing machine.
- ✓ Spring testing machine.
- ✓ Mechanical sanitizer.
- ✓ Solar powered refrigerator.
- ✓ Door opener.

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

Sl. No.	**Performance Criteria**
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9	Viva voce

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organizations to such an exhibition.

Project Phase-I and Phase-II

The Project work duration shall cover 2 semesters(5th and 6th sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 5th sem under Project Phase-I. The students may be allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work upto Design of the system have to be complete in Phase-I. Execution of work may begin in Phase-I depending on the Project. Project Milestones are to be set so that progress can be tracked . In Phase-II Execution of work and Documentation have to be complete. Project Report have to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable alteration in the components of Task and schedule.

At the end of Project Phase-I in 5th semester there shall be one presentation by each group to mark to progress and also to judge whether the Project is moving in right direction as per the objective of the Project.

EQUIPMENT LIST

REFRIGERATION AND AIR –CONDITIONING LAB

SL.NO	NAME OF THE EQUIPMENTS	QUANTITY
01	Domestic Refrigerator test rig	01 no
02	water cooler test rig	01 no
03	Window Air Conditioner test rig	01 no
04	Split Air Conditioner test rig	01 no
05	Vacuum pump set with accessories	01 no
06	Charging cylinder with accessories	02 nos
07	Halide torch or any leak tester	02 nos
08	Vapour absorption test rig	01

HYDRAULIC MACHINES & INDUSTRIAL FLUID POWER LAB

SL.NO	NAME OF THE EQUIPMENTS	QUANTITY
01	Impulse turbine(PELTON WHEEL) Test Rig with arrangements to find efficiency	01no
02	Kaplan turbine Test Rig with arrangements to find efficiency	01no
03	Francis turbine Test Rig with arrangements to find efficiency	01no
04	Centrifugal pump Test Rig with arrangements to find efficiency	01no
05	Pneumatic Trainer Kit with accessories	02nos
06	Hydraulic Trainer Kit with accessories	01no
07	Manual or Digital Tachometer	05nos

CAD/CAM LAB

SL.NO	NAME OF THE EQUIPMENTS	QUANTITY
01	DESKTOP COMPUTER with UPS	30 no
02	AUTOCAD SOFTWARE 2D/3D	01 each
03	CNC TURNING MACHINE	01 no
04	CNC MILLING MACHINE	01 no
05	PRINTER	02 nos

5TH SEMESTER MECHANICAL ENGG.

PR.1 REFRIGERATION AND AIR CONDITIONING LAB

SL NO.	AIM OF THE EXPERIMENT	APPARATUS REQUIRED	NO OF QTY.
1	Study the construction features of Domestic Refrigerator	Domestic Refrigerator test rig	1
2	Study the construction features of water cooler.	water cooler test rig	1
3	Study the construction features of window air conditioner	Window Air Conditioner test rig	1
4	Study the construction features of split air conditioner	Split Air Conditioner test rig	1
5	Determine the capacity and cop of vapour compression Refrigerator test rig	Vapour compression test rig	1
6	Determine the capacity and cop of water cooler	water cooler test rig	1
7	Determine the capacity and cop of window air conditioner	Window Air Conditioner test rig	1
8	Determine the capacity and cop of split air conditioner	Split Air Conditioner test rig	1
9	Determine the capacity and cop of vapour absorption Refrigerator test rig.	Vapour absorption test rig	1
1	Complete charging of a domestic refrigerator and its leak test.	Domestic Refrigerator test rig	1

PR 2. HYDRAULIC MACHINES &INDUSTRIAL FLUID POWER LAB

SL NO.	AIM OF THE EXPERIMENT	APPARATUS REQUIRED	NO OF QTY.
1	Performance test on impulse turbine and to find out the efficiency	Pelton Wheel	1
2	Performance test on Kaplan turbine and to find out the efficiency	Kaplan turbine Test Rig with arrangements to find efficiency	1
3	Performance test on Francis turbine and to find out the efficiency	Francis turbine Test Rig with arrangements to find efficiency	1
4	Performance test on centrifugal pump and to find out the characteristic curves	Centrifugal pump Test Rig with arrangements to find efficiency	1
5	Direct operation of single &double acting pneumatic cylinder.	Pneumatic Trainer Kit with accessories	1
6	Operating double acting pneumatic cylinder with quick exhaust valve	Pneumatic Trainer Kit with accessories	1
7	Speed control double acting pneumatic cylinder using metering in and metering out circuits	Pneumatic Trainer Kit with accessories	1
8	Direct operation of single &double acting hydraulic cylinder	Hydraulic Trainer Kit with accessories	1
9	Direct operation of hydraulic motor	hydraulic motor	1
1	Speed control double acting hydraulic cylinder using metering in & metering out circuits.	Hydraulic Trainer Kit with accessories	1

PR.3 CAD/CAM LAB

SL NO.	AIM OF THE EXPERIMENT	APPARATUS REQUIRED	NO OF QTY.
1.	Gib and cutter joint	Desktop Computer With Ups & Autocad Software 2d/3d	2
2.	Screw Jack	Desktop Computer With Ups & Autocad Software 2d/3d	2
3.	Connecting Rod	Desktop Computer With Ups & Autocad Software 2d/3d	2
4.	Bearing Block.	Desktop Computer With Ups & Autocad Software 2d/3d	2
5.	Print the programme and make the component in the CNC machine	Cnc Turning Machine & Cnc Milling Machine & Printer	2
6.	Using canned cycle-create a part programme for thread cutting, grooving and produce component in the CNC Turning Machine	Cnc Turning Machine & Cnc Milling Machine & Printer	2
7.	Using Linear interpolation and Circular Interpolation-Create a part programme for grooving and produce component in the CNC Milling Machine	Cnc Turning Machine & Cnc Milling Machine & Printer	2

CURRICULLUM OF 6TH SEMESTER

For

DIPLOMA IN MECHANICAL ENGINEERING

(Effective FROM 2020-21 Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING,

ODISHA, BHUBANESWAR

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 6th Semester (Mechanical Engg.) (wef 2020-21)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		INDUSTRIAL ENGINEERING & MANAGEMENT	4		-	20	80	3	100
Th.2		AUTOMOBILE ENGINEERING AND HYBRID VEHICLES	4		-	20	80	3	100
Th.3		POWER STATION ENGINEERING	4		-	20	80	3	100
Th.4		ELECTIVE (any One)	4			20	80	3	100
Th.4(a)		COMPOSITE MATERIALS							
Th.4(b)		ADVANCE MANUFACTURING PROCESSES							
Th.4(c)		INDUSTRIAL ROBOTICS & AUTOMATION							
		Total	**16**			**80**	**320**	**-**	**400**
		Practical							
Pr.1		AUTOMOBILE ENGINEERING LAB	-	-	4	50	50	3	100
Pr.2		POWER STATION ENGINEERING LAB	-	-	4	25	50	3	75
Pr.3		PROJECT WORK PHASE -II		-	10	50	100	3	150
Pr.4		LIFE SKILL	-	-	2	25	-	-	25
		STUDENT CENTERED ACTIVITIES (SCA)			3				
		Total	**-**	**-**	***23***	***150***	***200***	**-**	***350***
		Grand Total	**16**	**-**	**23**	**230**	**520**	**-**	**750**

Abbreviations: L-Lecturer, T-Tutorial, P-Practical. Each class is of minimum 55 minutes duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM /Idea Tinkering and Innovation Lab Practice etc. ,Seminar and SCA shall be conducted in a section.

There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

TH1. INDUSTRIAL ENGINEERING & MANAGEMENT

Name of the Course: Diploma in MECHANICAL ENGINEERING			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Internal assessment	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE:

Main objective of Mechanical Engineering is to produce goods and services for benefit to mankind. Such productions are done utilizing various resources like Men, Materials, machines and Money. Industrial engineering and quality control is the subject which allows optimized use of such resources and hence very important for a mechanical engineer.

B. COURSE OBJECTIVES:

After undergoing this course, the students will be able to:

1.Identify the place for a new plant set up and systematic arrangement of machinery and shop for smooth production.

2.Take right decisions to optimize resources utilizations by improving productivity of the lands ,buildings,people,material,machines,money,methods and management effectively.

3.Understanding of stock management and maintenance to reduce plant ideal time.

4 To use the charts to record the quality of products.

5.To eliminate unproductive activities under the control of the management, supervisor, worker and the design of products and processes.

C. CHAPTER WISE DISTRIBUTION OF PERIORDS

Sl No.	Topic	Periods
1	**PLANT ENGINEERING**	10
2	**OPERATIONS RESEARCH**	10
3	**INVENTORY CONTROL**	10
4	**INSPECTION AND QUALITY CONTROL**	15
5	**PRODUCTION PLANNING AND CONTROL**	15

D. COURSE CONTENT

1. PLANT ENGINEERING:

1.1 Selection of Site of Industry.

1.2 Define plant layout.

1.3 Describe the objective and principles of plant layout.

1.4 Explain Process Layout, Product Layout and Combination Layout.

1.5 Techniques to improve layout.

1.6 Principles of material handling equipment.

1.7 Plant maintenance.

1.7.1 Importance of plant maintenance.
1.7.2 Break down maintenance.
1.7.3 Preventive maintenance.
1.7.4 Scheduled maintenance.

2. OPERATIONS RESEARCH:

2.1 Introduction to Operations Research and its applications.
2.2 Define Linear Programming Problem,
2.3Solution of L.P.P. by graphical method.
2.4 Evaluation of Project completion time by Critical Path Method and PERT (Simple problems)-
2.5Explain distinct features of PERT with respect to CPM.

3. INVENTORY CONTROL:

3.1 Classification of inventory.
3.2 Objective of inventory control.
3.3 Describe the functions of inventories.
3.4 Benefits of inventory control.
3.5 Costs associated with inventory.
3.6 Terminology in inventory control
3.7 Explain and Derive economic order quantity for Basic model. (Solve numerical)
3.8 Define and Explain ABC analysis.

4. INSPECTION AND QUALITY CONTROL:

4.1Define Inspection and Quality control.
4.2Describe planning of inspection.
4.3 Describe types of inspection.
4.4 Advantages and disadvantages of quality control.
4.5 Study of factors influencing the quality of manufacture.
4.6 Explain the Concept of statistical quality control, Control charts (X, R, P and C - charts).
4.7 Methods of attributes.
4.8 Concept of ISO 9001-2008.
4.9.1 Quality management system, Registration /certification procedure.
4.9.2 Benefits of ISO to the organization.
4.9.3 JIT, Six sigma,7S, Lean manufacturing
4.9.4 Solve related problems.

5.0 PRODUCTION PLANNING AND CONTROL

5.1 Introduction
5.2 Major functions of production planning and control
5.3 Methods of forecasting
5.3.1 Routing
5.3.2Scheduling
5.3.3 Dispatching
5.3.4 Controlling
5.4 Types of production
5.4.1 Mass production
5.4.2 Batch production
5.4.3 Job order production
5.5 Principles of product and process planning.

Syllabus to be covered before IA: Chapter 1,2,3

Learning Resources:			
Sl. No.	***Name of Authors***	***Title of the Book***	***Name of the Publisher***
1	O.P.KHANNA	INDUSTRIAL ENGINEERING & MANAGEMENT	DHANPAT RAI & SONS
2	MARTAND TELSANG	INDUSTRIAL ENGG & PRODUCTION MANAGEMENT	S.CHAND
3	M.MAHAJAN	STATISTICAL QUALITY CONTROL	DHANPAT RAI &SONS
4			

TH.2 AUTOMOBILE ENGINEERING AND HYBRID VEHICLES

Name of the Course: Diploma in MECHANICAL ENGINEERING			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Internal assessment	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE:

Automobiles are the principal mode of transport system. Their manufacture and maintenance gives a major scope for employment. Many entrepreneur pass outs go for servicing of automobiles or trading/ manufacturing of auto components. Thus automobile engineering is an important subject to be in the regular curriculum of the mechanical engineering.

B. COURSE OBJECTIVES:

At the end of the course the students will be able to:

- Understand automobile chassis, transmission, breaking and fuel system etc.
- Understand the basics of electric vehicle kinematics.
- Understand the concepts of hybrid electric vehicles.

C.TOPIC WISE DISTRIBUTION OF PERIODS

Sl No.	Topic	Periods
1	Introduction & Transmission System	12
2	Braking system	5
3	Ignition & Suspension System	10
4	Cooling and Lubrication	8
5	Fuel system	10
6	Hybrid and Electric Vehicles	15

C.COURSE CONTENTS

1.0 INTRODUCTION & TRANSMISSION SYSTEM:

1.1 Automobiles: Definition, need and classification: Layout of automobile chassis with major components (Line diagram)
1.2 Clutch System: Need, Types (Single & Multiple) and Working principle with sketch
1.3 Gear Box: Purpose of gear box, Construction and working of a 4 speed gear box
1.4 Concept of automatic gear changing mechanisms
1.5 Propeller shaft: Constructional features
1.6 Differential: Need, Types and Working principle

2.0 BRAKING SYSTEM:

2.1 Braking systems in automobiles: Need and types
2.2 Mechanical Brake
2.3 Hydraulic Brake
2.4 Air Brake
2.5 Air assisted Hydraulic Brake
2.6 Vacuum Brake

3.0 IGNITION & SUSPENSION SYSTEM:

3.1 Describe the Battery ignition and Magnet ignition system

3.2 Spark plugs: Purpose, construction and specifications

3.3 State the common ignition troubles and its remedies

3.4 Description of the conventional suspension system for Rear and Front axle

3.5 Description of independent suspension system used in cars (coil spring and tension bars)

3.6 Constructional features and working of a telescopic shock absorber

4.0 COOLING AND LUBRICATION:

4.1 Engine cooling: Need and classification

4.2 Describe defects of cooling and their remedial measures

4.3 Describe the Function of lubrication

4.4 Describe the lubrication System of I.C. engine

5.0 FUEL SYSTEM:

5.1 Describe Air fuel ratio

5.2 Describe Carburetion process for Petrol Engine

5.3 Describe Multipoint fuel injection system for Petrol Engine

5.4Describe the working principle of fuel injection system for multi cylinder Engine 5.5 Filter for Diesel engine

5.6 Describe the working principle of Fuel feed pump and Fuel Injector for Diesel engine

6.0 ELECTRIC AND HYBRID VEHICLES:

6.1 Introduction, Social and Environmental importance of Hybrid and Electric Vehicles

6.2 Description of Electric Vehicles, operational advantages, present performance and applications of Electric Vehicles

6.3 Battery for Electric Vehicles, Battery types and fuel cells

6.4 Hybrid vehicles, Types of Hybrid and Electric Vehicles: Parallel, Series, Parallel and Series configurations;6.5 Drive train

6.6 Solar powered vehicles

D.SYLLABUS COVERED UP TO I.A-CHAPTERS 1,2 &3

E.LEARNING RESOURCES:

Sl. No.	***Name of Authors***	***Title of the Book***	***Name of the Publisher***
1	R.B.Gupta	Automobile Engineering	Satya Prakashan
2	Dr Kirpal Singh	Automobile Engineering Vol- I & II	Standard Publishers
3	C.P.Nakra	Automobile Engineering	Dhanpat Rai Publication
4	W.H.Course	Automotive Engine	McGraw Hill
5	Iqbal Hussain	Electric & Hybrid Vehicles – Design Fundamentals	CRC Press, 2
6 A.K. Babu		Statistical Electric & Hybrid Vehicles	Khanna Publishing House, New Delhi, 2018

TH.3 POWER STATION ENGINEERING

Name of the Course: Diploma in MECHANICAL ENGINEERING			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Internal assessment	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE:

Bulk powers used in industries and for domestic purposes are generated in power stations. A large number of diverse and specialized equipment and system are used in a power plant should have this important subject in mechanical engineering.

B. COURSE OBJECTIVES:

At the end of the course the students will be able to:

- Understand the generation of power by utilizing various energy sources.
- Understand the use of steam, its operation in thermal power stations.
- Understand the nuclear energy sources and power developed in nuclear power station.
- Understand the basics of diesel electric power station and hydroelectric power station.
- Understand the basics of gas turbine power station
-

C.TOPIC WISE DISTRIBUTION OF PERIODS

Sl No.	Topic	Periods
1	**INTRODUCTION**	05
2	**THERMAL POWER STATIONS**	20
3	**NUCLEAR POWER STATIONS**	10
4	**DIESEL ELECTRIC POWER STATIONS**	10
5	HYDEL POWER STATIONS	10
6	GAS TURBINE POWER STATIONS	05

D.COURSE CONTENTS:

1.0 INTRODUCTION:

1.1 Describe sources of energy.
1.2 Explain concept of Central and Captive power station.
1.3 Classify power plants.
1.4 Importance of electrical power in day today life.
1.5 Overview of method of electrical power generation.

2.0 THERMAL POWER STATIONS:

2.1 Layout of steam power stations.
2.2 Steam power cycle. Explain Carnot vapour power cycle with P-V, T-s diagram and determine thermal efficiency.
2.3 Explain Rankine cycle with P-V, T-S & H-s diagram and determine thermal efficiency, Work done, work ratio, and specific steam Consumption.
2.4 Solve Simple Problems.
2.5. List of thermal power stations in the state with their capacities.
2.6 Boiler Accessories: Operation of Air pre heater, Operation of Economiser, Operation Electrostatic precipitator and Operation of super heater. Need of boiler mountings and operation of boiler

2.7 Draught systems (Natural draught, Forced draught & balanced draught) with their advantages & disadvantages.
2.8 Steam prime movers: Advantages & disadvantages of steam turbine, Elements of steam turbine, governing of steam turbine. Performance of steam turbine: Explain Thermal efficiency, Stage efficiency and Gross efficiency.
2.9 Steam condenser: Function of condenser, Classification of condenser. function of condenser auxiliaries such as hot well, condenser extraction pump, air extraction pump, and circulating pump.
2.10 Cooling Tower: Function and types of cooling tower, and spray ponds
2.11 Selection of site for thermal power stations.

3.0 NUCLEAR POWER STATIONS:

3.1 Classify nuclear fuel (Fissile & fertile material)
3.2 Explain fusion and fission reaction.
3.3 Explain working of nuclear power plants with block diagram .
3.4 Explain the working and construction of nuclear reactor .
3.5 Compare the nuclear and thermal plants.
3.6 Explain the disposal of nuclear waste.
3.7 Selection of site for nuclear power stations.
3.8 List of nuclear power stations.

4.0 DIESEL ELECTRIC POWER STATIONS:

4.1 State the advantages and disadvantages of diesel electric power stations.
4.2 Explain briefly different systems of diesel electric power stations: Fuel storage and fuel supply system, Fuel injection system, Air supply system, Exhaust system, cooling system, Lubrication system, starting system, governing system.
4.3 Selection of site for diesel electric power stations.
4.4 Performance and thermal efficiency of diesel electric power stations.

5.0 HYDEL POWER STATIONS:

5.1 State advantages and disadvantages of hydroelectric power plant.
5.2 Classify and explain the general arrangement of storage type hydroelectric project and explain its operation.
5.3 Selection of site of hydel power plant.
5.4 List of hydro power stations with their capacities and number of units in the state.
5.5 Types of turbines and generation used.
5.6 Simple problems.
6.0 GAS TURBINE POWER STATIONS
6.1 Selection of site for gas turbine stations.
6.2 Fuels for gas turbine
6.3 Elements of simple gas turbine power plants
6.4 Merits, demerits and application of gas turbine power plants.

Syllabus covered up to I.A-Chapters 1,2 &3

E.LEARNING RESOURCES:			
Sl. No.	***Name of Authors***	***Title of the Book***	***Name of the Publisher***
1	R.K Rajput	Power Plant Engineering	Laxmi Publication
2	P.K.NAG	Power Plant Engineering	TMH
3	Nag pal G,R	Power plant Engineering	Khanna Publisher
4	P.C.SHARMA	Power Plant Engineering	S.K KATARIA &SONS

Th-4a-COMPOSITE MATERIALS (ELECTIVE)

Name of the Course: Diploma in MECHANICAL ENGINEERING			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Internal assessment	20
Maximum marks:	100	End Semester Examination:	80

RATIONALE: Composite material is the advanced engineering material and plays an important Role in design of engineering products.it is s.a valuable subject for mechanical engineer

COURSE OBJECTIVES:

At the end of the course the students will be able to:

- Understand the basic concept of composite materials
- Understand the Classification of Composites
- Understand the Mechanical Properties of Composites
- Understand the Laminates
- Understand the Joining Methods and Failure Theories.

Topic Wise Distribution of Periods

Sl No.	Topic	Periods
1	Introduction	15
2	Classification of Composites	8
3	Mechanical Properties of Composites	12
4	Laminates	15
5	Joining Methods and Failure Theories	10

CHAPTERS

1.0 Introduction:

1.1 Classifications of Engineering Materials, Concept of composite materials.

1.2 Matrix materials, Functions of a Matrix, Desired Properties of a Matrix, Polymer Matrix (Thermosets and Thermoplastics), Metal matrix, Ceramic matrix, Carbon Matrix, Glass Matrix etc.

1.3 Types of Reinforcements/Fibers: Role and Selection or reinforcement materials.

1.4 Types of fibers, Glass fibers, Carbon fibers, Aramid fibers , Metal fibers, Alumina fibers, Boron Fibers, Silicon carbide fibers, Quartz and Silica fibers, Multiphase fibers, Whiskers, Flakes etc.,

1.5 Mechanical properties of fibers.

2.0 Classification of Composites:

2.1Classification based on Matrix Material: Organic Matrix composites, Polymer matrix composites (PMC), Carbon matrix Composites or Carbon-Carbon Composites, Metal matrix composites (MMC), Ceramic matrix composites (CMC).

2.2 Classification based on reinforcements: Fiber Reinforced Composites, Fiber Reinforced Polymer (FRP) Composites, Laminar Composites, Particulate Composites.

2.3 Comparison with Metals, Advantages & limitations of Composites.

3.0 Mechanical Properties of Composites:

3.1 Geometrical aspects – volume and weight fraction.

3.2 Unidirectional continuous fiber, discontinuous fibers, Short fiber systems, woven

reinforcements – Mechanical Testing.

3.3 Determination of stiffness and strengths of unidirectional composites; tension, compression, flexure and shear.

4.0 Laminates:

4.1 Plate Stiffness and Compliance, Assumptions, Strains, Stress Resultants, Computation of Stresses.

4.2 Types of Laminates - Symmetric Laminates, Antisymmetric Laminate, Balanced Laminate, Quasi-isotropic Laminates, Cross-ply Laminate, Angle ply Laminate. Orthotropic Laminate.

4.3 Laminate Moduli, Hydrothermal Stresses.

5.0 Joining Methods and Failure Theories:

5.1 Joining –Advantages and disadvantages of adhesive and mechanically fastened joints.

5.2 Typical bond strengths and test procedures.

Syllabus covered up to I.A-Chapters 1, 2 & 3

E.LEARNING RESOURCES:			
Sl. No.	***Name of Authors***	***Title of the Book***	***Name of the Publisher***
1	A.K Bhargava	Engineering Materials: Polymers, Ceramics and Composites	Prentice Hall India
2	G. Dieter	Mechanical Metallurgy	Mc-Graw Hill
3	R.F. Speyer	Thermal Analysis of Materials	Marcel Decker

TH 4b ADVANCE MANUFACTURING PROCESSES

Theory	**4 Periods per week**	**Internal Assessment**	**20 Marks**
Total Periods	**60 Periods**	**End Sem Exam**	**80 Marks**
Examination	**3hours**	**Total Marks**	**100Marks**

RATIONALE:

Advance manufacturing processes is the field of production by advance nontraditional methods which give the conversion of raw materials into finished product..

COURSE OBJECTIVES:

At the end of the course the students will be able to:

- Understand the working principle of modern machining processes.
- Understand the Plastic Processing
- Understand the additive manufacturing process
- Understand the Special Purpose Machines
- Understand the Maintenance of Machine Tools

Topic Wise Distribution of Periods

Sl No.	Topic	Periods
1	Modern Machining Processes	20
2	Plastic Processing	10
3	Additive Manufacturing Process	15
4	Special Purpose Machines	7
5	Maintenance of Machine Tools	8

DETAILED CONTENTS

1.0 Modern Machining Processes:

1.1 Introduction – comparison with traditional machining.

1.2 Ultrasonic Machining: principle, Description of equipment, applications.

1.3 Electric Discharge Machining: Principle, Description of equipment, Dielectric fluid, tools (electrodes), Process parameters, Output characteristics, applications.

1.4 Wire cut EDM: Principle, Description of equipment, controlling parameters; applications.

1.5 Abrasive Jet Machining: principle, description of equipment, Material removal rate, application.

1.5 Laser Beam Machining: principle, description of equipment, Material removal rate, application.

1.6 Electro Chemical Machining: principle, description of equipment, Material removal rate, application.

1.7 Plasma Arc Machining – principle, description of equipment, Material removal rate, Process parameters, performance characterization, Applications.

1.8 Electron Beam Machining - principle, description of equipment, Material removal rate, Process parameters, performance characterization, Applications.

2.0 Plastic Processing:

2.1 Processing of plastics.

2.2 Moulding processes: Injection moulding, Compression moulding, Transfer moulding.

2.3 Extruding; Casting; Calendering.

2.4 Fabrication methods-Sheet forming, Blow moulding, Laminating plastics (sheets, rods & tubes), Reinforcing.

2.5 Applications of Plastics.

3.0 Additive Manufacturing Process:

3.1 Introduction, Need for Additive Manufacturing

3.2 Fundamentals of Additive Manufacturing, AM Process Chain

3.3 Advantages and Limitations of AM, Commonly used Terms

3.4 Classification of AM process, Fundamental Automated Processes, Distinction between AM and CNC, other related technologies.

3.5 Application –Application in Design, Aerospace Industry, Automotive Industry, Jewelry Industry, Arts and Architecture. RP Medical and Bioengineering Applications.

3.6 Web Based Rapid Prototyping Systems.

3.7 Concept of Flexible manufacturing process, concurrent engineering, production tools like capstan and turret lathes, rapid prototyping processes.

4.0 Special Purpose Machines (SPM):

4.1 Concept, General elements of SPM, Productivity improvement by SPM, Principles of SPM design.

5.0 Maintenance of Machine Tools:

5.1 Types of maintenance, Repair cycle analysis, Repair complexity, Maintenance manual, Maintenance records, Housekeeping. Introduction to Total Productive Maintenance (TPM).

Syllabus covered up to I.A-Chapters 1,2 &3

E.LEARNING RESOURCES:			
Sl. No.	***Name of Authors***	***Title of the Book***	***Name of the Publisher***
1	O.P.KHANNA	Production technology –Vol-II	Dhanpat Rai Publication
2	B.S. Raghuwanshi	Workshop Technology, Vol – II	Dhanpat Rai Publication
3	HMT, Bangalore	Production Technology	Tata Mc-Graw Hill
4	1. Chua C.K., Leong K.F. and LIM C.S,	Rapid prototyping: Principles and Applications	WORLD SCIENTIFIC PUBLICATION,THIRD EDITION,2010
5	Stephen F. Krar & Arthur Gil	Exploring Advanced Manufacturing Technologies	1. Industrial Press

TH.4(c) INDUSTRIAL ROBOTICS & AUTOMATION (Elective)

Name of the Course: Diploma in MECHANICAL ENGINEERING			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Internal assessment	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE:

Today's manufacturing units are using robots as substitute for workers working in hazardous atmosphere. Any automation found are using robots which are known as industrial robots and helps in mass production and assembling parts to make a finished product. So to meet the need of the day this Subject should be included in the syllabus of mechanical engineering of diploma stream.

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COURSE OBJECTIVES:

At the end of the course the students will be able to:

- Understand the basic concepts, parts of robots and types of robots.
- Understand the various drive systems for robot, sensors and their applications in robots and programming of robots.
- Understand the robots according to its usage.
- Understand the various applications of robots, justification and implementation of robot.
- Conceptualize automation and understand applications of robots in various industries.

Topic Wise Distribution of Periods

Sl No.	Topic	Periods
1	Fundamentals of Robotics	10
2	Robotic Drive System and Controller	12
3	Sensors	8
4	Introduction to Machine Vision	10
5	Robot kinematics and Robot Programming	15
6	Automation & Industrial Applications	5

CHAPTERS

1.0 Fundamentals of Robotics:

1.1 Definition; Robot anatomy (parts) and its working.

1.2 Robot Components: Manipulator, End effectors; Construction of links, Types of joints.

1.3 Classification of robots; Cartesian, Cylindrical, Spherical, Scara, Vertical articulated.

1.4 Structural Characteristics of robots; Mechanical rigidity; Effects of structure on control work envelope and work Volume.

1.5 Robot work Volumes, comparison.

1.6 Advantages and disadvantages of robots.

2.0 Robotic Drive System and Controller:

2.1 Actuators; Hydraulic, Pneumatic and Electrical drives; Linear actuator; Rotary drives.

2.2 AC servo motor; DC servo motors and Stepper motors; Conversion between linear and rotary motion.

2.3 Feedback devices; Potentiometers; Optical encoders; DC tachometers.

2.4 Robot controller; Level of Controller; Open loop and Closed loop controller.
2.5 Microprocessor based control system; Robot path control: Point to point, Continuous path control and Sensor based path control; Controller programming.

3.0 Sensors:

3.1 Requirements of a sensor.
3.2 Principles and Applications of the following types of sensors: Position sensors (Encoders, Resolvers, Piezo Electric); Range sensors (Triangulation Principle, Structured lighting approach).
3.3 Proximity sensing; Force and torque sensing.

4.0 Introduction to Machine Vision:

4.1 Robot vision system (scanning and digitizing image data); Image processing and analysis.
4.2 Cameras (Acquisition of images); Videocon camera (Working principle & construction).
4.3 Applications of Robot vision system: Inspection, Identification, Navigation & serving.

5.0 Robot kinematics and Robot Programming:

5.1 Forward Kinematics; Inverse Kinematics and Differences.
5.2 Forward Kinematics and Reverse Kinematics of Manipulators with Two Degrees of Freedom (In 2 Dimensional); Deviations and Problems.
5.3 Teach Pendant Programming; Lead through programming; Robot programming Languages; VAL Programming.
5.4 Motion Commands; Sensor Commands; End effecter commands; and Simple programs.

6.0 Automation & Industrial Applications:

6.1 Basic elements of automated system, advanced automation functions, levels of automation.
6.2 Application of robots in machining; welding; assembly and material handling.

Syllabus covered up to I.A-Chapters 1, 2 & 3

E.LEARNING RESOURCES:

Sl. No.	***Name of Authors***	***Title of the Book***	***Name of the Publisher***
1	Saeed B. Niku	Introduction to Robotics: Analysis, Systems, Applications	Pearson Education Inc.New DELHI 2006
2	M.P. Groover	Industrial Robotics: Technology, Programming and Applications	Tata Mc Graw Hill Co,2001
3	Fu K S Gonzalz R Cand Lee C S G	Robotics control,sensing,visionand intelligence	1. Mc-Graw Hill Book Co, 1987.
4	Ganesh S. Hedge	A Text book on Industrial Robotics	1. , Laxmi Publications Pvt. Ltd., New Delhi
5	S.R. Deb & Sankha Deb	Robotics Technology and Flexible Automation Robot	1. Tata McGraw-Hill, 2010.

Pr.1 AUTOMOBILE ENGINEERING LAB

Name of the Course: Diploma in MECHANICAL ENGINEERING			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Practical periods:	4 P/W	Sessional	50
Maximum marks:	100	End Semester Examination:	50

COURSE OBJECTIVES

At the end of the course the students will be able to

List of Practical .

1. Study of Automobile chassis.
2. Study the differential mechanism of the Tractor.
3. Study the hydraulic braking system of automobile.
4. Study Study the cut section model of carburetor solex type and maruti car type.
5. Study the fuel pump cut section model.
6. Study the actual cut section of gear box.
7. Study of actual car engine.

Pr 2. POWER STATION ENGINEERING LAB

Name of the Course: Diploma in MECHANICAL ENGINEERING			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Practical periods:	4 P/W	Sessional	25
Maximum marks:	75	End Semester Examination:	50

COURSE OBJECTIVES

At the end of the course the students will be able to

List of Practical

Experiment 01-To study the modern steam power plant with model.
Experiment 02-To determine the various efficiencies of steam turbine.
Experiment 03-To study the cooling tower.
Experiment 04-Study of jet condenser.
Experiment 05-Study of De-lavel turbine.
Experiment 06-To study the spring loaded safety valve.
Experiment 07-To study the following steam generators (boilers)models.

a) Lancashire boiler.

b) Cornish boiler.

c)Babcock & Wilcox Boiler.

d)Vertical water tube boiler.

Pr3. PROJECT Phase - II

Name of the Course: Diploma in Mechanical Engineering			
Course code:		Semester	6th
Total Period:	150	Examination	3 hrs
Lab. periods:	10 P / week	Sessional	50
Maximum marks:	150	End Sem Examination	100

RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of Mechanical engineering and practices in real life situations, so as to participate and manage a large Mechanical engineering projects, in future. Entire Project spreads over 5th and 6th Semester. Part of the Project covered in 5th Semester was named as *Project Phase-I* and balance portion to be covered in 6th Semester shall be named as *Project Phase-II*.

OBJECTIVES

After undergoing the Project Work, the student will be able to:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real practical working environment, preferably in an industrial environment.
- Develop software packages or applications and implement these for the actual needs of the community/industry.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.
- To achieve real life experience in Project design.
- To develop the skill of writing Project Report

Project Phase-I and Phase-II

The Project work duration covers 2 semesters(5th and 6th sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group was done in the beginning of 5th semester under Project Phase-I. The students were allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work and Design of the system also have to be complete in Phase-I. Development may also begin in this phase. Project Milestones are to be set so that progress can be tracked .

In Phase-II Development, Testing, Documentation and Implementation have to be complete. Project Report have to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable alteration in the components of Task and schedule.

At the end of Project Phase-II in 6th semester there shall be one presentation by each group on whole Project work undertaken by them.

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

Sl. No.	Performance Criteria
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9	Viva voce

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations to such an exhibition.

The Project Report need to be prepared as per standard format and following is the indicative format. The Teacher Guide may make minor alteration keeping the sense in tact.

Organization of Project Report

1. Cover page:
   It should contain the following (in order)
   (i) Title of the Project
   (ii) "Submitted in partial fulfillment of the requirements for the Diploma in <Branch Name>"
   (iii) By Name of the Student(s)
   (iv) Logo of the Institution
   (v) Branch Name/Depart Name and Institution Name with Address
   (vi) Academic Year
2. 1st Inner page
   Certificate:
   It should contain he following
   "This is to certify that the work in this Project Report entitled <Project Title> by <Name of student(s)> has been carried out under my supervision in partial fulfillment of the requirements for the Diploma in <Branch Name>" during session <session > in <Branch /Department Name> of <Institute name> and this work is the original work of the above student(s).

   Seal and signature of the Supervisor/Guide with date
3. 2nd Inner Page
   Acknowledgement by the Student(s)
4. Contents.
5. Chapter wise arrangement of Reports
6. Last Chapter: Conclusion
   It should contain
   (i) Conclusion
   (ii) Limitations
   (iii) Scope for further Improvement
7. References

Pr-4 LIFE SKILL

(Common to All Branches)

Practical	**2 Periods per week**	**Sessional**	**25 Marks**
Total Periods	**30 Periods**	**Total Marks**	**25 Marks**

Objective: After completion of this course the student will be able to**:**

- Develop team spirit i.e. concept of working in team
- Apply problem solving skills for a given situation
- Use effective presentation techniques
- Apply task management techniques for given projects
- Enhance leadership traits
- Resolve conflict by appropriate method
- Survive self in today's competitive world
- Face interview without fear

DETAIL CONTENTS:

1. SOCIAL SKILL

Society, Social Structure, Develop Sympathy and Empathy
Swot Analysis – Concept, How to make use of SWOT
Inter personal Relation**:** Sources of conflict, Resolution of conflict ,
Ways to enhance interpersonal relation

2. PROBLEM SOLVING

Steps of Problem solving**:**

- Identify and clarify the problem,
- Information gathering related to problem,
- Evaluate the evidence,
- Consider alternative solutions and their implications,
- Choose and implement the best alternative,
- Review
- Problem solving techniques:

1) Trial and error, 2) Brain storming, 3) Lateral (Out of Box) thinking

3. PRESENTATION SKILL

Body language , Dress like the audience
Posture, Gestures, Eye contact and facial expression. STAGE FRIGHT,
Voice and language – Volume, Pitch, Inflection, Speed, Pause
Pronunciation, Articulation, Language, Practice of speech.
Use of AV aids such as Laptop with LCD projector, white board etc.

4. GROUP DISCUSSION AND INTERVIEW TECHNIQUES

Group Discussion:
Introduction to group discussion, Ways to carry out group discussion,
Parameters— Contact, body language, analytical and logical thinking,
decision making
Interview Technique :
Dress, Posture, Gestures, facial expression, Approach
Tips for handling common questions.

5. WORKING IN TEAM

Understand and work within the dynamics of a groups.
Tips to work effectively in teams,
Establish good rapport, interest with others and work effectively with them
to meet common objectives,
Tips to provide and accept feedback in a constructive and considerate way ,
Leadership in teams, Handling frustrations in group.

6. TASK MANAGEMENT

Introduction, Task identification, Task planning ,
organizing and execution, Closing the task

PRACTICAL

List of Assignment: *(Any Five to be performed including Mock Interview)*

1. SWOT analysis:-

Analyse yourself with respect to your strength and weaknesses, opportunities and threats. Following points will be useful for doing SWOT.

a) Your past experiences,
b) Achievements,
c) Failures,
d) Feedback from others etc.

2. Solve the True life problem assigned by the Teacher.

3. Working in a Team

Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation, environment protection, camps on awareness like importance of cleanliness in slum area, social activities like giving cloths to poor etc.(One activity per group where Team work shall be exhibited)

4. Mock Interview

5. Discuss a topic in a group and prepare minutes of discussion.

6. Deliver a seminar for 5 minutes using presentation aids on the topic given by your teacher.

7. Task Management

Decide any task to be completed in a stipulated time with the help of teacher. Write a report considering various steps in task management (with Break up into sub tasks and their interdependencies and Time)

Note: -1. Please note that these are the suggested assignments on given contents/topic. These assignments are the guide lines to the subject teachers. However the subject teachers are free to design any assignment relevant to the topic.

Note: -2. The following Topics may be considered for Seminar/GD in addition to other Topics at the discretion of the Teacher.

(Comparison with developed countries, Occupational Safety, Health Hazard, Accident & Safety, First-Aid, Traffic Rules, Global Warming, Pollution, Environment, Labour Welfare Legislation, Labour Welfare Acts, Child Labour Issues, Gender Sensitisation ,Harassment of Women at Workplace)

METHODOLOGY:

The Teacher is to explain the concepts prescribed in the contents of the syllabus and then assign different Exercises under Practical to the students to perform.

Books Recommended:-

Sl.No	Name of Authors	Title of the Book	Name of the Publisher
01	E.H. Mc Grath , S.J	Basic Managerial Skills for All	PHI
02	Lowe and Phil	Creativity and problem solving	Kogan Page (I) P Ltd
03	Adair, J	Decision making & Problem Solving	Orient Longman
04	Bishop , Sue	Develop Your Assertiveness	Kogan Page India
05	Allen Pease	Body Language	Sudha Publications Pvt. Ltd.

EQUIPMENT LIST

AUTOMOBILE ENGINEERING LAB

SL.NO	NAME OF THE EQUIPMENTS	QUANTITY
01	Chassis of a car	01 no
02	Differential of a Tractor	01 no
03	Hydraulic brake system of a car working model	01 no
04	Solex carburetor	01 no
05	Maruty car type carburetor	01 no
06	Cut section of a fuel pump	01no
07	New car engine	01 no
08	Gear box	01no

POWER STATION ENGINEERING LAB

SL.NO	NAME OF THE EQUIPMENTS	QUANTITY
01	Stainless steel steam turbine test rig 01Kw 3000RPM	01no
02	Cooling Tower Apparatus or model	01no
03	Jet Condenser apparatus or model	01no
04	De Lavel turbine	01no
05	Spring loaded safety valve	02nos
06	Lancashire boiler model	01no
07	Babcock and Wilcox boiler model	01nos
08	Cornish boiler model	01no
09	Vertical water steam boiler model	01no

6TH SEMESTER MECHANICAL ENGG.

PR.1 AUTOMOBILE ENGINEERING LAB

SL NO.	AIM OF THE EXPERIMENT	APPARATUS REQUIRED	NO OF QTY.
1.	Study of Automobile chassis.	Chassis of a car	1
2.	Study the differential mechanism of the Tractor.	Differential of a Tractor	1
3.	Study the hydraulic braking system of automobile.	Hydraulic brake system of a car working model	1
4.	Study Study the cut section model of carburetor solex type and maruti car type..	Solex carburettor Maruty car type carburetor	1
5.	Study the fuel pump cut section model.	Cut section of a fuel pump	1
6.	Study the actual cut section of gear box.	cut section of gear box	1
7.	Study of actual car engine	Gear box	1

PR 2. POWER STATION ENGINEERING LAB

SL NO.	AIM OF THE EXPERIMENT	APPARATUS REQUIRED	NO OF QTY.
1.	To study the modern steam power plant with model.	steam power plant model	1
2.	To determine the various efficiencies of steam turbine.	Stainless steel steam turbine test rig 01Kw 3000RPM	1
3.	To study the cooling tower.	Cooling Tower Apparatus or model	1
4.	Study of jet condenser.	Jet Condenser apparatus or model	1
5.	Study of De-lavel turbine.	De Lavel turbine	1
6.	To study the spring loaded safety valve.	Spring loaded safety valve	1
7.	To study the following steam generators (boilers)models. a) Lancashire boiler. b) Cornish boiler. c)Babcock & Wilcox Boiler. d)Vertical water tube boiler.	a) Lancashire boiler Model b) Cornish boiler Model c)Babcock & Wilcox Boiler Model d)Vertical water tube boiler model	1

Final

DIPLOMACURRICULUM OF MINING ENGNEERING (SECOND YEAR) (3rd Semester)

(To be implemented from 2025-26)

Prepared by;

National Institute of Technical Teachers' Training & Research Kolkata
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Vetted by:
Domain experts from Polytechnics of Odisha

State Council for Technical Education & Vocational Training
Near Raj Bhawan, Unit-VIII, Bhubaneswar, Odisha

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PROGRAMME TITLE: MINING ENGINEERING (MIE)

SEMESTER – III

SL. No	Categoryof Course	Code No	Course Title	Teaching Scheme				Evaluation Scheme				Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory		Practical			
					L	T	P	End Exam	Progressive Assessment	End Exam	Progressive Assessment		
1	Programme core	MIEPC201 (TH:1)	Surface Mining Technology	-	3	0	0	70	30	-	-	100	3
2		MIEPC203 (TH:2)	Mine Survey -I	-	3	0	0	70	30	-	-	100	3
3		MIEPC205 (TH:3)	Mine Geology -I	-	3	0	0	70	30	-	-	100	3
4		MIEPC207 (TH:4)	Mechanical Operationin Mines	-	3	0	0	70	30	-	-	100	3
5		MIEPC209 (TH:5)	Mine Machinery -I	-	3	0	0	70	30	-	-	100	3
6		MIEPC211 (PR:1)	Mine Survey -I Lab	-	0	0	4	-	-	15	35	50	2
7		MIEPC213 (PR:2)	Mine Geology -I Lab	-	0	0	4	-	-	15	35	50	2
8		MIEPC215 (PR:3)	Mechanical Operationin Mines Lab	-	0	0	4	-	-	15	35	50	2
9		MIEPC217 (PR:4)	Mine Machinery -I Lab	-	0	0	4	-	-	15	35	50	2
10	Summer Internship	SI201	Summer internship – I*	-	0	0	0	-	- - -	15	35	50	2
TOTAL					**15**	**0**	**16**	**350**	**150**	**75**	**175**	**750**	**25**

*3 to 4-weeks after 2nd Semester

***The best of 2 IA conducted in a subject out of 20 marks to be considered. Assignment/ quiz etc. of 10 marks to be treated as part of IA. Besides this, Monthly Test to be conducted for each subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester. Club/Innovation/ Idea Tinkering Activities etc. shall be encouraged to be performed by students beyond the above stipulated hours.**

SEMESTER – III

TH:1- SURFACE MINING TECHNOLOGY

L	T	P		Course Code: MIEPC201(Th 1)	
3	0	0			
Total Contact Hours			**Total Marks: 100**	**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PC	

RATIONALE:

As a Mining Engineer, onehas to develop the basic concepts and principles of winning and working in mines. Further, he should have basic knowledge of explosives for development of mines.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Explain the concepts of choice of Opencast Mining.
- Define bench parametersand slope stability.
- Describe various compositions, properties of Explosives and Blasting accessories.
- Explain different drilling methods and blasting practices in Mines.
- Describe blasting techniques asper statutory provisions and safetyprovisions of magazine.

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	**Choice of Opencast Mining:** Define Mine, Mining, Mineral, Ore, tenor, and mining engineering. Classify Surface Mining. State factors affecting choice of Open casting Mining method, Define stripping ratio and classify various stripping ratio, factor affecting stripping ratio. Define quarriable limit, State favorable conditions for mechanized Opencast Mines, State advantages and disadvantages surface mining, Define Box cut and its type. Determine the location of Box cut.	**9**
II	**Benching:** Determine bench parameters. Objective of benching in opencast mining. Factor affecting height, width of bench. **Slope Stability:** Define slope stability. Factors affecting slope stability. Types of slope failure. Causes and prevention of slope failure.	**9**

III	**Explosive and blasting accessories:** Define explosive, state constituents of explosives, properties and characteristics of explosives, Classify explosives, state composition and uses of explosives. Explain PMS and SMS Define permitted explosive and classify permitted explosive. Explain sheathed, equivalent sheathed and ultra-safe explosive. State properties of permitted explosives, State composition and constructional features of safety fuse, detonating fuse, detonating relay, igniter cord, nonel and raydet. Describe different types of detonators and uses, state advantages of delay detonators. State different types of exploder, its construction and safety features. Describe circuit tester stemming rod, crack detector knife, crimper.	**9**
IV	**Drilling**: Different types of drilling used in surface mining. Explain different principles and methods of exploratory drilling in surface mining,. State different types of drill machine used in Opencast mining, Describe simple constructional features of churn drill, drills master, wagon drill and jack hammer, State D.T.H, Describe different types of drill bits in drilling. **Blasting practices in Mines**: Define Conventional Blasting. Describe preparation of charge. State procedure of firing shots. Direct and inverse initiation, stemming materials, water ampoules, wiring and firing of explosive. Define blasting efficiency. State and describe plaster shooting and pop shooting, toe blasting.	**9**
V	**Controlled Blasting Techniques as per statutory provision:** State and describe pre-splitting, cushion blasting, muffle blasting, coyote hole blasting, chambered hole blasting, directional blasting, Electronics Blasting System (EBS). **Magazines:** Describe layout and arrangement of different types of magazines, state their safety features.	**9**
Total		45

REFERENCES:

1. SurfaceMining Technology S.K. DAS, Lovely Prakashan; 3rd edition, 2020.
2. Blasting Safety Manual, Pradhan, G.K., & Sandhu, M.S., 2002.
3. BlastingPractices in Mines S.K. DAS, Das, S.K., Lovely Prakashan, Dhanbad, 2001.
4. Elements of Mining Technology Vol. 2, D. J. Deshmukh, Denett & Co., 9th edition, 2016.
5. SurfaceMining Vol. 1, G.B. Mishra, DhanbadPublishers, 1979.
6. SME Mining Engineering Hand Book Vol.I & II, 2nd Edition, Society for Mining, 2019.

TH:2- MINE SURVEY – I

L	T	P		
3	0	0		**Course Code: MIEPC203 (Th 2)**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs		End Term Exam 70
			Total Marks: 100	Progressive Assessment 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PC

RATIONALE:

Before the starting of the actual mining operation, it is essential for the mining engineer to survey the piece of land, where mining operation is contemplated. This is not possible without the knowledge of mine surveying. In this context, Mine Survey-1 deals with the initial aspects of surveying.

COURSE OUTCOMES:

After completion of the course, the students will be able

- Explain the concepts of chain survey.
- Describe the principles of compass survey.
- Identifythe fundamentals of plane table survey.
- Describe general methods of determining areas.
- Identify various leveling methods.
- Describe different methods of calculating ore reserves and application of theodolites in surveying.

Unit No.	Content	Time Allotted (Hrs.)
I	**Chain Survey: S**urvey conventional signs, abbreviations, Standards of lining, inking and coloring, selection of scales, principle of chain surveying, instruments and correctness, Ranging and chaining of a line, Errors in chaining, Obstruction while chaining, Chaining along a sloping ground, Use of optical square and line range and correctness, Offsets and their measurements, Reference sketches of stations. Procedure of chain surveying, Field booking and plotting of chain survey.	**9**
II	**Compass Survey:** Prismatic compass, its adjustments and use, True meridians, magnetic meridian, grid line meridian and arbitrary meridian, W.C.B. and Q.B. and conversion, Fore and back bearing and their conversion, Bearing angles, Local alteration, Local alteration and correction to the bearing, Closed and open compass surveying and its plotting, Field booking in compass and chain traverses, Adjustment of closing error in compass traversing, Surveyor compass(miner's dial),its adjustment and use, Prismatic compass with surveyor compass.	**9**
III	**Plane Table Survey:** Fundamentals of Plane Table Survey, Two point problems. Three point problems and its solution by tracing paper method, Advantages and disadvantages of plane table.	**6**
IV	**Computation of areas:** Methods of determining areas, Areas from offset to a base line using Mid ordinate rule, Average ordinate rule, Trapezoidal rule, Simpson's rule, Compute area by Planimeter and from graph paper.	6
V	**Leveling: B**enchmark M.S.L. Dumpy level, Adjust dumpy level, modern levels (Auto Level & etc.), and precise staff. Methods of leveling- Rise & fall method, height of instrument, Errors in ordinary levelling, Reciprocal leveling, subsidence leveling, setting out gradient, trigonometric leveling, geometrical leveling and physical leveling.	**6**
VI	**Calculation of Ore Reserves: R**eserves, Reserves by exploratory, Primary ore reserve by material balance method and decline curve method. **Theodolite: T**emporary and permanent adjustment of Theodolite. Principles of operation and different parts, Horizontal and Vertical angles, Setting of the instrument, Traversing with Theodolite.	9
	Total	**45**

REFERENCES:

1. Textbook of Surveying, B.C. Punmia Vol I & II, Laxmi Publications, New Delhi.
2. Textbook of Surveying, T.P Kanetkar, Griha Prakashan, Pune.

TH:3- MINE GEOLOGY – I

L	T	P	Total Marks: 100	Course Code: MIEPC205 (Th 3)	
3	0	0		**Theory Assessment**	
Total Contact Hours				End Term Exam	70
Theory		: 45Hrs		Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PC	

RATIONALE:

In majority of the cases, materials that need to be mined in order to reach the hidden treasure are rocks and minerals. It is therefore, essential for a mining engineer to have the basic knowledge of geology. In this course, aspects of Geology, Crystallography and Mineralogy are discussed, which are needed for the Mining engineers.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Discuss the concept of Geomorphology.
- Identify the fundamentals of Igneous, Sedimentary and Metamorphic rocks along with their texture and structures.
- Explain the basics of structural geology.
- Demonstrate the elements of crystallography.
- Interpret the elements of mineralogy.

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	**Physical Geology:** Geology for mining engineering: branches, scope and applications – internal structure of earth and composition – layers in atmosphere - Weathering and erosion, Erosional and depositional land forms produced by wind, Erosional and depositional land forms produced by river, Glacier and iceberg, Erosional and depositional features produced by glacier, Different type of moraine with sketches.	**10**
II	**Petrology:** Define Rock and mineral. Describe Igneous, Sedimentary and Metamorphic rocks, Various textures and structures found in Igneous rocks, Structures of sedimentary rocks, Structures in metamorphic rocks, Vacancies, Interstitials and impurities, Types and causes of line defects: Edge dislocation and screw dislocation, Effect of imperfection on material properties, Deformation by slip and twinning, Effect of deformation on material properties.	**12**
III	**Structural Geology:** Dip, True dip and apparent dip, Strike, Folds, Faults, Various types of faults, Unconformity, Various type of unconformity, Joints. Various joints.	**7**
IV	**Elements of Crystallography:** Crystal, Miller's indices, Symmetryelements and forms present in the normal class of isometric system.	**9**

V	**Elements of Mineralogy: M**ineral, Physical properties of minerals. Optical properties of minerals, Silicate structures, Minerals, Mineralogy, Physical properties of Olivine, Quartz, Feldspar and Pyroxene group of minerals.	**7**
	Total	**45**

REFERENCES:

1. Textbook of Geology, P.K Mukharjee, World Press Publications, 2013.
2. Textbook of Geology, G.B. Mohapatra, CBS Publishers, 2019.
3. H. H. Read F.R.S., Rutley's Elements of Mineralogy, Springer, 1970.
4. The Principles of Petrology, G.W. Tyrrel. 1978.
5. Structural Geology, M.P. Billings, AITBS Publishers, 2012.
6. Structural Geology of Rocks at Regions,. G. Davids, 3rd Edition, 2013.

TH:4- MECHANICAL OPERATIONS IN MINES

L	T	P		Course Code: MIEPC207 (Th 4)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PC	

RATIONALE:

As Mining Engineers, it is essential to have the fundamental concepts of mechanical engineering, specially related to the working of machines that are used in mines. This course deals with the strength of materials, power transmission elements of hydraulics, compressed air and internal combustion engines.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Explain the fundamentals of strength of materials.
- Identifythe fundamentals of power transmission.
- Explain the basic elements of hydraulics.
- Identifythe uses of compressed air.
- Explain the working of internal combustion engines.

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	**Strength of Materials:** Cantilever with UDL over whole span, simple supported beam with concentration loading, Simple supported beam with UDL over whole span, Bending formula, Section modules, Section modules for beam sections of simple cases.	**9**
II	**Power Transmission**: Torsion and its effects, Application of torsion formula, Shaft couplings such as hydraulic and magnetic couplings, Belt, chain and rope Drive, Simple and compound gear train, Torque converters, Flywheel and governors, Watt, Porter and Proell governors.	**9**
III	**Elements of Hydraulics:** Properties of fluids, pressure of fluid and head, Working principles of various pressure measuring devices such as: Pieccometer tube, Continuity equation, Bernoulli's theorem, Venturimeter, Orifices, Discharge for rectangular orifices. Orifice and notch, Classification of notches, Discharge through notches, Laws of fluid friction, Loss of head due to friction (Darcy weisbach formula), Hydraulic gradient and energy gradient.	**9**

IV	Compressed air: Compressed air as a power, Classification of Compressors, Working principle, Various methods of transmission, Storage of compressed air, Use of compressed air in mines, Working principle of pneumatic machines.	**9**
V	**Internal Combustion Engines:** Various air cycles used in I.C Engines such as: OTTO Cycle, Diesel Cycle. Working principle of 2 stroke and 4 stroke petrol and diesel engines, I.H.P., B.H.P, Mechanical efficiency of I.C Engines. Applications of I.C Engines in Mining field.	**9**
	Total	**45**

REFERENCES:

1. Strength of Materials, Ramrutham, Dhanpat Rai Publishing Company(p) Ltd, New Delhi.
2. Applied Mechanics, Khurmi and Gupta, S Chand, New Delhi.
3. Hydraulic Fluid Mechanics and Fluid Machines, Ramrutham, Dhanpat Rai Publishing Company (p) Ltd, New Delhi.
4. Thermal Engineering, A.S. Sarao, Satya Prakashan, New Delhi.

TH:5- MINE MACHINERY –I

L	T	P	Total Marks: 100	Course Code: MIEPC209 (Th 5)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PC	

RATIONALE:

There are various types of machines and equipment used in mining operations. As a mining engineer, it is necessary for them to understand about the Machinery used during mining. This course is very helpful, which discusses about Mine Machinery.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Describe the features, types, construction, uses and maintenance of wires.
- Describe different types of rope haulage.
- Describe constructional and safety features of cage and shaft fittings.
- Describe different profiles of winding drum and types of friction winding.
- Explain skip-winding arrangements.
- Draw various arrangements of pit top and pit bottom layouts.

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	**Wire Ropes: W**ire ropes used in Mines, Constructional features of wire ropes and lay of wire ropes, Factor of safety, Nominal and actual factor of safety of wire ropes, Factors influencing the F.O.S, Efficiency of rope construction, space factor, cross sectional area rope. Factors affecting deterioration of ropes. Care and maintenance of ropes, Testing and examination of wire ropes, Splicing of wire ropes, Rope capel for haulage winding and recapping.	**9**
II	**Rope Haulage:** Transportation in mines by rope haulage, Types of rope haulage, Safety devices on rope haulage roadways, Different types of clips and couplings.	**6**
III	**Headgear: S**tate functions of headgear. Describe constructional features of headgear pulley. Define angle of fleet. **Cage and shaft fittings: C**age, cage suspension gear, detaching hooks, safety catch at headgear and keps, Types of guide, Rigid guide, flexible shoes, guide rope suspension and tensioning arrangement.	**6**
IV	**Winding drum: D**ifferent profiles of winding Drum, Different types of winding brake, Various types of safety devices on winding system. **Friction Winding: P**rinciple and constructional features of ground-mounted and tower-mounted koepe winder, Advantages & disadvantages of koepe winding. Multi rope system of koepe winding.	**12**
V	**Skip winding:** Constructional features bottom discharge skip, Top discharge skip, Skip winding and cage winding.	**6**
VI	**Pit top & Pit bottom circuit layout: F**actors affecting pit top and pit bottom layouts, Different types of pit top and pit bottom car/tub circuit layouts.	**6**
	Total	**45**

REFERENCES:

1. Mine Hoisting, M A Ramulu, White Falcon Self-Publishing Platform; 2nd edition, 2015.
2. SME Mining Engg Handbook, Littleton, Colo. : Societyfor Mining, Metallurgy, and Exploration, 1992.
3. Material Handling in Mines, IIT Kgp NPTEL Course Material, 2022.
4. Elements of Mining Technology Vol. 2, D. J. Deshmukh, Denett & Co., 9th edition, 2016.
5. Mine Transport, N.T Kerlin.
6. Universal Mining School Volume, T. S. Southern Ltd, 1883.

PR:1- MINE SURVEY -I LAB

L	T	P		Course Code: MIEPC211(Pr 1)	
0	0	4			
Total Contact Hours			**Total Marks: 50**	**Practical Assessment**	
Practical		: 60Hrs		End Term Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PC	

RATIONALE:

Mine surveying is important to Mining engineers. In this course, fundamentals of Mine Survey are discussed. In the field of mining, it is required to have measurements, calculations and mapping at all stages from prospecting to exploitation and utilizing mineral deposits by both surface and underground working.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Develop clear idea about Chain survey and Compass survey.
- Identify various components of Level and Theodolite along with their uses.
- Distinguish methods employed for measurement of horizontal and vertical angles.

COURSE CONTENT DETAILS:

Sl. No.	Topics for practice	Time Allotted (Hrs.)
I	**Chain Survey** • Ranging a line more than 100 m in length and measuring its correct length applying corrections. • Taking offsets of objects on both sides of a line. • Plotting the above details. • Overcoming obstructions in chaining. • Vision free, chaining obstructed (Pond, river) • Chaining free, vision obstructed (Raising ground) • Both vision and chaining obstructed (Building) • Measuring on sloping ground. • Chain surveying and plotting of small plot by triangulation.	**12**
II	**Compass Survey** • Finding bearing of line and applying check. • Closed traversing of a small plot with station (without intermediate filling) • Open traversing of a small length with few station (without offsets) • Plotting both the above traverses applying correction.	**12**
III	**Levels**: □ Temporaryand permanent adjustment, sensitivity of bubble tube practice with different types of level(Auto Level & etc.)	**12**
IV	Temporaryand permanent adjustment of theodolite.	**8**
V	Measurement of horizontal angle byreiteration and repetition methods.	**8**
VI	Measurement of vertical angle	**8**

REFERENCES:

1. Mine Surveying and Levelling Vol 1, S Ghatak, Lovely Prakashan, 2012.
2. Surveying & Levelling, B. C. Punamia, A.K. Jain, Arun Kumar Jain, 17th Edition, Laxmi Publications, 2016.
3. Surveying & Levelling, T.P. Kanetkar and S.V. Kulkarni, Pune Vidyarthi Girha Prakashan, 2017.
4. Mine surveying by F. Winniberg, Mining Publications, 1935.

PR:2- MINE GEOLOGY -I LAB

L	T	P		Course Code: MIEPC213 (Pr 2)	
0	0	4			
Total Contact Hours			**Total Marks: 50**	**Practical Assessment**	
Practical		: 60Hrs		End Term Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PC	

RATIONALE:

In majority of the cases, materials that need to be explored comprise of rocks and minerals. It is therefore, essential for a mining engineer to have the basic knowledge regarding the composition, structure and texture of both rock and minerals.

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Identifyore forming and rock forming minerals.
- Determine specific gravity of minerals by workers steel yard balance.
- Analyze thin section of minerals and rocks under microscope.
- Solve the structural geology problems
- Measure strike and dip in the field

COURSE CONTENT DETAILS:

Sl. No.	Topics for practice	Time Allotted (Hrs.)
I	Identification of rock forming and ore minerals in hand specimens	**8**
II	Determination of specific gravity by workers steel yard balance	**8**
III	Analysis of thin sections of minerals under the microscopes	**8**
IV	Analysis of thin sections of rocks under the microscopes	**12**
V	Studyand sketching of models showing different types of faults, folds & their relation to topography	**12**
VI	Strike and dip measurement using Brunton Compass and Clinometer, Dip and Strike Problems.	**12**
	Total	**60**

REFERENCES:

1. Simmons & Schuden guide, Rocks and Minerals Cornelius S. Hurlbut. Jr. Dana's manual of Mineralogy, John Wiley and Sons, 1985.

PR:3- MECHANICAL OPERATION IN MINES LAB

L	T	P		Course Code: MIEPC215 (Pr 3)	
0	0	4			
Total Contact Hours			**Total Marks: 50**	**Practical Assessment**	
Practical		: 60Hrs		End Term Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PC	

RATIONALE:

Mechanization is happening in mining sector and is vital for the growth of the mining industry. As a mining engineer, one should have some fundamental knowledge regarding the machines used in mines.

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Identify the application of Bernouli's Theorem
- Determine velocity of air
- Determine volumetric efficiency of air compressor.
- Distinguish construction and working procedure of 2-stroke and 4-stroke diesel engine.
- Experiment involving the testing on I.C. Engine.

COURSE CONTENT DETAILS:

Sl. No	Topics for practice	Time Allotted (Hrs.)
I	Verify Bernoulli's Theorem by using Bernoulli's Verification Apparatus.	**8**
II	Determine rate of flow through the venturimeter set-up.	**8**
III	Conduct Tensile test of a mild steel specimen and plot stress-stain curve, show salient points on it.	**8**
IV	Determine volumetric efficiency of Air compressor	**12**
V	Study of 2-Stroke and 4-Stroke diesel engines	**12**
VI	Conduct of I.C Engine Test - Conduct I/C engine testing on single cylinder diesel engine & find out I.H.P., B.H.P. & mechanical efficiency.	**12**
	Tota	**60**

REFERENCES:

1. Strength of Materials, Ramrutham, Dhanpat Rai Publishing Company(p) Ltd, New Delhi.
2. Applied Mechanics, Khurmi and Gupta, S Chand, New Delhi.
3. Hydraulic Fluid Mechanics and Fluid Machines, Ramrutham, Dhanpat Rai Publishing Company (p) Ltd, New Delhi.
4. Thermal Engineering, A.S. Sarao, Satya Prakashan, New Delhi.

PR:4- MINE MACHINERY -I LAB

L	T	P	Total Marks: 50	Course Code: MIEPC217 (Pr 4)	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs		End Term Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PC	

RATIONALE:

It is imperative that a Mining Engineer should be thoroughly conversant with various types of machine used in mining operations.

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Identifythe basics of Wire rope, rope splicing & capeling.
- Describe the details about Safety hook, keps & rope guides.
- Explain about head gear structure, suspension gear & winding drum.

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COURSE CONTENT DETAILS:

Sl. No	Topics for practice	Time Allotted (Hrs.)
I	Study of Wire rope.	**4**
II	Studyof rope splicing.	**4**
III	Studyof rope cappel.	**4**
IV	Study of safetyhook.	**4**
V	Study of keps.	**4**
VI	Studyof guide in shaft.	**4**
VII	Study of clips used in endless ropehaulage.	**4**
VIII	Model Development of Headgear Structure.	**4**
IX	Model Development of Suspension Gear.	**8**
X	Model Development of different types of winding drum	**8**
XI	Model development of different types of safetydevices used in haulageroadways.	**12**
	Tota	**60**

References:

1. Mine Hoisting, M A Ramulu, White Falcon Self-Publishing Platform; 2nd edition, 2015.
2. SME Mining Engg Handbook, Littleton, Colo. : Society for Mining, Metallurgy, and Exploration, 1992.
3. Material Handling in Mines, IIT Kgp NPTEL Course Material, 2022.
4. Elements of Mining Technology Vol. 2, D. J. Deshmukh, Denett & Co., 9th edition, 2016.
5. Mine Transport, N.T Kerlin.
6. Universal Mining School Volume, T. S. Southern Ltd, 1883.

SUMMER INTERNSHIP – I

L	T	P		Course Code: SI201	
0	0	0			
Total Contact Hours				Internship Assessment	
Practical		0	Total Marks: 50	End Term Exam	15
				Progressive Assessment	35
Pre Requisite		: Nil			
Credit		2		Category of Course : SI	

Duration: 3-4 weeks during summer vacation after 2nd Semester.

RATIONALE

Summer Internship - I is to offer a structured and practical learning experience that prepares individuals for their future careers, helps them make informed career choices, and equips them with the skills and knowledge necessary to succeed in their chosen field. This course provides opportunities to students for hands-on industry experience.

LEARNING OUTCOMES

After completion of the course, the students will be able to:

- Apply theoretical knowledge gained in their academic coursework toreal-world situations.
- Enhance specific skills relevant totheir field.
- Gain hands-on experience in a professional network by interacting with mentors and industry professionals.
- Manage time effectively.
- Clarifycareer goals.

DETAILED COURSE CONTENTS

SUGGESTED ACTIVITIES:

I Orientation:

- Introduction to the organization's mission, values, and culture.
- Familiarization with workplace policies, procedures, and safety guidelines.
- Orientation to the team and organizational structure.

II Project-Based Learning:

- Description of the main project or tasks the intern will be working on during theinternship.
- Detailed project goals and objectives.
- Training and guidance on project-specific tools, technologies, or methodologies.

III Technical and Skill Development:

- Training sessions or workshops to enhance technical skills relevant to the internship role (e.g., programming languages, software tools, laboratory techniques).
- Soft skills development, including communication, teamwork, problem solving, and time management

IV Mentorship and Supervision:

- Regular meetings with a designated mentor or supervisor for guidance, feedback, and support.
- Mentorship objectives and expectations.

V Professional Development:

- Sessions on professional etiquette, networking, and building a personal brand

- Resume writing and interview preparation workshops.

VI Industryand Field-Specific Knowledge:

- Lectures, seminars, or presentations on industrytrends, best practices, and emerging technologies.
- Guest speakers from the field to share insights and experiences.
- Field visit for practical exposures.

VII Reporting and Documentation:

- Training on how to document project progress, results, and findings.
- Practice in creating reports, presentations, or other deliverables.

VIII Ethics and Professionalism:

- Discussions on ethical considerations within the field.
- Scenarios and case studies related to ethical decision-making

IX Feedback and Evaluation:

- Regular performance evaluations and feedback sessions.
- Self-assessment and goal-setting exercises.

X Networking and Industry Exposure:

- Opportunities to attend industry conferences, webinars, or networking events.
- Encouragement to connect with professionals in the field.

NOTE

As per AICTE guidelines, in Summer Internship-I, students are required to be involved in Inter/ Intra Institutional Activities viz;

- Training with higher Institutions;
- Soft skill training organized by Training and Placement Cell of the respective institutions;
- contribution at incubation/ innovation /entrepreneurship cell of the institute;
- participation in conferences/ workshops/ competitions etc.;
- Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop;
- Working for consultancy/ research project within the institutes and
- Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

BRANCH – MINING ENGG. YEAR - 2ND (3RD SEM)

EXPERIMENT WISE REQUIREMENTS

LAB – MINE SURVEY-I (PR-1)

SL NO.	NAME OF THE EXPERIMENTS	APPARATUS REQUIRED	NO. OF QUANTITY
1	Ranging a line more than 100 m in length and measuring its correct length applying corrections	Ranging Rod,Chain,Tape	4
2	Taking offsets of objects on both sides of a line.	Chain / Tape	1
3	Plotting the above details.	Chain(1), Tape(1), Wooden peg(12), Ranging rod(4), Thread(1), Lime	
4	Overcoming obstructions in chaining.		
	Vision free, chaining obstructed (Pond, river)	Chain(1), Tape(1), Wooden peg(12), Ranging rod(4), Thread(1)	
	Chaining free, vision obstructed (Raising ground)	Chain(1), Tape(1), Clinometer (1), Ranging rod(4), Thread(1)	
	Both vision and chaining obstructed (Building)	Chain(1), Tape(1), Wooden peg(12), Ranging rod(4), Thread(1)	
5	Measuring on sloping ground.	Ranging rod(4), Chain / Tape(1)	
6	Chain surveying and plotting of small plot by triangulation.	Chain(1), Tape(1), Wooden peg(12), Ranging rod(4), Thread(1), Lime	
7	Finding bearing of line and applying check	Surveyor Compass **or** Prismatic Compass	1
8	Closed traversing of a small plot with station (without intermediate filling)	Surveyor Compass **or** Prismatic Compass **or** Theodolite	1
9	Open traversing of a small length with few station (without offsets)	Theodolite	1
10	Plotting both the above traverses applying correction.	Chain, Tape**,** Surveyor Compass **or** Prismatic Compass, Tripod stand	1
11	Temporary adjustment, sensitivity of bubble tube practice with different types of level (Auto Level & etc.)	Auto Level, Tripod Stand, Staff	1
12	Permanent adjustment, sensitivity of bubble tube practice with different types of level (Auto Level & etc.)	Auto Level, Tripod Stand, Staff	1
13	Temporary adjustment of theodolite.	Theodolite, Tripod Stand, Staff	1
14	Permanent adjustment of theodolite.	Theodolite, Tripod Stand, Staff	1
15	Measurement of horizontal angle by reiteration method.	Theodolite, Tripod Stand, Staff	1
16	Measurement of horizontal angle by repetition method.	Theodolite, Tripod Stand, Staff	1
17	Measurement of vertical angle.	Theodolite, Tripod Stand, Staff	1

BRANCH – MINING ENGG. YEAR - 2ND (3RD SEM)

EXPERIMENT WISE REQUIREMENTS

LAB – MINE GEOLOGY -I LAB (PR-2)

SL NO.	NAME OF THE EXPERIMENTS	APPARATUS REQUIRED	NO. OF QUANTITY
1	Identification of rock forming and ore minerals in hand specimens	Different types of Rocks & Minerals.	1
2	Determination of specific gravity by workers steel yard balance	Workers steelyard balance	1
3	Analysis of thin sections of minerals under the microscopes	Microscope & Thin sections of Minerals	1
4	Analysis of thin sections of rocks under the microscopes	Microscope & Thin sections of Rocks	1
5	Study and sketching of models showing different types of faults, folds & their relation to topography	Models of Faults, Folds	1
6	Strike and dip measurement using Brunton Compass and Clinometer, Dip and Strike Problems	Brunton Compass & Clinometer	1

BRANCH – MINING ENGG. YEAR - 2ND (3RD SEM)

EXPERIMENT WISE REQUIREMENTS

LAB – MECHANICAL OPERATION IN MINES LAB (PR-3)

SL NO.	NAME OF THE EXPERIMENTS	APPARATUS REQUIRED	NO. OF QUANTITY
1	Verify Bernoulli's Theorem by using Bernoulli's Verification Apparatus	Hydraulic Bench	1
2	Determine rate of flow through the venturimeter set-up.	Hydraulic Bench	1
3	Conduct Tensile test of a mild steel specimen and plot stress-stain curve, show salient points on it.	Universal Testing Machine (UTM)	1
4	Determine volumetric efficiency of Air compressor	Air Compressor	1
5	Study of 2-Stroke diesel engines	2-Stroke diesel engine Model	1
6	Study of 4-Stroke diesel engines	4-Stroke diesel engine Model	1
7	Conduct of I.C Engine Test - Conduct I/C engine testing on single cylinder diesel engine & find out I.H.P., B.H.P. & mechanical efficiency.	Single cylinder diesel engine	1

BRANCH – MINING ENGG. YEAR - 2ND (3RD SEM)

EXPERIMENT WISE REQUIREMENTS

LAB – MINE MACHINERY -I LAB

SL NO.	NAME OF THE EXPERIMENTS	APPARATUS REQUIRED	NO. OF QUANTITY
1	Study of Wire rope.	Stranded Rope & Non-stranded Rope	1
2	Study of rope splicing	Wire Ropes, Vice, Wooden Hammer, Toggle	1
3	Study of rope cappel.	Split Capple, Coned Socket Cappel, Reliance Capple	1
4	Study of safetyhook.	Ormerd Detaching Safety hook, King Detaching Safety hook	1
5	Study of keps.	keps	1
6	Study of guide in shaft.	Rigid Guide & Flexible Guide	1
7	Study of clips used in endless rope haulage.	Screw Clips, Smallman Clip, Cam Clip	1
8	Model Development of Headgear Structure.	Headgear Structure	1
9	Model Development of Suspension Gear.	Suspension Gear	1
10	Model Development of different types of winding drum	Friction Winding, Skip Winding	1
11	Model development of different types of safety devices used in haulage roadways	Stop Block, Monkey Catch, Back stay, Drop Warwick, Runaway Switch, Tub rerailer	1

Final

DIPLOMA CURRICULUM OF MINING ENGNEERING (SECOND YEAR) (4th Semester)

(To be implemented from 2025-26)

Prepared by;

National Institute of Technical Teachers' Training & Research Kolkata
Block – FC, Sector – III, Salt Lake City, Kolkata – 700106

Vetted by:
Domain experts from Polytechnics of Odisha

State Council for Technical Education & Vocational Training
Near Raj Bhawan, Unit-VIII, Bhubaneswar, Odisha

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PROGRAMME TITLE: MINING ENGINEERING

SEMESTER – IV

SL. No	Category of Course	Code No	Course Title	Teaching Scheme				Evaluation Scheme				Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory		Practical			
					L	T	P	End Exam	Progressive Assessment	End Exam	Progressive Assessment		
1	Programme Core	MIEPC202 (TH:1)	Mine Survey -II	**MIEPC 203**	3	0	0	70	30	-	-	100	3
2		MIEPC204 (TH:2)	Mine Ventilation		3	0	0	70	30	-	-	100	3
3		MIEPC206 (TH:3)	Mine Machinery II	**MEPC 209**	3	0	0	70	30	-	-	100	3
4		MIEPC208 (PR:1)	Mine Survey -II Lab		0	0	4	-	-	15	35	50	2
5		MIEPC210 (PR:2)	Mine Ventilation Lab		0	0	4	-	-	15	35	50	2
6#		MIEPC212 (PR:3)	Mine Machinery II Lab		0	0	4	-	-	15	35	50	2
7	Programme Elective	MIEPE202 (TH:4)	(A) Underground Coal Mining (B) Mining Technology		3	0	0	70	30	-	-	100	3
8		MIEPE204 (TH:5)	(A) Special Underground Mining (B) Mine Legislation and General Safety – I (C) Advanced Mine Survey		3	0	0	70	30	-	-	100	3
9	**Minor Project**	PR202 PR:4	MINOR PROJECT		0	0	4	-	-	30	70	100	2
10	**Mandatory**	AU202	Essence of Indian knowledge and tradition		2	0	0	-	-	0	0	0	0
TOTAL					**17**	**0**	**16**	**350**	**150**	**75**	**175**	**750**	**23**

The best of 2 IA conducted in a subject out of 20 marks to be considered. Assignment/ quiz etc. of 10 marks to be treated as part of IA. Besides this, Monthly Test to be conducted for each subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester. Club/Innovation/ Idea Tinkering Activities etc. shall be encouraged to be performed by students beyond the above stipulated hours.

TH:1- MINE SURVEY –II

L	T	P		Course Code: MIEPC202 (TH 1)	
3	0	0			
Total Contact Hours			**Total Marks: 100**	**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre-Requisite		**: Nil**			
Credit		**3**		Category of Course: PC	

RATIONALE:

Before starting the actual mining operation, it is essential for mining engineer to first survey the piece of land where mining operation is contemplated. This is not possible without the knowledge of mine surveying.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Comprehend the principle of tachometry and its applications in measurement of distance.
- Explain the principle of triangulation & trilateration.
- Explain principles of correlations by different methods.
- Define various terms in connection with cove setting, laying out of curves by different methods.
- Explain different methods of stope surveying, transfer of stope faces to mine Plan.
- Explain the basic principle of global positioning systems & total station.

COURSE CONTENT DETAILS:

Unit No.	Topics for practice	Time Allotted (Hrs.)
I	**Tachometry:** Stadia and its principle, Diaphragm, reticules, tacheometer, instruments constants, Height and distance from stadia intercepts, tangential systems, movable hair method.	**10**
II	**Triangulation and Trilateration:** Triangulation and trilateration method. Triangulation survey primary, secondary and tertiary colliery triangulation. Reconnaissance survey. Measuring angle, types of theodolite used in triangulation survey. Methods of base line measurement using E.D.M. Tape correction. Triangulation station of permanent nature.	**10**
III	**Correlation of surface and underground survey: D**irect correlation by traversing and optical methods, Orientation by wires in two shafts, Correlation by mines in vertical shafts, Co-planning/ alignment, weissbach triangle, weis-quadrilateral methods, precise magnetic correlation.	**10**
IV	**Setting out curves: E**lements of curves, Designation of curves, simple, compound and reverse curves, setting of surface and underground curves by chords and offsets, chords and angle, tangent and offset, plate layers method, Various setting out by chain and one theodolite, two theodolites, Super elevation, transition and vertical curves.	**9**
V	**Stope Surveying: T**ape triangulation, instrumental survey, Stope face, Preparation of stope planes, plotting the stope station, plotting of stope face to	**6**

	the mine plan. Area of extraction by Planimeter and calculation of triangle thereof. **G.P.S. and Total Station**: Basic principles of global positioning system and total station, Introduction to DGPS.	
	Total	**45**

REFERENCES:

1. Surveying Vol I, E. Mason.
2. Surveying and Levelling, T.P. Kanetkar, 2008.
3. Geodetic Surveying Vol I, David Clerk, CBS Publishers, 2018.
4. Mineral Economics, Sinha and Sharma, CBS Publishers, 2019.

TH:2- MINE VENTILATION

L	T	P		Course Code: MIEPC204 (TH 2)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre-Requisite		**: Nil**			
Credit		**3**		Category of Course: PC	

RATIONALE:

The provision of proper ventilation is very essential for any underground mining operation. As a mining Engineer, one should have the thorough knowledge of types of ventilation, methods of air crossing, types of fans etc.

COURSE OUTCOMES:

- Describe different types of natural ventilation and laws of mine air friction.
- Describe different methods of air crossings and distribution.
- Illustrate different types of fans, fan characteristics, Mine characteristics and selection of fans.
- Identify different locations of booster fan, auxiliary ventilation and its advantages and disadvantages.
- Explain different ways of pressure survey, quantity survey & quality survey, leakage of air in mines.

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	**Natural Ventilation**: Objective of ventilation. Define geothermic gradient. Definition of natural ventilation and factors affecting natural ventilation, Different types of Barometer, Kata thermometer, Sources of moisture content of mine air. Effects of heat and humidity, Natural ventilation, motive column, Laws of mine air friction and solve problems.	**9**
II	**Air Crossing and distribution**: Ventilation stopping, air crossing, ventilation door, brattice partition, Different types of ventilation, Accessional and declensional ventilation, Homotropal and Antitropal ventilation, Boundary ventilation, Central and combined ventilation, Splitting of air current and solve numerical problems on splitting. Air locks at pit top.	**9**
III	**Mechanical Ventilation**: Construction and principle of operation of centrifugal flow fans, Fan laws & calculate fan efficiency and capacity, Installation of mine fan with reversal arrangement. Fan drift, fan drive, evasee and diffusers. Fan characteristics and mine characteristics, Methods of output control of mine fans. Forcing fan vs. exhaust fan	**9**
IV	**Booster fan and its Effects: I**nstallation, location and purpose & disadvantages of booster fan. **Auxiliary Ventilation: S**ystems of auxiliary ventilation, Advantages and disadvantages of auxiliary ventilation.	**9**

V	**Ventilation Survey**: Methods of pressure survey using barometer, gauge and pitot tube with manometer, Method of measurement of cross-sectional area, Method of velocity measurements by using anemometer, velometer, pitot- static tube, smoke & cloud method, Determination of percentage of oxygen, methane, carbon monoxide, SO_2 and H_2S by using multigas detector. **Leakage of air in Mines**: Causes and preventive measures of leakage of air in mines.	**9**
	Total	**45**

REFERENCES:

1. Mine Ventilation, G B Mishra, OUP India Publishers, 1989.
2. Elements of Mining Technology Vol. 2, D. J. Deshmukh, Denett & Co., 9th edition, 2016
3. Coal Mine Practices, E. Mason
4. Mine Ventilation, L C KAKU, Lovely Prakashan, 2020.
5. Universal Mining School Volume, T. S. Southern Ltd, 1883.
6. SME Mining Engineering Hand Book Vol.I & II, 2nd Edition, Society for Mining, Metallurgy, and Exploration; A.B. Cummins, I.A Given, 2nd edition, 1992.

TH:3- MINE MACHINERY – II

L	T	P	Total Marks: 100	Course Code: MIEPC206 (TH 3)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre-Requisite		**: Nil**			
Credit		**3**		Category of Course: PC	

RATIONALE:

There are various types of machines and equipment used in mining operations. As a mining engineer, it is necessary for them to understand about the Machinery used during mining. This course is very helpful, which discusses about Mine Machinery, which were not details in Mine Machinery-I course.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Describe various underground face machineries and their applicability.
- Describe various opencast machineries and their applicability.
- Describe various types of pump and their applicability.
- Describe various types of bore hole pumps and their applications.
- Elaborate details about various pipes and valves used in mines.

COURSE CONTENT DETAILS:

Unit No.	Topics for practice	Time Allotted (Hrs.)
I	**Underground Face Machineries:** Electric coal drill, Constructional features, operation, principle and use of electric coal drill, Types of drill rods & drill bits used in electric coal drill, Constructional features and operation principle of gathering arm loader, scraper loader, side discharge loader, load and haul loader, Jack hammer drill and air leg rock drill. Road header and Shearer loader.	**12**
II	**Opencast machineries: C**onstructional features of surface miner, dragline, shovel and backhoe, bucket wheel excavator, Dumper, dozer, scraper and road grader.	**6**
III	**Mine Pumps:** Mine pumps, Constructional features, working & use of ram pumps, Constructional features, Principle of centrifugal and turbine pumps and their applicability, Balancing the axial thrust of turbine pumps, Characteristic curves for turbine pumps, Constructional features and working principle and use of roto pump (screw pump), Constructional features & working principle of sinking pump, Suspension in shaft.	**12**
IV	**Bore hole pump:** Constructional features and working of bore hole pump, Installation of bore hole pump.	**6**
V	**Pipes and valves:** Types of pipes and valves used in Mines, Constructional features of various type of valves, Different types of pipe joints. Describe Pipe line layout.	**9**
	Total	**45**

REFERENCES:

1. Electrical equipment in Mine, H. Cotton, Newnes Publishers, 1955.
2. Winning and Working of Iron Ore, R.J Desmukh and D.J. Desmukh, Published by Amravati D J Deshmukh 1967.
3. Elements of Mining Technology VOL III, D.J.Desmukh, NAGPUR DENETT Publishers, 2014.

PR:1- MINE SURVEY -II LAB

L	T	P	Total Marks: 50	Course Code: MIEPC208 (PR 1)	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs		End Exam	15
				Progressive Assessment	35
Pre-Requisite		**: Nil**			
Credit		**2**		Category of Course: PC	

RATIONALE:

Mine surveying is important to Mining engineers. In this course, fundamentals of Mine Survey are discussed. In the field of mining, it is required to have measurements, calculations and mapping at all stages from prospecting to exploitation and utilizing mineral deposits by both surface and underground working. In this course, advanced equipment like Tacheometry, GPS and DGPS along with the uses of Autocad and software in Mine planning are practiced.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Identify the working of about Tacheometer and Tacheometry.
- Demonstrate various components of GPS, DGPS and their uses.
- Use total station in calculations of various components in mining field.
- Applycomputational tools and software in Mine planning.

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	Fix triangulation and measurement of peripheral and hub angles. Base line measurement applying all corrections and plotting by co-ordinates.	**4**
II	Determine the north, Setting of curves by Total Station and Theodolites.	**4**
III	Correlate underground and surface survey during survey camp.	**4**
IV	Measurement of Horizontal & Vertical angles, measurement of distance by Total Station.	**4**
V	Mining lease boundary survey using Total Station, Base line fixation using Total Station.	**4**
VI	Coordinate point shifting and reference point shifting by Total Station.	**4**
VII	Fixation of control point by 02 traversing (both Horizontal and Vertical control points) with Total Station and auto level.	**4**
VIII	Topographic survey & existing features, Area and Volume calculation using software.	**4**
IX	GPS Survey.	4
X	Preparation of plan and section using AUTOCAD.	**8**
XI	DGPS Survey.	**8**
XII	Reserve calculation of Ore.	**8**

	Total	**60**

REFERENCES:

1. Surveying Vol I, E. Mason.
2. Surveying and Levelling, T.P. Kanetkar, 2008.
3. Geodetic Surveying Vol I, David Clerk, CBS Publishers, 2018.
4. Mineral Economics, Sinha and Sharma, CBS Publishers, 2019.

PR:2- MINE VENTILATION LAB

L	T	P	Total Marks: 50	Course Code: MIEPC210 (PR 2)	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs		End Exam	15
				Progressive Assessment	35
Pre-Requisite		**: Nil**			
Credit		**2**		Category of Course: PC	

RATIONALE:

Proper ventilation is very essential for any underground mining operation. As a mining Engineer, one should have the practical exposure to different types of mechanical ventilators, different measuring instruments and air leakage protecting devices used in mines. This course deals with different types of ventilation aspects.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Explain the uses of stationary and storrow's hygrometer in calculation of relative humidity.
- Calculate cooling power of air with help of kata thermometer.
- Illustrate different types of fans, fan characteristics and selection of fans.
- Explain the uses of Regulators and Air locks in different parts of mine.
- Calculate velocityof air with the help of vane anemometer.
- Explain different ways of pressure survey, quantity survey & quality survey.

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	Determine the relative humidity bystationary hygrometer.	**4**
II	Determine the relative humidityby storrow's hygrometer.	**4**
III	Determine the cooling power of mine air using Kata thermometer.	**4**
IV	Studyand sketching of air crossing.	**4**
V	Study& use of Vane Anemometer.	**4**
VI	Study& use of Digital Anemometer.	**4**
VII	Study of constructional features of axial flow fan.	**4**
VIII	Determination of fan characteristic curve.	**4**
IX	Studyand sketching of regulator &airlocks.	**8**
X	Studyand use of Pitot static-tube measurement of quantity of air flow.	**8**
XI	Study of constructional features of centrifugal fans and reversal arrangement.	**12**
	Total	**60**

REFERENCES:

1. Mine Ventilation, G B Mishra, OUP India Publishers, 1989.
2. Elements of Mining Technology Vol. 2, D. J. Deshmukh, Denett & Co., 9th edition, 2016
3. Coal Mine Practices, E. Mason

4. Mine Ventilation, L C KAKU, Lovely Prakashan, 2020.
5. Universal Mining School Volume, T. S. Southern Ltd, 1883.
6. SME Mining Engineering Hand Book Vol.I & II, 2nd Edition, Society for Mining, Metallurgy, and Exploration; A.B. Cummins, I.A Given, 2nd edition, 1992.

PR:3- MINE MACHINERY -II LAB

L	T	P	Total Marks: 50	Course Code: MIEPC212 (PR 3)	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs		End Exam	15
				Progressive Assessment	35
Pre-Requisite		**: Nil**			
Credit		**2**		Category of Course: PC	

RATIONALE:

It is imperative that a Mining Engineer should be thoroughly conversant with various types of machines used in mining operations.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Prepare an electrical switch board to control 2 light points & 1 plug points.
- Describe circuit breakers and draw circuit diagram of gate-end box and drill panel.
- Describe different types of protective system and Relays.
- Distinguish different types of cables used for mining purpose
- Explain the uses of Megger check and continuity of windings.

COURSE CONTENT DETAILS:

Expt No.	Content	Time Allotted (Hrs.)
I	Study of Centrifugal Pumps.	**4**
II	Study of Turbine Pumps.	**4**
III	Study of Roto Pump.	**4**
IV	Study of Sinking Pump.	**4**
V	Study of electric coal drills & its accessories.	**4**
VI	Study of Jack Hammer Drill with air leg.	**4**
VII	Study& plotting of characteristics curve of Turbine pump.	**12**
VIII	Study of scrapper loader.	**8**
IX	Model Development of Gathering arm loader.	**8**
X	Study of scrapper & shaker conveyor.	**8**
	Total	**60**

REFERENCES:

1. Electrical equipment in Mine, H. Cotton, Newnes Publishers, 1955.
2. Winning and Working of Iron Ore, R.J Desmukh and D.J. Desmukh, Published by Amravati D J Deshmukh 1967.
3. Elements of Mining Technology VOL III, D.J.Desmukh, NAGPUR DENETT Publishers, 2014.

TH:4(A)- UNDERGROUND COAL MINING

L	T	P		Course Code: MIEPE202A (TH 4)	
3	0	0			
Total Contact Hours			**Total Marks: 100**	**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre-Requisite		**: Nil**			
Credit		**3**		Category of Course: PE	

RATIONALE:

As a Mining Engineer, one should know different methods of underground working in coal mining and operational principles. This course deals with the aspects of Underground Coal Mining.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Explain different mining methods and working of B.P. method and its development and depillaring, precautions against fire and water and B.P. layout.
- Explain long wall method.
- Describe elementary idea about thick seam mining and horizon mining.
- Explain hydraulic and pneumatic stowing along with support and roof control in Mines.
- Describe Subsidence due to Mining.

COURSE CONTENT DETAILS:

Unit No.	Topics for practice	Time Allotted (Hrs.)
I	**Introduction to Underground Coal Mining: Diff**erent methods of mining Underground Coal Mining Methods. **Bord and Pillar Method: V**arious application of Bord and Pillar method, Various layouts of Bord & Pillar method. Depillaring method with stowing and caving. Precautions against fire and water during and after depillaring, Various machineries used in working face, contiguous seam, working of contiguous seams, working of seams above and below goaved out area, advantages and disadvantages of Bord & Pillar method.	**9**
II	**Longwall Method:** Longwall advancing and retreating methods, Single unit and double unit face, Cyclic and non-cyclic L/W layouts, Mechanized longwall working with armoured flexible conveyor, shield support and shearer loader.	**9**
III	**Thick seam Mining: T**hick seams, Thick seam Mining, layouts of horizontal slicing, incline slicing, blasting gallery and sublevel caving. **Horizon Mining:** Conditions, advantages, disadvantages and limitations of Horizon Mining, Layout of Horizon Mining.	**9**
IV	**Hydraulic and Pneumatic stowing**: Hydraulic stowing, Pneumatic stowing. **Support and roof control in Mines:** Properties of various types of roof & roof behaviour, Pressure arch theory in B&P and longwall working, Testing of roof, Support system in Mines construction, principle of operation application and load bearing capacity assessment.	**9**
V	**Subsidence due to Mining**: Angle of draw, Factors of subsidence, critical area of extraction, Factors affecting subsidence, Precautionary measures against damage due to subsidence, Shaft pillar. **Shaft Sinking: V**ertical shaft and inclined shaft; Shape and size of shaft, location of	**9**

	shaft. Sinking through normal ground. State shaft plumbing, Sinking through difficult ground, cementation, freezing, mechanized shaft sinking, sinking upward, widening and deepening of shafts.	
	Total	**45**

REFERENCES:

1. Coal Mining, S. Mathur, Sahyog Publishers, 2008.
2. Elements of Mining Technology VOL III, D.J.Desmukh, Nagpur Denett Publishers, 2014.
3. Modern Coal Mining, S.K. Das, Lovely Prakashan, 1994.
4. Advanced Coal Mining, RT Deshmukh & B.Borovjev
5. Universal Mining School Volume, T. S. Southern Ltd, 1883.
6. Coal Mine Ground Control, S S Peng, Society for Mining Metallurgy; 3rd edition, 2008.
7. SME Mining Engineering Hand Book Vol.I & II, 2nd Edition, Society for Mining, Metallurgy, and Exploration; A.B. Cummins, I.A Given, 2nd edition, 1992.
8. Strata Control in Mineral Engineering by Z. T., Bieniawski, 1987.

TH:4(B)- MINING TECHNOLOGY

L	T	P	Total Marks: 100	Course Code: MIEPE202B (TH 4)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre-Requisite		**: Nil**			
Credit		**3**		Category of Course: PE	

RATIONALE:

The student of Mining must be aware of the Mineral Industry in the country and the Departments, which deal with mineral exploration, exploitation, safety, conservation and control of the mining industry. All technical definitions and terminologies connected with above are included here, as the students at this stage must be acquainted with these to cope up with the contents at later stage. Blasting is an important operation in all the mining operations. Knowledge of all the types of explosives, their properties and selection for different conditions/situation types of detonator/fuses etc is a must for them. Also, it is essential for a mining engineer to understand systems of support of the mine workings. These all aspects have been included in this course.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- State various organizations engaged in coal and noncoal mining, their role and functions.
- Identify various technical terms, operations involved in coal & noncoal mining.
- Describe the properties of explosives, procedure of conducting shot firing operation in underground coalmines with due regards to safety.
- Explain the procedure of erection of temporary supports in underground coalmines.
- Discuss the major method of extraction of coal used in underground coal mines, their conditions of applicability.

COURSE CONTENT DETAILS:

Unit No.	Topics for practice	Time Allotted (Hrs.)
I	**Introduction to Mineral & Important Mining Organizations:** Definition of minerals, Uses of important minerals mined, Important Organizations involved like DGMS, IBM, GSI, CIL, MECL, CIMFR, CMPDIL etc their role and functions.	**6**
II	**Mining Terminology and Definition:** Common terminologies used in coal mining, Common terminologies used in metal mining, Common terminologies used in mine ventilation and environment, Common terminologies used in mine supports, Simple definition, explanation, purposes and sketches	**9**

III	**Explosives and Accessories:** Common explosive bases, Properties of Explosives, High Explosive and Low explosive, their comparison. Permitted explosives their types, composition, properties, uses, advantages and disadvantages. Brand names of some commonly used explosive of each type. A detonator, common types of detonators, plain detonators, instantaneous and delay action detonators their construction, uses, comparison etc. low tension and high-tension detonators, Safety fuses, detonating cords, detonating relays. Exploders	**6**
IV	**Shot Firing:** Drilling patterns for shot firing on machine cut face, in stone drift etc., Shot Firing tools, Face preparation for shot firing, Preparation of priming charge, charging of hole in coal and rock in underground working only, Direct and inverse initiation, shot firing circuits, procedure of shot firing of holes in gassy mine, precautions. Simultaneous & delay firing, Solid blasting, conditions to be satisfied before doing solid blasting, advantages of solid blasting, drilling patterns used with solid blasting	**9**
V	**Safety in Shot firing operation**: Explosive required for blasting in coal/rock. Powder factor, detonator factor. Precaution to improve blasting results. Misfires, causes, remedy and method of relieving dealing with misfires, blown out shots, blown through shots causes and precautions. Purpose of stemming, Stemming materials used for shot firing, water ampoules for stemming. Storage of explosives, Magazines Disposal of outdated explosives.	**6**
VI	**Introduction to coal mining method**: Classifications of method of working, Board & Pillar , Open cast method. Long wall. Applicability condition for selection of each methods of working. Layout of each method. Advantages & disadvantages	**9**
	Tota	**45**

REFERENCES:

1. G.K. Pradhan Explosive and Blasting Techniques Publisher 1996 1993 S.K. Das
2. Explosives and Blasting Techniques Mintech publication Bhubaneshwar. Lovely prakashan Dhanbad.
3. D.J. Deshmukh Elements of Mining Technology Vol.- I 1995 Central techno publication, Nagpur

TH:5(A)- SPECIAL UNDERGROUND MINING

L	T	P		Course Code: MIEPE204A (TH 5)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre-Requisite		**: Nil**			
Credit		**3**		Category of Course: PE	

RATIONALE:

It is important for the Mining engineers to learn about various special methods practiced in underground mines. This course takes care of all such details.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Describe Bord & Pillar method using Continuous Miner.
- Identify mining in thick and thin seams.
- Explain hydraulic mining method.
- Describe the methods in underground coal gasification.
- Identify the basics of the highwall mining method.

COURSE CONTENT DETAILS:

Unit no.	Content	Time allotted (hrs.)
I	**Bord & Pillar method using Continuous Miner:** Formation and extraction of pillars by Bord & Pillar method using Continuous Miner - Split and Fender method, Wongawilli method, Rib pillar extraction method, Statutory provisions regarding formation and extraction of pillars by Bord & Pillar method using Continuous Miner, Machineries used in Bord and Pillar working using Continuous Miner– Continuous Miner, Shuttle Car/ Ram Car, Rock Bolters (Twin/ Quad Bolter etc.), Feeder Breaker, LHD – operational aspects only, Simple layouts of formation and extraction in Bord and Pillar method using Continuous Miner, Case studies of Bord & Pillar mining method using Continuous Miner in India	12
II	**Mining of thick and thin seams:** Problems of mining thick seams; Longwall based multi-slice methods: Inclined slicing, horizontal slicing and cross-slicing in ascending and descending sequence, Under winning methods: sub-level caving, integral caving, Longwall Top Coal Caving, Blasting Gallery Method, Problems in Mining thin seams, Equipment and methods for thin seam extraction.	9
III	**Hydraulic Mining of Coal:** Conditions suitable for hydraulic Mining of Coal, Hydraulic Mining Operation, Layout of workings for hydraulic mining of moderately thick seams.	9
IV	**Underground Coal Gasification (UGC);** Conditions suitable for Underground Coal Gasification, Basic principle and technology of underground coal gasification, Advantage and disadvantage of UCG, Scope of application of UCG in Indian conditions.	9
V	**Highwall Mining**: Introduction, Applicability and Method, Scope of application of Highwall Mining in Indian conditions	6
	Total	**45**

REFERENCES:

1. Singh, T. N., Underground winning of Coal, Oxford and IBH, New Delhi, 1992
2. Statham, I. C. F., Coal Mining Practice, Caxton eastern agencies, Calcutta, Reprint, 1964
3. Das, S. K., Modern Coal Mining Technology, Lovely Prakashan, Dhanbad, 1992
4. Singh, R. D., Principles & Practices of Modern Coal Mining, New Age International, New Delhi, 1997
5. Peng, S. S. and Chiang, H. S., Longwall Mining, John Willey and Sons, New York, 1992.

TH:5(B)- MINE LEGISLATION AND GENERAL SAFETY -I

L	T	P	Total Marks: 100	Course Code: MIEPE204B (TH 5)	
3	0	0		**Theory Assessment**	
Total Contact Hours				End Term Exam	70
Theory		: 45Hrs		Progressive Assessment	30
Pre-Requisite		**: Nil**			
Credit		**3**		Category of Course: PE	

RATIONALE:

Mining operations involve complex processes and mechanisms. Accidents may occur if appropriate safety measures are not taken care. It is very important for the mining engineer to be thoroughly conversant with various acts and rules framed for providing safety to workers.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Describe various aspects of Mines Act 1952.
- Describe various aspects of Mines Rule 1955.
- Describe various aspects of Coal Mines Regulations 2017.
- Describe various aspects of Mines Rescue Rules 1985.
- Describe various aspects of Indian Explosive Rules 2008.
- Describe various aspects of Central Electricity Authority 2010.

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	**Mines Act 1952 & Mines Rules 1955** Mines Act: Important definition: Adolescent, adult, child, Employed, Mine, Open cast working, Relay, Shift, Serious bodily injury. Provisions under chapter V, Provision for health and safety. Provisions regarding leave with wages, Act 49 to 56 .Hours & Limitations of Employment, act 28 to 48.Mines rules: Provisions regarding health & sanitation, first aid and medical appliances. Mines Rules- Provisions connected with leave with wages and over time and welfare amenities. Employment of persons, Rule 46 to 52	**9**
II	**Coal Mines Regulations: Important definitions:** Duties and responsibilities of workman, competent person & officials. Provisions of Reg. 38, 39, 43, 44, 45, 46, 48, 56 Planes and sections Reg. 58, 59, 61, 63.Means of access & egress. Reg. 66 to 70 Provisions regarding winding in shaft Reg. 71 to 86. Transport of men & material Reg. 88, 89,90,91,92,93,94,95 mine working Reg. to 115 Precautions against dangers from the dust, gas & water .Reg. 116 to 128. Ventilation Reg. 130 to 149 Provisions regarding lighting and safety lamp. Reg. 150 to 158. Explosives & Blasting Reg. 158 to 180 Provisions regarding machinery, plant & equipment and important provisions under chapter on miscellaneous.	**9**

III	**Mine accidents** : Basic concept and their classification , accident costs, accident report, procedure for conducting an enquiry to ascertain the causes of accidents, procedure for investigating and reporting mine accidents, accident proneness, Industrial fatigue, fatality rate, frequency rate, severity rate, role of supervisor in accident prevention, statistical analysis of accidents, accident statistics- its need and method of data processing , Effect of accidents in productivity.	**9**
IV	**Mine Rescue rules 1985:** Explain Various provision MRR 1985	**9**
V	**Indian Explosive rule 2008** Discuss various provisions of Indian Explosive rules	**9**
	Tota	**45**

REFERENCES:

1 Mines Act, 1952.
2 Mines Rules, 1955.
3 Coal Mine Regulations, 2017.
4 Mines Rescue Rules, 1985.
5 Indian Explosive Rules, 2008.

TH:5(C)- ADVANCED MINES SURVEY

L	T	P	Total Marks: 100	Course Code: MIEPE204C (TH 5)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre-Requisite		**: Nil**			
Credit		**3**		Category of Course: PE	

RATIONALE:

A Mining engineer entrusted with the responsibility of supervising mine survey works should be through conversant with the latest developments techniques employed in mine surveying.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Explain the fundamental concepts of Spherical Trigonometry.
- Describe the important ideas of File Astronomy.
- Explain the essential elements of Photogrametry.
- Describe the fundamental concepts of Global Positioning System.
- Explain the important notions of Total Station

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	**Spherical Trigonometry:** Common terms used in Spherical Trigonometry like Sphere. Great circle, Small circle, Side of a triangle, Angle of a Triangle, Spherical axes, Spherical Triangle, Right Angled Triangle, Rectangular to Spherical coordinates. Convergence of meridian and parallel of latitude.	**9**
II	**Field Astronomy:** Terms used in field astronomy like, Celestial Sphere, Celestial Latitude, Celestial Longitude, Azimuth, Hour angle, Declination, Altitude, Zenith, Nadir, Right Ascension, Celestial Meridian, Celestial Equator, Zenith Distance, Vertical Circle, Celestial Horizon. Astronomical Triangle etc. Astronomical coordinates for heavenly bodies. Apparent time, Meantime, Sidereal time, Standard Time, Relation between different types of times. Latitude , Longitude, Time and azimuth of a place.	**12**
III	**Element of Photogrammetry:** Photo theodolite, Camera axis, Picture Plane, Principal points, Focal Length, Nodal Point, Prospective centre, Principal Distance, Principal Plane, Print, Isocentre in terrestrial Photogrammetry. Fundamental principles behind stereo phtogrammetry. Vertical photograph, Tilted Photograph, Oblique photograph, Prospective projection, Explosure station, Flying height focal length, Principal Point, Nadir Point, Ground	**12**

	Nadir Point, Till, Principle plane, Principle Line, Isocentre, Azimuth of Principle Plane, Horizontal Point. Find out the scale of Photography.	
IV	**Global Positioning System:** Global Positioning System. Principle of working of the system in brief, Application of GPS in Mining Engineering.	**6**
V	**Total Station:** Different components of Total Station, Applications of Total Station in Mines.	**6**
	Tota	**45**

REFERENCES:

1. Surveying Volume –III, Dr. B. C. Punmia, Laxmi Publication, 1990.
2. Modern Concepts of Mine Surveying. Vol-II by Alam Chand, News Sketch Press, Dhanbad.

PR:4- MINOR PROJECT

L	T	P		Course Code: PR 202	
0	0	4			
Total Contact Hours				**Project Assessment**	
Theory		: 60Hrs	**Total Marks: 100**	End Exam	30
				Progressive Assessment	70
Pre-Requisite		**: Nil**			
Credit		**2**		Category of Course	: Project

RATIONALE:

A Minor project generally requires a larger amount of effort and more independent work than that involved in a normal assignment. It requires students to undertake their own fact-finding and analysis. The students will select the topic, perform and design work. Minor project is as preparation for the students to take on more responsibilities and bigger project in the future. It is a learning experience, which aims to provide students with the opportunity to synthesize knowledge from different areas of learning, and critically and creatively apply it to real life situations. The leadership quality, co-ordination of job and maintaining good communal harmony is an important factor of this type of activity.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Plan a Minor Project
- Execute a Minor Project with team.
- Implement hardware/software/analytical/numerical techniques, etc. based on project requirements.
- Optimize time related works through sharing of work responsibility
- Develop cost awareness and utilization of fund.
- Prepare a technical report on the project.

GUIDELINES FOR MINOR PROJECT

Unit No.	Topic/Sub-Topic
I	o Minimum three and maximum five students can form a group for the minor project.
II	o Project type can include • Development of a simple prototype system/product. • Investigation of performance of some systems using experimental method • Analysis of components/systems/devices using suitable software • Investigation of optimum process/material for product development using market survey.

	• Solution for society/industry problems
III	o Project domain may not be limited to the specific area / discipline.
IV	o Project report to be prepared and submitted by the students with following components: 1. Title 2. Objectives 3. Relevance and significance 4. Methodology 5. Analysis-Simulation/experimentation/survey/testing etc. 6. Result and Discussion 7. Conclusion

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

L	T	P		Course Code: AU 202	
2	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 30Hrs	**Total Marks:0**	End Term Exam	0
				Progressive Assessment	0
Pre-Requisite		**: Nil**			
Credit		**0**		Category of Course	: AU

RATIONALE:

Considering the need of protecting Indian knowledge and tradition, the diploma level students of Automobile Engineering should be facilitated the concepts Indian traditional knowledge and to make them understand the importance of roots of knowledge system and methods of application in today's life and how to protect traditional knowledge system. Interpretation of the concepts of Intellectual property to protect the traditional knowledge as well as importance of Traditional knowledge in Agriculture and Medicine must be known.

LEARNING OUTCOMES:

After completion of the course, the students will be able to**:**

- Understand the foundational principles of Indian knowledge systems by exploring the Vedas, Upavedas, Vedangas, and their interrelation with ancient and modern disciplines.
- Develop an appreciation for the integration of traditional Indian practices with modern science, focusing on holistic health care, yoga, and sustainable living practices.
- Analyze case studies to evaluate the practical applications of Indian knowledge systems in modern technological and scientific domains, including AI and ML.
- Foster interdisciplinary thinking by bridging ancient wisdom with contemporary educational and technological frameworks.

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge (Unani / Siddha/ Ayurveda), Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge of Odisha	7
II	Protection of traditional knowledge (TK): The need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.	7

III	Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.	6
IV	Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, Geographical Indications (GI).	4
V	Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK	6

REFERENCES:

1. Cultural Heritage of India- Course Material by V. Sivaramakrishna Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014.
2. Modern Physics and Vedant by Swami Jitatmanand, Bharatiya Vidya Bhavan.
3. The wave of Life by Fritzof Capra
4. Tao of Physics by Fritzof Capra
5. Tarkasangraha of Annam Bhatta, Inernational by V N Jha Chinmay Foundation, Velliarnd, Amaku,am
6. Science of Consciousness Psychotherapy and Yoga Practices by RN Jha Vidyanidhi Prakasham, Delhi, 2016

BRANCH – MINING ENGG. YEAR - 2ND (4TH SEM)

EXPERIMENT WISE REQUIREMENTS

LAB – MINE SURVEY-II (PR-1)

SL NO.	NAME OF THE EXPERIMENTS	APPARATUS REQUIRED	NO. OF QUANTITY
1	Fix triangulation and measurement of peripheral and hub angles. Base line measurement applying all corrections and plotting by co-ordinates	Theodolite / Total Station, Tripod stand, Staff	1
2	Determine the north, Setting of curves by Total Station and Theodolites.	Total Station / Theodolites	1
3	Correlate underground and surface survey during survey camp.	Compass / Theodolites /Total Station, Tripod stand, Staff	1
4	Measurement of Horizontal measurement of distance by Total Station.	Total Station, Tripod stand, Staff	1
5	Measurement of Vertical angles measurement of distance by Total Station.	Total Station, Tripod stand, Staff	1
6	Mining lease boundary survey using Total Station, Base line fixation using Total Station	Total Station, Tripod stand, Staff	1
7	Coordinate point shifting and reference point shifting by Total Station.	Total Station, Tripod stand, Staff	1
8	Fixation of control point by 02 traversing (both Horizontal and Vertical control points) with Total Station and auto level.	Total Station and auto level, Tripod stand, Staff	1
9	Topographic survey & existing features, Area and Volume calculation using software.	AUTOCAD Installed System	30
10	GPS Survey.	GPS, Tripod stand, Staff	1
11	Preparation of plan and section using AUTOCAD.	AUTOCAD Installed System	30
12	DGPS Survey.	DGPS, Tripod stand, Staff	1
13	Reserve calculation of Ore.	GPS, Planimeter	1

BRANCH – MINING ENGG. YEAR - 2ND (4TH SEM)

EXPERIMENT WISE REQUIREMENTS

LAB – MINE VENTILATION LAB (PR-2)

SL NO.	NAME OF THE EXPERIMENTS	APPARATUS REQUIRED	NO. OF QUANTITY
1	Determine the relative humidity by stationary hygrometer	Stationary hygrometer	1
2	Determine the relative humidity by storrow's hygrometer.	Storrow's hygrometer	1
3	Determine the cooling power of mine air using Kata thermometer.	Kata thermometer	1
4	Study and sketching of air crossing.	Model of Air Crossing	4
5	Study& use of Vane Anemometer.	Vane Anemometer	1
6	Study & use of Digital Anemometer.	Digital Anemometer	1
7	Study of constructional features of axial flow fan.	Model of Axial flow fan	1
8	Determination of fan characteristic curve	Graph Paper, Scale, Pencil	1
9	Study and sketching of regulator & airlocks.	Model of regulators & airlocks	4
10	Study and use of Pitot static-tube measurement of quantity of air flow.	Pitot static-tube	1
11	Study of constructional features of centrifugal fans and reversal arrangement	Model of Centrifugal fans	1

BRANCH – MINING ENGG. YEAR - 2ND (4TH SEM)

EXPERIMENT WISE REQUIREMENTS

LAB – MINE MACHINERY -II LAB (PR-3)

SL NO.	NAME OF THE EXPERIMENTS	APPARATUS REQUIRED	NO. OF QUANTITY
1	Study of Centrifugal Pumps.	Centrifugal Pump	1
2	Study of Turbine Pumps.	Turbine Pump	1
3	Study of Roto Pump	Roto Pump	1
4	Study of Sinking Pump.	Sinking Pump	1
5	Study of electric coal drills & its accessories.	Electric coal drill	1
6	Study of Jack Hammer Drill with air leg.	Jack Hammer Drill	1
7	Study & plotting of characteristics curve of Turbine pump.	Turbine pump, Graph Paper	1
8	Study of scrapper loader.	Scrapper loader	1
9	Model Development of Gathering arm loader.	Gathering arm loader	1
10	Study of scrapper & shaker conveyor.	Scrapper & Shaker conveyor	1

CURRICULLUM OF 5TH SEMESTER

For

DIPLOMA IN MINING ENGINEERING

(Effective FROM 2020-21 Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING,ORISSA

TEACHING AND EVALUTION SCHEME FOR 5th Semester Mining Engg. (w e f 2020-21)

SUBJECT NUMBER	SUBJECT CODE	SUBJECT	Periods/Week			Evaluation Scheme			
			L	T	P	Internal assessment /Sessional	End Sem Exam	Exams (Hours)	Total
		Theory							
Th. 1		Entrepreneurship and Management & Smart Technology	4	-	-	20	80	3	100
Th .2		Mine Hazard and Safety	4	-	-	20	80	3	100
Th .3		Mine Legislation and General Safety -I	4	-	-	20	80	3	100
Th .4		Mine Machinery -I	4	-	-	20	80	3	100
Th. 5		Underground Metal Mining	4	-	-	20	80	3	100
		Total	20			100	400		500
		Practical							
Pr .1		Mine Hazard and Safety Lab	-	-	6	50	50	3	100
Pr .2		Mine Machinery -I Lab	-	-	6	50	50	3	100
Pr .3		Project Phase - I	-	-	4	50	-		50
		Student Centred Activities(SCA)	-	-	3	-	-		
		Total			19	150	100		250
		Grand Total	20		19	250	500		750

Abbreviations : L-Lecturer ,T-Tutorial ,P-Practical .Each class is of minimum 55 minutes duration.

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/Personality Development/Environmental issues /Quiz/Hobbies/Field visits/Cultural Activities/Library Studies/Classes on MOOCS/SWAYAM etc. ,Seminar and SCA shall be conducted in a section.

There shall be 1 Internal Assesment done for each of Theory subject .Sessional Marks shall be total of the performance of individual different jobs/experiments in a subject throughout the semester

Th1. ENTREPRENEURSHIP and MANAGEMENT & SMART TECHNOLOGY

(Common to All Branches)

Theory	**4 Periods per week**	**Internal Assessment**	**20 Marks**
Total Periods	**60 Periods**	**End Sem Exam**	**80 Marks**
Examination	**3hours**	**Total Marks**	**100Marks**

Topic Wise Distribution of Periods

Sl No.	Topic	Periods
1	Entrepreneurship	10
2	Market Survey and Opportunity Identification(Business Planning)	8
3	Project report Preparation	4
4	Management Principles	5
5	Functional Areas of Management	10
6	Leadership and Motivation	6
7	Work Culture, TQM & Safety	5
8	Legislation	6
9	Smart Technology	6
	TOTAL	60

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students, so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mind set with managerial skill helps the student in the job market. The students can also be introduced with Startup and Smart Technology concept, which shall radically change the working environment in the coming days in the face of Industry 4.0

In this subject, the Students shall be introduced/ exposed to different concepts and Terminologies in brief only, so that he/she can have broad idea about different concepts/items taught in this subject. Solving numerical problem on any topic/item is beyond the scope of this subject.

OBJECTIVES

After undergoing this course, the students will be able to :

- Know about Entrepreneurship, Types of Industries and Startups
- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- know the management Principles and functional areas of management
- Inculcate leadership qualities to motivate self and others.
- Maintain and be a part of healthy work culture in an organisation.
- Use modern concepts like TQM
- Know the General Safety Rules
- Know about IOT and its Application in SMART Environment.

DETAILED CONTENTS

1. **Entrepreneurship**
   - Concept /Meaning of Entrepreneurship
   - Need of Entrepreneurship
   - Characteristics, Qualities and Types of entrepreneur, Functions
   - Barriers in entrepreneurship

- Entrepreneurs vrs. Manager
- Forms of Business Ownership: Sole proprietorship, partnership forms and others
- Types of Industries, Concept of Start-ups
- Entrepreneurial support agencies at National, State, District Level(Sources): DIC, NSIC,OSIC, SIDBI, NABARD, Commercial Banks, KVIC etc.
- Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

2. **Market Survey and Opportunity Identification (Business Planning)**

- Business Planning
- SSI, Ancillary Units, Tiny Units, Service sector Units
- Time schedule Plan, Agencies to be contacted for Project Implementation
- Assessment of Demand and supply and Potential areas of Growth
- Identifying Business Opportunity
- Final Product selection

3. **Project report Preparation**

- Preliminary project report
- Detailed project report, Techno economic Feasibility
- Project Viability

4. **Management Principles**
- Definitions of management
- Principles of management
- Functions of management (planning, organising, staffing, directing and controlling etc.)
- Level of Management in an Organisation

5. **Functional Areas of Management**

a) Production management
- Functions, Activities
- Productivity
- Quality control
- Production Planning and control

b) Inventory Management
- Need for Inventory management
- Models/Techniques of Inventory management

c) Financial Management
- Functions of Financial management
- Management of Working capital
- Costing (only concept)
- Break even Analysis
- Brief idea about Accounting Terminologies: Book Keeping, Journal entry, Petty Cash book, P&L Accounts, Balance Sheets(only Concepts)

d) Marketing Management
- Concept of Marketing and Marketing Management
- Marketing Techniques (only concepts)
- Concept of 4P s (Price, Place, Product, Promotion)

e) Human Resource Management
- Functions of Personnel Management

- Manpower Planning, Recruitment, Sources of manpower, Selection process, Method of Testing, Methods of Training & Development, Payment of Wages

6. **Leadership and Motivation**

a) Leadership
- Definition and Need/Importance
- Qualities and functions of a leader
- Manager Vs Leader
- Style of Leadership (Autocratic, Democratic, Participative)

b) Motivation
- Definition and characteristics
- Importance of motivation
- Factors affecting motivation
- Theories of motivation (Maslow)
- Methods of Improving Motivation
- Importance of Communication in Business
- Types and Barriers of Communication

7. **Work Culture, TQM & Safety**
- Human relationship and Performance in Organization
- Relations with Peers, Superiors and Subordinates
- TQM concepts: Quality Policy, Quality Management, Quality system
- Accidents and Safety, Cause, preventive measures, General Safety Rules , Personal Protection Equipment(PPE)

8. **Legislation**

a) Intellectual Property Rights(IPR), Patents, Trademarks, Copyrights
b) Features of Factories Act 1948 with Amendment (only salient points)
c) Features of Payment of Wages Act 1936 (only salient points)

9. **Smart Technology**
- Concept of IOT, How IOT works
- Components of IOT, Characteristics of IOT, Categories of IOT
- Applications of IOT- Smart Cities, Smart Transportation, Smart Home, Smart Healthcare, Smart Industry, Smart Agriculture, Smart Energy Management etc.

Syllabus to be covered before IA: Chapter 1,2,3,4

RECOMMENDED BOOKS

1. Entrepreneurship Development and Management by R.K Singhal, Katson Books., New Delhi
2. Entrepreneurship Development and Management by U Saroj and V Mahendiratta, Abhishek Publications, Chandigarh
3. Entrepreneurship Development and Management by Vasant Desai, Himalaya Pub.House
4. Industrial Engineering and Management by O.P Khanna ,Dhanpat Rai and Sons
5. Industrial Engineering and Management by Banga and Sharma, Khanna Publications
6. Internet of Things by Jeeva Jose, Khanna Publications, New Delhi
7. Online Resource on Startups and other concepts
8. https://www.fundable.com/learn/resources/guides/startup

Th.2. MINE HAZARD AND SAFETY

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	5th
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

RATIONALE

As a Mining Engineer, one must be thoroughly conversant with various sources of mining hazards as also the remedial measures needed to be undertaken to avoid any mishap and able to understand total operation of rescue and recovery.

OBJECTIVES

After completion of the subject, students will be able to:

- Testing of different mine gases. Physiological effect on miners, detection of fire damp by flame safety lamp, explains the method of gas testing by CO-detectors & methanometer.
- Explain how firedamp is emitted in mines.
- Explain causes of mine fires & spontaneous heating.
- Define explosion, explain causes & elaborate necessary steps required for prevention of coal dust & firedamp explosion.
- Define mine inundation, explain causes & elaborate necessary preventive measures required.
- Describe lighting arrangement, lighting standards explain glare & its effect
- Explain the effect of noise & vibration on miners & mine structures & other surface structure.
- Explain rescue and recovery work when mine hazard occurs.

Topic- wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Mine gases & gas testing	6
2	Emission of firedamp in U/g coal mines	6
3	Mine fires & spontaneous heating	10
4	Mine Explosion	10
5	Mine Inundation	8
6	Mine lighting & Illumination	5
7	Noises & Vibration	5
8	Mine Rescue and Recovery	10
	Total	60

COURSE CONTENTS

1. Mine gases & gas testing

- Composition of atmospheric air. Different mine gases, their properties and physical effects .
- State fire damps, black damp, stink damp, white damp and after damp in mines.
- Describe flame safety lamp & its working principle.
- Explain gas testing by flame safety lamp by accumulation test & percentage test.
- State precaution for gas testing.
- Describe various parts of flame safety lamp, special features.
- State limitations of flame safety lamp.

2. Emission of firedamp in U/g workings

- Describe gradual exudation, blower & outbursts of firedamp in U/g workings.

3. Define fires & spontaneous heating

- Define incubation period
- Define spontaneous heating and its causes and effects.
- State preventive measures against spontaneous heating.
- Explain CO/O_2 ratio & CO_2/O_2 ratio.

4. Mine Explosion

- Describe coal dust explosion & fire damp explosion with their causes & prevention.
- State inflammability of coal dust & fire damp.
- Explain Coward's diagram.
- State prevention, suppression & treatment of dust.
- Describe sampling of dust in Mines.
- Stone dust barrier.

5. Mine Inundation

- State sources of water in mines & its danger.
- State precaution against inundation.
- Describe burnside safety boring apparatus.
- State precaution while approaching water logged area.
- Describe water dams- its construction & design. (Without derivation of formula)
- Explain water danger plan.
- Statutory provision for working near water body.

6. Mine lighting & illumination

- Define illumination and its units.
- Standards of lighting at different parts of mine as per mine regulation.

7. Noise and Vibration .

- Explain the effect of noise & vibration on miners & mine structures & other surface structure with respect to statutory provision.

8. Mine Rescue and Recovery

- Proto-IV, Proto-V, Drager BG-174, Self rescuer, Smoke helmet, Gas mask.
- Construction of Rescue brigade and their role in rescue and recovery operation.
- Mine Rescue rules 1985 Annexure I,II,III.

SYLLABUS COVERAGE UP TO I.A

Chapter 1,2,3,4

Learning Resourses:		
Sl. No.	Title of the Book	Name of Authors
1	Mine Ventilation	G B Mishra
2	EMT - II	D J Deshmukh
3	Coal Mine Practices	E Mason
4	UMS Vol - I	
5	Coal mine Regulations - 2017	
6	Mine Rescue	M A Ramlu

Th. 3. MINE LEGISLATION & GENERAL SAFETY-I

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	5th
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

RATIONALE

Since Mining operations involve frequent accidents, it is very important for a mining engineer to be thoroughly conversant with various acts & rules framed for providing safety to workers.

OBJECTIVES

On completion of the course, students will be able to :

- Describe various aspects of Mines Act 1952.
- Describe various aspects of Mines Rule 1955.
- Describe various aspects of Coal Mines Regulations 2017.
- Describe various aspects of Mines Rescue Rules 1985.
- Describe various aspects of Indian Explosive Rules 2008.
- Describe various aspects of Central Electricity Authority 2010.

Topic- wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Mines Act 1952	14
2	Mines Rules 1955	10
3	Coal Mines Regulations 2017	18
4	Mine Rescue Rules 1985	5
5	Indian Explosive Rule 2008	7
6	Central Electricity Authority 2010	6
	Total	60

COURSE CONTENTS

1. Mines Act 1952

- Discuss various provisions of Mines Act 1952.

2. Mines Rules 1955

- Discuss various provisions of Mines Rule 1955.

3. Coal Mines Regulation 2017

- Discuss various Provisions of C.M.R. 2017.

4. Mines Rescue Rules 1985

- Discuss various provisions of Mines Rescue Rules 1985.

5. Indian Explosive Rules 2008

- Discuss various provisions of Indian Explosive Rules 2008.

6. Central Electricity Authority 2010

- Discuss various provisions of Central Electricity Authority 2010.

SYLLABUS COVERAGE UP TO I.A

Chapter 1,2

Learning Resourses		
Sl. No.	Title of the Book	Name of Authors
1	Mines Act - 1952	
2	Mines Rules - 1955	
3	Coal Mine Regulations - 2017	
4	Mines Rescue Rules - 1985	
5	Indian Explosive Rules - 2008	
6	Central Electricity Authority - 2010	

Th.4. MINE MACHINERY – I

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	5th
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

RATIONALE

It is imperative that a Mining Engineer should be thoroughly conversant with various types of machine used in mining operations.

OBJECTIVES

On completion of the subject, students will be able to:

- Describe type & construction of wire, their uses, maintenance & related calculation.
- Describe different types of transportation methods in mines.
- Explain headgear's functions & its design factors.
- Describe constructional & safety features of cage and shaft.
- Describe different profiles of winding drum, various safety devices & related calculations.
- Describe different types of friction winding & its function.
- Explain skip-winding arrangements.
- Draw various arrangements at pit top & pit bottom layouts.

Topic- wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Wire ropes	12
2	Rope Haulage	14
3	Headgear	5
4	Cage & shaft fittings	6
5	Winding drum	6
6	Friction Winding	5
7	Skip Winding	6
8	Pit top & Bottom Layout	6
	Total	60

COURSE CONTENTS

1. Wire Ropes

- State the types of wire ropes used in Mines.
  - Describe constructional features of wire ropes & lay of wire ropes.
- Define factor of safety to wire ropes nominal & actual factor of safety of wire ropes.
  - State factors influencing the F.O.S.
- State efficiency of rope construction, space factor & cross sectional area rope.
- State factors affecting deterioration of ropes.
- Describe care & maintenance of ropes.
- State & describe testing & examination of wire ropes.
- Give the procedure of splicing of wire rope
- Describe rope capel for haulage winding & recapping.

2. Rope Haulage

- Transportation in mines by rope haulage.
- State type of rope haulage.
- Describe various types of rope haulage with simple sketches.
- State & describe different type of safety devices on rope haulage roadways.
- State & describe different types of clips & couplings.

3. Headgear

- State function of headgear.
- Describe constructional features of headgear pulley.
- Define angle of fleet.

4. Cage and shaft fittings

- Describe cage, cage suspension gear, detaching hooks & its function, safety catch at headgear & keps.
- State types of guide.
- State & describe rigid guide, flexible shoes, guide rope suspension & tensioning arrangement.

5. Winding drum

- State different profiles of winding Drum.
- Describe different types of winding brake.
- Describe various types of safety devices on winding system.

6. Friction Winding

- State & describe principle & constructional features of ground-mounted & tower-mounted koepe winder.
- State advantages & disadvantages of koepe winding.
- Describe multirope system of koepe winding.

7. Skip winding

- Describe constructional features bottom discharge skip, Top discharge skip.
- Compare skip winding cage winding.

8. Pit top & Pit bottom circuit layout

- State factors affecting pit top & pit bottom layouts.
- Describe different types of pit top & pit bottom car/tub circuit layouts.

SYLLABUS COVERAGE UP TO I.A.

Chapter 1,2.3.4

Learning Resourses		
Sl. No.	Title of the Book	Name of Authors
1	Mine Hoisting	M A Ramulu
2	SME Mining Engg Handbook	
3	Material Handling in Mines,IIT KGP	
4	EMT III	D.J.Desmukh
5	Mine Transport	N.T Kerlin
6	UMS Volume	

Th. 5. UNDERGROUND METAL MINING

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	5th
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

RATIONALE

As Mining Engineer, one should have the knowledge in fundamental principles of generation in underground metal mines.

OBJECTIVES

On completion of the subject, students will be able to :

- Describe various methods to access an ore body.
- Explain various methods of development used in underground metal mines.
- Compare between coal & metal mining.
- Explain various stopping methods used in u/g metal mines.
- Stone Drifting.
- Explain causes & prevention of rock burst.
- Describe about face mechanization.

Topic- wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Access to ore body	5
2	Development in underground metal mines	12
3	Comparative study between Coal & Metal Mining	3
4	Stoping Method	18
5	Stone Drifting.	7
6	Rock burst.	5
7	Face mechanization	10
	Total	60

COURSE CONTENTS (Based on specific objectives)

1. Access to ore body

- Classify modes of entries – Adits , inclines and shafts ,applicability of entries.

2. Development in underground Metal Mine.

- Explain formation of blocks of mineral deposit.

- o Explain level interval
- o Describe
- Open raising method
- Two compartment method
- Jora raise lift
- Long hole drilling method./Vertical Crater retreat (VCR) method.
- Alimak raise climber
- Raise borer.
- Development of Ore passe system.

3. Give a comparative study between coal and metal Mining.

4. Stoping methods.

- o Classify stoping methods with application and factors affecting methods of stopping.
- o Preparatory arrangement for stoping.
- o Describe the following methods with layout including drilling, blasting, transportation and supports.
- Open stoping.
- Open stoping with pillar support.
- Shrinkage stoping.
- Cut & fill stoping.
- Square set stoping.
- Block caving.
- Sub-level caving.
- Top slicing.

5. Stone Drifting

- Describe conventional methods of drifting. Find out direction gradient of drift. Describe drilling and blasting, support, transportation, drainage, ventilation and lighting arrangements, organization and supervision in mechanised method of drifting.

6. Rock Burst

- Explain causes and prevention of rock burst.

7. Face mechanization

- o Describe use of jumbo drill with air leg.
- o Describe various Loading & Transportation System like
- ▪ L.H.D., L.P.D.T.(Low Profile Dump Truck), rocker shovel, spiral chutes and draw points, Scraper etc.

SYLLABUS COVERAGE UP TO I.A.

Chapter 1,2,3

Learning Resourses		
Sl. No.	Title of the Book	Name of Authors
1	SME Mining Engineering Hand Book Vol.I & II-1993 edition.	
2	Metal Mining	Chacharker
3	Mining Engineering Hand Book	Peele
4	EMT Vol.II	D.J.Desmukh
5	Mining Ground control	Prof. B.S. Verma
6	Rock Mechanics	Jermic
7	Rock Mechanics	Jugger & Cook
8	Metalliferous Mining	Higam
9	Underground Mining Method	Bullock.

Pr.1 MINING HAZARDS & SAFETY LAB

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	5th
Total Periods:	90	End Examination	50
Practical Periods:	6P/week	Sessional	50
		Total	100

A. RATIONALE:

As a Mining Engineer, one must be thoroughly conversant with various sources of mining hazards as also the remedial measures needed to be undertaken to avoid any mishap and able to understand total operation of rescue and recovery.

B. OBJECTIVES:

On completion of lab students will able to :

- Develop a clear idea about Methanometer & CO detector.
- Know details about procedure of analysis of gases by halden & Orsat apparatus.
- Sample the dust particles by using Gravimetric dust Sampler.

Topic wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Estimation of CH_4 in air sample using flame safety lamp and methanometer.	18
2	Study & use of different types of methonometer.	10
3	Determination of CO by using CO-dectector.	6
4	Determination of CO_2 in air sampling by CO_2 detectors	10
5	Gas analysis by (I) Orsat apparatus.	8
6	Haldane apparatus for gas analysis.	8
7	Study & uses of Konimeter.	6
8	Sampling of dust by gravimetric dust sampler.	10
9	Study of Rescue Apparatus	6
10	Multi gas Detector (NOx, H_2S, CO, $CO_{2)}$	8
	Total	90

C. COURSE CONTENT.

- Estimation of CH_4 in air sample using flame safety lamp and detection by a methanometer.

o Accumulation & percentage test of CH_4 by flame safety lamp.

- Study & use of different types of methonometer.
- Determination of CO by using CO-dectector.
- Determination of CO_2 in air sampling by CO_2 detectors.
- Gas analysis by (I) Orsat apparatus.
- Haldane apparatus for gas analysis.
- Study & uses of Konimeter.
- Sampling of dust by gravimetric dust sampler.
- Study of Rescue Apparatus.
- Multi gas Detector (NOx, H_2S, CO, CO_2

Pr.2. MINE MACHINERY – I LAB.

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	5th
Total Periods:	90	End Examination	50
Practical Periods:	6P/week	Sessional	50
		Total	100

RATIONALE

It is imperative that a Mining Engineer should be thoroughly conversant with various types of machine used in mining operations.

OBJECTIVES:

On completion of lab students will able to :

- Develop a clear idea about Wire rope,rope splicing & capeling.
- Know details about Safety hook,keps & rope guides.
- Generate a clear idea about head gear structure,suspension gear & winding drum.

Topic wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Study of Wire rope.	8
2	Study of rope splicing.	8
3	Study of rope capel.	8
4	Study of safety hook.	10
5	Study of keps.	8
6	Study of guide in shaft.	8
7	Study of clips used in endless rope haulage.	8
8	Model Development of Headgear Structure.	8
9	Model Development of Suspension Gear.	8
10	Model Development of different types of winding drum.	8
11	Model development of different types of safety devices used in haulage.	8
	Total	90

COURSE CONTENT.

- Study of Wire rope.
- Study of rope splicing.

- Study of rope cappel.
- Study of safety hook.
- Study of keps.
- Study of guide in shaft.
- Study of clips used in endless rope haulage.
- Model Development of Headgear Structure.
- Model Development of Suspension Gear.
- Model Development of different types of winding drum.
- Model development of different types of safety devices used in haulage roadways.

Pr 3. PROJECT WORK (Phase-I)

Name of the Course: Diploma in Mining			
Course code:		Semester	5th
Total Period:	60	Examination :	-
Theory periods:	4P / week	Sessional Marks	50
		TOTAL Marks	50

RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of Mining Engineering and practices in real life situations, so as to participate and manage a Mining projects in future.
Entire Project shall spread over 5th and 6th Semester. Part of the Project covered in 5th Semester shall be named as *Project Phase-I* and balance portion to be covered in 6th Semester shall be named as *Project Phase-II*.

OBJECTIVES

After undergoing the Project Work, the student will be able to:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real practical working environment, preferably in an industrial environment.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.
- To achieve real life experience in Mines operation and management.
- To develop the skill of writing Project Report

General Guidelines

The individual students have different aptitudes and strengths and also areas of interest. Project work, therefore, should match the strengths and interest of the students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (right from beginning of 5th semester). Students should be allotted a problem of interest to him/her as a project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. Preferably there should not be more than 5 students, if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

Sl. No.	**Performance Criteria**
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9	Viva voce

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.
It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations to such an exhibition.

Project Phase-I and Phase-II

The Project work duration shall cover 2 semesters(5th and 6th sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 5th sem under Project Phase-I. The students may be allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work including Design of the system have to be complete in Phase-I. Project Milestones are to be set so that progress can be tracked . In Phase-II detailed work, Testing, Documentation have to be complete. Project Report have to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable alteration in the components of Task and schedule.
At the end of Project Phase-I in 5th semester there shall be one presentation by each group to mark to progress and also to judge whether the Project is moving in right direction as per the objective of the Project.

Equipment List

MINE HAZARD AND SAFETY LAB

(a) GL50 and GL60 flame safety lamp.
(b) MSA D6 Methanometer.
(c) CO detector.
(d) CO2 detector.
(e) Orsat apparatus
(f) Konometer.
(g) GDS dust sampler.
(h) Multigas detector
(i) Hygrometer.
(j) Haldane apparatus.
(k) DRAGER BG174 self-contained breathing apparatus.
(l) Self-contained open circuit breathing apparatus.
(m) Face mask for rescue apparatus.

MINE MACHINERY –I LAB

(a) Pieces of standard and non standard Rope.
(b) Model of rope splicing.
(c) Rope splicing tools.
(d) King detaching safety hook.
(e) Ormoured safety hook.
(f) Model of Keps.
(g) Models of rope guide and rigid guide.
(h) Rope guide and rigid guide shoe.
(i) Model of different types of clips such as cam clip, small man clip, lashing chain, Screw clip.
(j) Model of headgear structure.
(k) Models of cylindrical drum, conical drum, bi cylindro conical drum.
(l) Models of different types of safety devices used in haulage rode way such as Back stay, Drop warrick, Runaway switches, Stop block, Monkey Catches.

BRANCH – MINING ENGG. YEAR – 3RD (5TH SEM)

EXPERIMENT WISE REQUIREMENTS

LAB – MINE HAZARDS & SAFETY LAB (PR-1)

SL NO.	NAME OF THE EXPERIMENTS	APPARATUS REQUIRED	NO. OF QUANTITY
1	Estimation of CH4 in air sample using flame safety lamp and methanometer.	Flame safety lamp (GL-50, GL-7) & Methano Meter	1
2	Study & use of different types of methonometer.	Methano Meter	1
3	Determination of CO by using CO-dectector.	Carbon Monoxide(CO)-dectector	1
4	Determination of CO2 in air sampling by CO2 detectors	Multigas Detector	1
5	Gas analysis by (I) Orsat apparatus.	Orsat Apparatus	1
6	Haldane apparatus for gas analysis.	Haldane Apparatus	1
7	Study & uses of Konimeter.	Konimeter	1
8	Sampling of dust by gravimetric dust sampler.	Dust Sampler	1
9	Study of Rescue Apparatus	Rescue Apparatus	1
10	Multi gas Detector (NOx, H2S, CO, CO2)	Multi gas Detector	1

BRANCH – MINING ENGG. YEAR – 3RD (5TH SEM)

EXPERIMENT WISE REQUIREMENTS

LAB – MINE MACHINERY – I LAB (PR-2)

SL NO.	NAME OF THE EXPERIMENTS	APPARATUS REQUIRED	NO. OF QUANTITY
1	Study of Wire rope.	Stranded Rope & Non-stranded Rope	1
2	Study of rope splicing	Wire Ropes, Vice, Wooden Hammer, Toggle	1
3	Study of rope cappel.	Split Capple, Coned Socket Cappel, Reliance Capple	1
4	Study of safetyhook.	Ormerd Detaching Safety hook, King Detaching Safety hook	1
5	Study of keps.	keps	1
6	Study of guide in shaft.	Rigid Guide & Flexible Guide	1
7	Study of clips used in endless rope haulage.	Screw Clips, Smallman Clip, Cam Clip	1
8	Model Development of Headgear Structure.	Headgear Structure	1
9	Model Development of Suspension Gear.	Suspension Gear	1
10	Model Development of different types of winding drum	Friction Winding, Skip Winding	1
11	Model development of different types of safety devices used in haulage roadways	Stop Block, Monkey Catch, Back stay, Drop Warwick, Runaway Switch, Tub rerailer	1

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 6TH SEMESTER MINING ENGINEERING(wef 2020-21)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Mine Machinery -II	4			20	80	3	100
Th.2		Mine Geology -II	4			20	80	3	100
Th.3		Mine Legislation & General Safety - II	4			20	80	3	100
Th.4 Elective (Any One)		(a)Mineral Dressing (b)Advanced Mine Survey (c) Material handling & Logistics	4			20	80	3	100
		Total	*16*			*80*	*320*		*400*
		Practical							
Pr.1		Mine Geology -II Lab			6	25	50	3	75
Pr.2		Mine Machinery -II Lab			6	50	50	3	100
Pr.3		Project Phase -II			6	50	100	3	150
Pr.4		Life Skill			2	25	-	-	25
		Student Centred Activities(SCA)			3				
		Total			*23*	*150*	*200*		*350*
		Grand Total	**16**		**23**	**230**	**520**		**750**

Abbreviations: L-Lecturer, T-Tutorial, P-Practical. Each class is of minimum 55 minutes duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM/Idea Tinkering and Innovation Lab Practice etc., Seminar and SCA shall be conducted in a section.

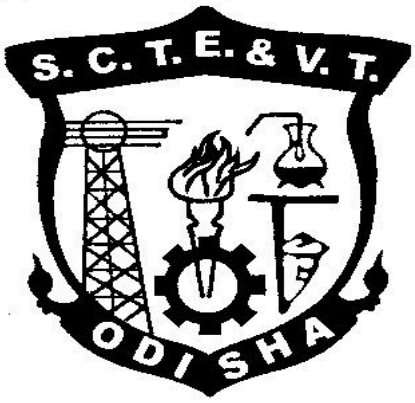
There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

CURRICULLUM OF 6TH SEMESTER

For

DIPLOMA IN MINING ENGINEERING

(Effective FROM 2020-21 Sessions)



STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

Th.1. MINE MACHINERY – II

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Theory Periods	: 4 Periods/week	Internal Assessment	: 20
Total Periods	: 60	End Semester Examination	: 80
Examination	: 3 Hours	Maximum Marks	: 100

RATIONALE

It is imperative that a Mining Engineer should be thoroughly conversant with various types of machine used in mining operations.

OBJECTIVES

On completion of the subject, students will be able to:

- Describe various underground face machineries & its applicability.
- Describe various opencast machineries & its applicability.
- Describe various types of pump & its applicability.
- Describe various types of Bore hole pumps & its application.
- Elaborate details about pipes and valves used in mine.

Topic- wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Underground face machineries	15
2	Opencast machineries	15
3	Mine Pumps	20
4	Bore hole pump	5
5	Pipes and valves	5
	Total	60

COURSE CONTENTS (Based on specific objectives)

1. Underground face machineries.

- Electric coal drill
- Describe constructional features, operation, principle & use of electric coal drill.
- State types of drill rods & drill bits used in electric coal drill.
- Describe basic constructional features of gathering arm loader, scraper loader, side discharge loader & load & haul loader.
- Describe basic constructional features & operation principle of jack hammer drill & air leg rock drill.
- Describe basic constructional features & operation principle of road header & Shearer loader.

2. Opencast machineries

- Describe basic constructional features of surface miner, dragline, shovel & backhoe, bucket wheel excavator.
- Describe basic constructional features of dumper, dozer, scraper & road grader.

3. Mine Pumps.

- Classify mine pumps.
- Describe constructional features, working & use of ram pumps.
- Centrifugal & turbine pumps.
- Describe constructional features of centrifugal & turbine pumps.
- State principle of centrifugal & turbine pumps & its applicability.
- Explain balancing the axial thrust of turbine pumps.
- Draw characteristic curves for turbine pumps.
- Solve numerical problems on centrifugal & turbine pumps.
- Describe constructional features and working principle & use of roto pump (screw pump)
- Describe constructional features & working principle of sinking pump.
- State procedure of suspension in shaft.

4. Bore hole pump

- Describe constructional features & working of bore hole pump.
- State installation of bore hole pump.

5. Pipes and valves

- State types of pipe & valves used in Mines.
- Describe constructional features of various type of valves.
- State & describe different types of pipe joints.
- Describe support of laying main pipe in shaft.
- Discuss the Pipe line layout.

SYLLABUS COVERAGE UP TO I.A.

Chapter 1,2,3

RECOMMENDED BOOKS

- Electrical equipment in Mine – H. Cotton
- Winning and Working of Iron Ore – Desmukh & Desmukh
- E.M.T. Vol.-III – D.J.Desmukh

Th.2. MINING GEOLOGY-II

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Theory Periods	: 4 Periods/week	Internal Assessment	: 20
Total Periods	: 60	End Semester Examination	: 80
Examination	: 3 Hours	Maximum Marks	: 100

RATIONALE

In majority of the cases, materials that need to be explored comprise rocks & minerals. It is therefore, essential for an engineer to have basic knowledge of mining geology.

OBJECTIVES

On completion of the paper, students will be able to:

- Outline the importance of Stratigraphy & Geological time Scale in the study of geology.
- The major Groups & economic minerals associated with them that form the basis for the study of stratigraphy.
- Describe the use, origin mode of occurrence & distribution of fossil fuels & where to look for them.
- Explain the fundamental principles that underline the search for economic minerals. He will achieve a certain amount of clarity in using geological, geophysical & geochemical methods for looking for important mineral deposits.
- Develop a comprehensive idea regarding mineralogy mode of occurrence, uses & distribution of ores.
- Undertake sampling work according to BIS specification.

Topic- wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Stratigraphy	12
2	Fossil Fuels	12
3	Prospecting & Exploration	12
4	Economic Geology	12
5	Sampling	12
	Total	60

COURSE CONTENTS (Based on specific objectives)

1. Stratigraphy

- Describe the principles of stratigraphy.
- Describe the geological time Scale.
- Describe the stratigraphic sequence, lithology, distribution & economic mineral deposits of Iron Ore series, Cuddpah Supergroup, Vindhyan super group & gondwana super group.

2. Fossil fuels

- Coal
  - Describe the different ranks of coal.
  - Describe different grades of coal like A,B,C,D.
  - Describe the various theories accounting for the origin of coal.
  - Describe various important lower gondwana Coalfields of India.
- Petroleum
  - Describe the organic & inorganic theories accounting for the origin of petroleum.
  - Define oil pool & oil trap.
  - Describe process of accumulation of oil.
  - Describe favorable conditions for accumulation of oil.
  - Describe different important oil fields in India.

3. Prospecting & exploration.

- Define prospecting.
- Differentiate between prospecting & exploration.
- Use of multi shot camera for borehole direction test.
- Enumerate & describe various criteria for geological exploration.
- Describe various methods of Geophysical prospecting.
- Explain Geochemical prospecting.
- Differentiate between biogeochemical & geo botanical prospecting.

4. Economic Geology

- Define ore & gangue.
- Define tenor & grade.
- Describe the mineralogy, mode of occurrence, distribution & use of iron ore deposits in India.
- Describe the mineralogy, mode of occurrence, & description of Chromites deposits in India & its uses.
- Describe the mineralogy, mode of occurrence & distribution of copper deposits in India & uses of this metal.
- Describe the mineralogy, mode of occurrence, distribution of lead & zinc deposits in India & the uses of these metals.
- UNFC (United Nation Framework of Classification) code of classification of reserves.

5. Sampling

- Define sampling, outline the method of preparation of samples for assay.
- Explain sampling
- Describe the different methods of sampling as outlined by Bureau of
- Indian Standards. (BIS)

SYLLABUS COVERAGE UP TO I.A.

Chapter 1,2,3.

RECOMMENDED BOOKS

- Geology of India & Burma – M.S. Krishnan
- An Introduction to geology of Coal & coalfields of India – N.L.Sharma, K.S.V.Ram
- Geology of petroleum – A.I.Levorsen
- Geological prospecting & Exploration – V.K.Kreiter
- A Hand Book of economic geology – A.K.Sen, P.K.Guha
- Mineral Economics – R.K. Sinha, N.L.Sharma

Th.3. MINE LEGISLATION & GENERAL SAFETY-II

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Theory Periods	: 4 Periods/week	Internal Assessment	: 20
Total Periods	: 60	End Semester Examination	: 80
Examination	: 3 Hours	Maximum Marks	: 100

CHAPTER	TOPIC	PERIODS
1	M.M.R. 1961	15
2	Mines V.T.Rules 1966	4
3	Mines Creche Rules	4
4	Maternity Benefit Act	4
5	Mines Accident & Safety	15
6	Forest Conservation Act (FCA) 1980	3
7	Environmental Protection Act 1986	5
8	MMRD & MCR	5
9	Classified circulars (DGMS)	5
	Total	60

RATIONALE

Since Mining operations involve frequent accidents, it is very important for a mining engineer to be thoroughly conversant with various acts & rules framed for providing safety to workers.

OBJECTIVES

On completion of the above topics, students will be able to :

- Describe various aspects of M.M.R. 1961.
- Describe various aspects of Mines Vocational Training Rules 1966.
- Describe various aspects of Mines Creche Rules 1966.
- Describe various aspects of Maternity Benefit Act.
- Describe various aspects of Mines Accident & Safety.
- Describe various aspects of Forest Conservation Act (FCA) 1980.
- Describe various aspects of Environmental Protection Act 1986.

COURSE CONTENTS (Based on specific objectives)

1. Metalliferous Mines Regulations 1961

- Discuss various provisions of Metalliferous Mines Regulations 1961.

2. Mines V.T. Rules 1966

- Discuss various provisions of Mines V.T. Rules 1966.

3. Mines Creche Rules 1966

- Discuss various provisions of Mines Creche Rules 1966.

4. Maternity Benefit Act

- Discuss various provisions of Maternity Benefit Act.

5. Mines Accident & Safety

- Discuss their classification, causes & prevention.
- Develop concept about accident cost, accident report, procedure for conducting an enquiry to ascertain the causes of accidents.
- Discuss procedure for investigation & reporting Mine accident, accident proneness, fatality rate, frequency rate & severity rate.
- Explain role of supervision in accident prevention, accident due to opencast workings, statistical analysis of accidents, accident statistics, its head & method of data processing.
- Develop basis concepts of safety, safety & productivity, safety consciousness & safety campaign, safety organization, safety audit.
- Describe rules of safety committee.
- Explain the role of workmen inspectors.
- Discuss terms like industrial fatigue, preventive maintenance, productive equipments & duties of Safety Officer.

6. Forest Conservation Act (FCA) 1980.

- Discuss various provisions of Forest Conservation Act (FCA) 1980.

7. Environmental Protection Act 1986

- Discuss various provisions of Environmental Protection Act 1986.

8. MMRD Act & MCR Rules

- Various provisions of Mineral conservation & exploitation.
- National Mineral policy.

9. Classified Circulars (DGMS)

- As amended up-to-date.

SYLLABUS COVERAGE UP TO I.A.

Chapter 1,2,3,4.

RECOMMENDED BOOKS

- M.M.R.- 1961
- Mines V.T.Rules- 1966
- Mines Creche Rules- 1966
- Maternity Benefit Act
- Pit Head bath Rules
- Worker's compassion Act
- Environmental Protection Act-1986
- DGMS Circulars

Th.4 (a). MINERAL DRESSING (ELECTIVE)

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Theory Periods	: 4 Periods/week	Internal Assessment	: 20
Total Periods	: 60	End Semester Examination	: 80
Examination	: 3 Hours	Maximum Marks	: 100

CHAPTER	TOPIC	PERIODS
1	Introduction	2
2	Unit Operations	6
3	Grinding	6
4	Lab. Sizing	6
5	Industrial Screening	6
6	Gravity Concentration	6
7	Heavy Media Separation	8
8	Floatation	10
9	Magnetic & Electrostatic Separators	10
	Total	60

RATIONALE

In case of metalliferous mines, the ultimate goal is the extraction of metals. Prior to sending ores into the process of extraction, it requires dressing for removal of desirable gangue minerals as far as possible. So a Mining Engineer, specially attached to metalliferous mines should have some basic concepts about mineral dressing.

OBJECTIVES

On completion of the subject, students will be able to:

- Comprehend physical & chemical properties of ores, know the application in mineral dressing.
- Explain the principle of operation of Blake & Dodge jaw crushers, Gyratory Cone crushers, roll crushers.
- Explain the principle of ball mill, open circuit & close circuit Grinding.
- Explain the principle of lab.sizing.
- Explain the principle of operation of industrial screening. Comprehend the principle of operation of classifiers & their application in the field.
- Comprehend elementary idea about gravity concentration.
- Explain the principle of operation of heavy media separation.
- Comprehend elementary principle of floatation process.
- Explain the principle & application of magnetic separators.

COURSE CONTENTS (Based on specific objectives)

1. Introduction

- Describe the objective & scope of application of mineral dressing in surface & u/g mines.

2. Unit operations

- Explain the principle of Blake & dodge jaw crushers, gyratory & cone crushers, roll crusher.

3. Grinding

- Explain the principle of ball mill operation, open circuit grinding, close circuit grinding, dry & wet grinding.

4. Explain the procedure for size analysis & use of standard screen as also screening techniques employed.

5. Industrial screening

- Explain the principle of industrial screening, type of screening (without calculation)
- Explain the operation of classifier & their application.

6. Gravity concentration

- Explain the general principles of wilfly table & its operation.
- Develop elementary idea regarding the operation jigs.

7. Heavy media separation

- Explain the fundamental principle of heavy media separation – Chance process.

8. Floatation

- Comprehend elementary principle of froth floatation, practical utility of frother, collection, modifiers & depressants.
- Describe & illustrate floatation cell.

9. Magnetic & Electrostatic Separators

- Explain the principle of operation of magnetic & electrostatic separators.
- Describe the application of separators in mineral dressing.

SYLLABUS COVERAGE UP TO I.A.

Chapter 1,2,3,4.

RECOMMENDED BOOKS

- Principles of Mineral Dressing- Gaudin A.M.
- Hand Book of Mineral Dressing Ores & Minerals – A.E.Taggart
- Mineral Processing Technology – B.A.Wills.

Th.4. (b). ADVANCED MINES SURVEY (ELECTIVE)

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Theory Periods	: 4 Periods/week	Internal Assessment	: 20
Total Periods	: 60	End Semester Examination	: 80
Examination	: 3 Hours	Maximum Marks	: 100

Topic wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Spherical Trigonometry	15
2	Field Astronomy	12
3	Elements of Photogrametry	12
4	Global Positioning System	11
5	Total Station	10
	Total	60

RATIONALE

A Mining engineer entrusted with the responsibility of supervising mine survey works should be through conversant with the latest developments techniques employed in mine surveying.

OBJECTIVES

After the completion of the subject, students will develop the fundamental concepts about
:

- Spherical Trigonometry.
- File Astronomy.
- Elements of Photogrametry.
- Global Positioning System.
- Total Station

COURSE CONTENTS (Based on specific objectives)

1. Spherical Trigonometry.

- Define some common terms used in Spherical Trigonometry like Sphere. Great circle , Small circle, Side of a triangle , Angle of a Triangle, Spherical axes, Spherical Triangle, Right Angled Triangle.
- Convert rectangular to Sperical coordinates.
- Define convergence of meridian and parallel of latitude.

2. Field Astronomy.

- Define some terms used in field astronomy like, Celestial Sphere, Celestial Latitude, Celestial Longitude, Azimuth, Hour angle, Declination , Altitude, Zenith, Nadir, Right Ascension, Celestial Meridian, Celestial Equator, Zenith Distance, Vertical Circle, Celestial Horizon.
- Astronomical Triangle etc. Discuss different astronomical coordinates for heavenly bodies.
- Determine apparent time , Meantime, Sidereal time, Standard Time, Relation between different types of time.
- Determine latitude , Longitude, Time and azimuth of a place .

3. Element of Photogrammetry.

- Know the Photo theodolite.
- Define camera axis, Picture Plane, Principal points, Focal Length, Nodal Point, Prospective centre, Principal Distance, Principal Plane, Print, Isocentre in terrestrial Photogrammetry.
- Explain fundamental principles behind stereo phtogrammetry.
- Define vertical photograph , Tilted Photograph, Oblique photograph, Prospective projection, Explosure station, Flying height focal length, Principal Point, Nadir Point, Ground Nadir Point, Till, Principle plane, Principle Line, Isocentre, Azimuth of Principle Plane, Horizontal Point .Find out the scale of Photography.

4. Global Positioning System.

- Define Global Positioning System. Explain the Principle of working of the system in brief.
- Outline the application of GPS in Mining Engineering.

5. Total Station.

- Identify different components of Total Station.
- Describe the applications of Total Station in Mines.

SYLLABUS COVERAGE UP TO I.A.

Chapter 1,2.

RECOMMENDED BOOKS

- Surveying VOL.-III by Dr. B. C. Punmia
- Modern concept of Mine Surveying by Prof. Alam Chand.

Th.4. (c). MATERIAL HANDLING AND LOGISTICS (ELECTIVE)

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Theory Periods	: 4 Periods/week	Internal Assessment	: 20
Total Periods	: 60	End Semester Examination	: 80
Examination	: 3 Hours	Maximum Marks	: 100

CHAPTER	TOPIC	PERIODS
1	Introduction to surface & Underground haulage system	10
2	Conveyors	8
3	Locomotive haulage	12
4	Aerial ropeways	5
5	Introduction of hydraulic transportation	10
6	Man riding haulage	5
7	Spiral chutes	5
8	Flow of materials in bins, bunkers	5
	Total	60

RATIONALE

A Mining Engineer entrusted with the responsibility of supervising material handling in a mine should have specialized knowledge in this area including transportation in mines.

OBJECTIVES

On completion of the subject, students will be able to:

- Classify underground & surface transportation system in mines.
- Describe various types of conveyor & its design.
- Explain various types of locomotive haulage used in underground mines.
- Describe aerial ropeway & its applicability.
- Describe hydraulic transportation in mines.
- Explain man riding haulage system.
- Explain spiral chute.
- Describe flow of materials in bins & bunkers.

COURSE CONTENTS (Based on specific objectives)

1. **Introduction to surface & underground haulage system**
   - Classify underground & surface haulage system.
   - State factors affecting design of a haulage system.
   - Find out the capacity of a haulage system in a given production.

2. **Conveyors**
   - Classification of Conveyors.
   - State factors affecting design of belt conveyor, cable belt conveyor and steel cord conveyors.
   - Find out carrying capacity of belt conveyor, cable belt conveyor & steel cord conveyor.
   - Describe constructional features of belt conveyor & cable belt conveyor.
   - Describe formula to calculate drive capacity of belt conveyor & cable belt conveyor.

3. **Locomotive haulage**
   - State different types of locomotive haulage.
   - Describe basic constructional features of trolley wire, compressed air , diesel & battery locomotives.
   - State applicability, merits & demerits of locomotives.
   - Describe safety devices of diesel locomotive including flame trap around exhaust conditioner box.
   - Solve numerical problems.

4. **Aerial ropeways**
   - Classify aerial ropeways.
   - State applicability of aerial ropeways.
   - Describe constructional features of bicable and twin cable ropeways.
   - Describe loading, unloading & angle stations bicable & thin cable ropeways.

5. **Hydraulic transportation of solids**
   - Define hydraulic transportation.
   - Discuss theory of hydraulic transportation of solids in mines (without derivation)
   - Design the hydraulic transportation system.
   - State applicability, advantages & disadvantages of hydraulic transportation in Mines.

6. **Man riding haulage**
   - State different types of man riding system.
   - Describe constructional features of monorail, deorail & flight chairs & conveyor system.

7. **Spiral Chutes**
   - State capability of spiral chutes.
   - Explain working principle of spiral chutes.
   - Describe constructional features of spiral chutes.

8. **Flow of materials in bins, bunkers**

   - Describe bins & bunkers.
   - Explain flow of materials in bins & bunkers.
   - Design bunkers & bins for a given production.

SYLLABUS COVERAGE UP TO I.A.

Chapter 1,2,3,4.

RECOMMENDED BOOKS

- Mining Machinery – T. Bryson
- Material Handling in Mines IIT Kharagpur journal
- Mine Transport – N.T.Kerlin
- EMT Vol.-III – D.J.Desmukh
- S.M.E. Mining Engineering Hand Book

Pr.1 . MINING GEOLOGY-II LAB

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Lab Periods	: 6 Periods/week	Sessional	: 25
Total Periods	: 90	End Semester Examination	: 50
Examination	: 3 Hours	Maximum Marks	: 75

Topic wise Distribution of Periods

CHAPTER	TOPIC	PERIODS
1	Megascopic identification of Igneous rocks	15
2	Megascopic identification of Sedimentary rocks	15
3	Megascopic identification of Metamorphic rocks	15
4	Interpretation of contour maps	15
5	Interpretation of geological maps	15
6	Describe the specific gravity of small specimen	15
	Total	90

- Megascopic identification of Igneous rocks in hand specimens.
- Megascopic identification of Sedimentary rocks in hand specimens.
- Megascopic identification of Metamorphic rocks in hand specimens.
- Interpretation of contour maps and preparation of the profile section for it.
- Interpretation of geological maps and preparation of the profile Section for it.
- Describe the specific gravity of small specimen by Joley's spring balance.

Pr.2. MINE MACHINERY – II LAB.

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Lab Periods	: 6 Periods/week	Sessional	: 50
Total Periods	: 90	End Semester Examination	: 50
Examination	: 3 Hours	Maximum Marks	: 100

Topic wise Distribution of Periods

CHAPTER	TOPIC	PERIODS
1	Study of Centrifugal Pumps.	9
2	Study of Turbine Pumps.	9
3	Study of Roto Pump.	9
4	Study of Sinking Pump.	9
5	Study of electric coal drills & its accessories.	9
6	Study of Jack Hammer Drill with air leg.	9
7	Study of scrapper & shaker conveyor	9
8	Study of scrapper loader.	9
9	Model Development of Gathering arm loader.	9
10	Study of Electric Coal Drill.	9
	Total	90

- Study of Centrifugal Pumps.
- Study of Turbine Pumps.
- Study of Roto Pump.
- Study of Sinking Pump.
- Study of electric coal drills & its accessories.
- Study of Jack Hammer Drill with air leg.
- Study of scrapper & shaker conveyor.
- Study of scrapper loader.
- Model Development of Gathering arm loader.
- Study of Electric Coal Drill.

Pr3. PROJECT PHASE - II

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Lab Periods	: 6 Periods/week	Sessional	: 50
Total Periods	: 90	End Semester Examination	: 100
Examination	: 3Hours	Maximum Marks	: 150

RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of Mechanical engineering and practices in real life situations, so as to participate and manage a large Mechanical engineering projects, in future. Entire Project spreads over 5th and 6th Semester. Part of the Project covered in 5th Semester was named as *Project Phase-I* and balance portion to be covered in 6th Semester shall be named as *Project Phase-II*.

OBJECTIVES

After undergoing the Project Work, the student will be able to:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real practical working environment, preferably in an industrial environment.
- Develop software packages or applications and implement these for the actual needs of the community/industry.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.
- To achieve real life experience in Project design.
- To develop the skill of writing Project Report

Project Phase-I and Phase-II

The Project work duration covers 2 semesters(5th and 6th sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group was done in the beginning of

5th semester under Project Phase-I. The students were allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work and Design of the system also have to be complete in Phase-I. Development may also begin in this phase. Project Milestones are to be set so that progress can be tracked .

In Phase-II Development, Testing, Documentation and Implementation have to be complete. Project Report have to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable alteration in the components of Task and schedule.

At the end of Project Phase-II in 6th semester there shall be one presentation by each group on whole Project work undertaken by them.

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

Sl. No.	**Performance Criteria**
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9	Viva voce

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations to such an exhibition.

The Project Report need to be prepared as per standard format and following is the indicative format. The Teacher Guide may make minor alteration keeping the sense in tact.

Organization of Project Report

1. Cover page:

   It should contain the following (in order)

   (i) Title of the Project

   (ii) “Submitted in partial fulfillment of the requirements for the Diploma in

<Branch Name>”

(iii) By Name of the Student(s)

(iv) Logo of the Institution

(v) Branch Name/Depart Name and Institution Name with Address

(vi) Academic Year

2. 1st Inner page

   Certificate:

   It should contain he following

   “This is to certify that the work in this Project Report entitled <Project Title> by <Name of student(s)> has been carried out under my supervision in partial fulfillment of the requirements for the Diploma in <Branch Name>” during session <session > in <Branch /Department Name> of <Institute name> and this work is the original work of the above student(s).

   Seal and signature of the Supervisor/Guide with date

3. 2nd Inner Page

   Acknowledgement by the Student(s)

4. Contents.

5. Chapter wise arrangement of Reports

6. Last Chapter: Conclusion

   It should contain

   (i) Conclusion

   (ii) Limitations

   (iii) Scope for further Improvement

7. References

Pr-4 LIFE SKILL

(Common to All Branches)

Practical	**2 Periods per week**	**Sessional**	**25 Marks**
Total Periods	**30 Periods**	**Total Marks**	**25 Marks**

Objective: After completion of this course the student will be able to**:**

- Develop team spirit i.e. concept of working in team
- Apply problem solving skills for a given situation
- Use effective presentation techniques
- Apply task management techniques for given projects
- Enhance leadership traits
- Resolve conflict by appropriate method
- Survive self in today's competitive world
- Face interview without fear

DETAIL CONTENTS:

1. SOCIAL SKILL

Society, Social Structure, Develop Sympathy and Empathy
Swot Analysis – Concept, How to make use of SWOT
Inter personal Relation**:** Sources of conflict, Resolution of conflict ,
Ways to enhance interpersonal relation

2. PROBLEM SOLVING

Steps of Problem solving**:**

- Identify and clarify the problem,
- Information gathering related to problem,
- Evaluate the evidence,
- Consider alternative solutions and their implications,
- Choose and implement the best alternative,
- Review
- Problem solving techniques:

1) Trial and error, 2) Brain storming, 3) Lateral (Out of Box) thinking

3. PRESENTATION SKILL

Body language , Dress like the audience
Posture, Gestures, Eye contact and facial expression. STAGE FRIGHT,
Voice and language – Volume, Pitch, Inflection, Speed, Pause
Pronunciation, Articulation, Language, Practice of speech.
Use of AV aids such as Laptop with LCD projector, white board etc.

4. GROUP DISCUSSION AND INTERVIEW TECHNIQUES

Group Discussion:
Introduction to group discussion, Ways to carry out group discussion,
Parameters— Contact, body language, analytical and logical thinking,
decision making
Interview Technique :
Dress, Posture, Gestures, facial expression, Approach

Tips for handling common questions.

5. WORKING IN TEAM

Understand and work within the dynamics of a groups.
Tips to work effectively in teams,
Establish good rapport, interest with others and work effectively with them to meet common objectives,
Tips to provide and accept feedback in a constructive and considerate way ,
Leadership in teams, Handling frustrations in group.

6. TASK MANAGEMENT

Introduction, Task identification, Task planning , organizing and execution, Closing the task

PRACTICAL

List of Assignment: *(Any Five to be performed including Mock Interview)*

a. SWOT analysis:-

Analyse yourself with respect to your strength and weaknesses, opportunities and threats. Following points will be useful for doing SWOT.

a) Your past experiences,
b) Achievements,
c) Failures,
d) Feedback from others etc.

b. Solve the True life problem assigned by the Teacher.

3. Working in a Team

Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation, environment protection, camps on awareness like importance of cleanliness in slum area, social activities like giving cloths to poor etc.(One activity per group where Team work shall be exhibited)

4. Mock Interview

5. Discuss a topic in a group and prepare minutes of discussion.

6. Deliver a seminar for 5 minutes using presentation aids on the topic given by your teacher.

7. Task Management

Decide any task to be completed in a stipulated time with the help of teacher. Write a report considering various steps in task management (with Break up into sub tasks and their interdependencies and Time)

Note: -1. Please note that these are the suggested assignments on given contents/topic. These assignments are the guide lines to the subject teachers. However the subject teachers are free to design any assignment relevant to the topic.

Note: -2. The following Topics may be considered for Seminar/GD in addition to other Topics at the discretion of the Teacher.

(Comparison with developed countries, Occupational Safety, Health Hazard, Accident & Safety, First-Aid, Traffic Rules, Global Warming, Pollution, Environment, Labour Welfare Legislation, Labour Welfare Acts, Child Labour Issues, Gender Sensitisation ,Harassment of Women at Workplace)

METHODOLOGY:

The Teacher is to explain the concepts prescribed in the contents of the syllabus and then assign different Exercises under Practical to the students to perform.

Books Recommended:-

Sl.No	Name of Authors	Title of the Book	Name of the Publisher
01	E.H. Mc Grath , S.J	Basic Managerial Skills for All	PHI
02	Lowe and Phil	Creativity and problem solving	Kogan Page (I) P Ltd
03	Adair, J	Decision making & Problem Solving	Orient Longman
04	Bishop , Sue	Develop Your Assertiveness	Kogan Page India
05	Allen Pease	Body Language	Sudha Publications Pvt. Ltd.

EQUIPMENT LIST

DETAILS OF INSTRUMENTS / SAMPLES/ SPECIMENS - GEOLOGY LABORATORY

SUBJECT NO / SUBJECT CODE -PR.1. MINING GEOLOGY-II LAB

The following instruments / samples/ specimens are required for Geology laboratory based on the **6th Semester Mining Engineering Syllabus.**

CHAPTER	TOPIC	ITEM	SPECIFICATION	QUANTITY
1	Megascopic identification of Igneous rocks	Igneous rocks in hand specimen	Common Igneous Rocks in hand specimen along with specimen trey and primary information about the rock specimen.	30 Nos of different Igneous rock specimen
2	Megascopic identification of Sedimentary rocks	Sedimentary rocks in hand specimen	Common Sedimentary Rocks in hand specimen along with specimen trey and primary information about the rock specimen.	30 Nos of different Sedimentary rock specimen
3	Megascopic identification of Metamorphic rocks	Metamorphic rocks in hand specimen	Common Metamorphic Rocks in hand specimen along with specimen trey and primary information about the rock specimen.	30 Nos of different Metamorphic rock specimen
4	Interpretation of contour maps	Contour maps	Different topographic map worksheet with scale for Interpretation and preparation of the profile section for it.	10 nos of different topographic/contour map
5	Interpretation of geological maps	Geological Maps	Different geological map worksheet with scale for Interpretation and preparation of the profile section for it.	10 nos of different geological map
6	Describe the specific gravity of small specimen	Joley's spring balance	The Jolly balance consists essentially of a spring fastened at the top to a movable arm. At the lower end, the spring is provided with two small pans, one suspended beneath the other. The lower pan is kept always immersed to the same depth in water, while the other one hangs in the air. On the upright standard behind the spiral is a mirror on which is engraved or painted a scale of equal parts. The specific gravity of an object, typically a solid, is determined by noting the amount of lengthening of the spring when the object is resting	01 no

			in the upper pan in air (w), and the amount when it is in the lower pan and immersed in water (w'). The specific gravity is then w / (w - w').	

Pr.2. MINE MACHINERY – II LAB.

SL NO.	EQUIPMENT	NO. OF EQUIPMENT/15 STUDENTS
1	Centrifugal Pump.	1
2	Turbine Pump.	1
3	Roto Pump./Screw pump	1
4	Sinking Pump./Submersible pump	1
5	electric coal drills & its accessories.	1
6	Jack Hammer Drill with air leg.	1
7	Working model of scrapper & shaker conveyor	1
8	Working model of scrapper loader.	1
9	Working model of Gathering arm loader.	1
10	Electric Coal Drill.	1

BRANCH – MINING ENGG. YEAR – 3RD (6TH SEM)

EXPERIMENT WISE REQUIREMENTS

LAB – MINING GEOLOGY-II LAB (PR-1)

SL NO.	NAME OF THE EXPERIMENTS	APPARATUS REQUIRED	NO. OF QUANTITY
1	Megascopic identification of Igneous rocks	Igneous rocks	30
2	Megascopic identification of Sedimentary rocks	Sedimentary rocks	30
3	Megascopic identification of Metamorphic rocks	Metamorphic rocks	30
4	Interpretation of contour maps	Contour maps	1
5	Interpretation of geological maps	Geological maps	1
6	Describe the specific gravity of small specimen	Jolly's Spring Balance	1

BRANCH – MINING ENGG. YEAR – 3RD (6TH SEM)

EXPERIMENT WISE REQUIREMENTS

LAB – MINING GEOLOGY-II LAB (PR-2)

SL NO.	NAME OF THE EXPERIMENTS	APPARATUS REQUIRED	NO. OF QUANTITY
1	Study of Centrifugal Pumps.	Centrifugal Pump	1
2	Study of Turbine Pumps.	Turbine Pump	1
3	Study of Roto Pump	Roto Pump	1
4	Study of Sinking Pump.	Sinking Pump	1
5	Study of electric coal drills & its accessories.	Electric coal drill	1
6	Study of Jack Hammer Drill with air leg.	Jack Hammer Drill	1
7	Study of scrapper & shaker conveyor	Turbine pump, Graph Paper	1
8	Study of scrapper loader.	Scrapper loader	1
9	Model Development of Gathering arm loader.	Gathering arm loader	1
10	Study of Electric Coal Drill.	Scrapper & Shaker conveyor	1

अखिल भारतीय तकनीकी शिक्षा परिषद
ALL INDIA COUNCIL FOR TECHNICAL EDUCATION
(भारत सरकार का एक सांविधिक संस्थान) (A STATUTORY BODY OF THE GOVERNMENT OF INDIA)
EASTERN REGIONAL OFFICE

Letter of Approval

File No. ERO/AICTE/OR/ET/07/2009-10 /1774-79 **DATE 14.07.2009**

To
The Commissioner-cum-Secretary,
Industrial Department,
Govt. of Orissa,
Bhubaneswar – 751 001, Orissa

Sub: AICTE approval to **Purna Chandra Institute of Engineering & Technology Trust, At/PO/PS - Chhendipada, Angul 759 124, Orissa** for establishment of **Purna Chandra Institute of Engineering & Technology (Polytechnic), At/PO Chhendipada, Angul 759 124.**

Sir,

Based on the recommendations of State Level Committee and subsequent clarifications, conveyed vide letter no. 9717, dated – 06.07.2009 by the Director of Technical Education and Training, Govt. of Orissa, the All India Council for Technical Education (AICTE) is according approval to **Purna Chandra Institute of Engineering & Technology Trust, At/PO/PS - Chhendipada, Angul 759 124, Orissa** for establishment of **Purna Chandra Institute of Engineering & Technology (Polytechnic), At/PO Chhendipada, Angul 759 124, Orissa** for conduct of Diploma programme in Engineering & Technology with annual Intake for each course(s) as given below:

Approved programme(s)	Approved Intake	Level	Duration (Yrs.)	Entry level	Period of approval
Electrical Engineering	60	Diploma	3 Yrs.	10+	2009-2010*
Mechanical Engineering	60	Diploma	3 Yrs.	10+	2009-2010*
Mining Engineering	60	Diploma	3 Yrs.	10+	2009-2010*
Civil Engineering	60	Diploma	3 Yrs.	10+	2009-2010*
Total	**240**				

* The approval is valid for **two years** from the date of issue of this letter. The **Society/Trust/Institution** shall obtain necessary affiliation/ permission from the concerned affiliating University/State Board/State Council as per the prescribed schedule of the University/ Admission Authority etc. The Applicant Society/Trust/Institution shall send information about commencement of the above courses to AICTE. Incase the Institution could not commence the above mentioned courses for whatsoever reasons during the two years period from the date of issue of this letter, the approval becomes invalid and the applicant society/trust shall have to make fresh application to AICTE for grant of fresh approval.

The approval is further subject to fulfillment of following conditions.

1. That the management shall provide adequate funds for development of land and building and for providing related infrastructural, instructional and other facilities as per Council's norms and standards laid down by the Council from time to time and for meeting recurring expenditure.

2. (a) That the admissions shall be made only after adequate infrastructure and all other facilities are provided as per norms and guidelines of the AICTE.

(b) That the admissions shall be made in accordance with the regulations notified by the Council from time to time.

(c) That the admissions to the courses shall be made only after the affiliating University/ State Board/State Council under whose ambit the institution is functioning has given permission to start the course.

(d) That the Institution shall not allow closure of the Institution or discontinuation of the course(s) or start any new course (s) or alter intake capacity of seats without the prior approval of the Council.

(e) That no excess admissions shall be made by the Institution over and above the approved intake under any circumstances.

(f) That the institutions shall not have any collaborative arrangements with any Indian and/or Foreign Universities for conduct of technical courses other than those approved by AICTE without obtaining prior approval from AICTE.

(g) That the Institution shall not allow conduct of any unapproved course whether technical or non technical in the premises of AICTE approved institution/campus and /or in the name of the Institution without prior permission from AICTE.

3. That the institution shall operate only from the approved location, and that the institution shall not open any off campus study centers/ extension centers directly or in collaboration with any other institution/ university/ organization for the purpose of imparting technical education without obtaining prior approval from the AICTE.

4. That the tuition and other fees shall be charged as prescribed by the Competent Authority within the overall criteria prescribed the Council from time to time. No capitation fee shall be charged from the students/guardians of students in any form.

5. That the accounts of the Institution shall be audited annually by a certified Chartered Accountant and shall be open for inspection by the Council or any body or person authorized by it.

6. That the Director/Principal and the teaching and other staff shall be selected according to procedures, qualifications and experience prescribed by the Council from time to time and pay scales are paid as per the norms prescribed by the Council for time to time.

7. (a) That the institution shall furnish requisite returns and reports as desired by AICTE/S.L.C. in order to ensure proper maintenance of administrative and academic standards.

(b) That the technical institution shall publish an information booklet before commencement of the academic year giving details regarding the institution and courses/programmes being conducted and details of infrastructural facilities including faculty etc. in the form of mandatory disclosure. The information booklet may be made available to the stakeholders of the technical education on cost basis. The mandatory disclosure information shall be housed in the Institution Web-Site. The information shall be revised every year with updated information about all aspects of the institution.

(c) That it shall be mandatory for the technical institution to maintain a web-site providing the prescribed information. The website information must be continuously updated as and when changes take place.

(d) That a compliance report in the prescribed format along with mandatory disclosure on fulfillment of the above conditions, shall be submitted each year by the Institution within the time limit prescribed by the Council from time to time.

(e) That if Technical Institution fails to disclose the information or suppress and/or misrepresent the information, appropriate action could be initiated including withdrawal of AICTE approval.

8. That all the laboratories, workshops etc. shall be equipped as per the syllabi of the concerned affiliating University /University under whose ambit the institution is functioning, and shall be in operational condition before making admissions.

9. That a library shall be established with adequate number of titles, books, journals (both Indian & Foreign) etc as per AICTE norms.

10. That a computer center with adequate number of terminals, Printers, legal software etc. shall be established as per AICTE norms.

11. That a Joint FDR with DTE is required to be created for an amount and period prescribed by the Council from time to time.

12. AICTE may carry out random inspections round the year any time for verifying the status of the Institutions to ensure maintenance of norms and standards.

13. That the AICTE / DTE may also conduct inspections with or without notifying the dates to verify specific complaints of mis-representation, violation of norms and standards, mal-practices etc.

14. That the Institution by virtue of the approval given by Council shall not automatically become claimant to any grant-in-aid from the Central or State Government.

15. The Institute shall take appropriate measures for prevention of ragging in any form, in the light of directions of Supreme Court of India in Writ Petition No. © 656/1998. Incase of failure to prevent the instances of ragging by the Institutions, the Council shall take appropriate action including withdrawal of approval.

16. That the Management shall strictly follow further conditions as may be specified by the AICTE/DTE from time to time.

17. In the event of non-compliance by the Institution with regard to guidelines, norms and conditions prescribed from time to time the Council shall be free to take measures for withdrawal of its approval or recognition, without consideration of any related issues and that all liabilities arising out of such withdrawal would solely be that of the Institution.

Thanking you,

Yours faithfully,

(K.K. Katarie)
Director

Copy to:

1. The Director of Technical Education & Training, Govt. of Orissa, Killa Maidan, Cuttack - 753 001.
(With a request to ensure the compliance of norms & standards of AICTE for the approved Intake).

2. The President/Chairman, **Purna Chandra Institute of Engineering & Technology Trust, At/PO/PS - Chhendipada, Angul 759 124, Orissa**
(A request to fulfill the deficiencies as annexed (if any) to this letter and submit the Compliance Report by 31st August every year to the Director of Technical Education of concerned State Govt./UT and a copy this Regional Office).

3. The Secretary, State Council of Technical Education & Industrial Training, Raj Bhavan Marg, Unit - VIII, Bhubaneswar 751 012.

4. The Advisor (E&T), AICTE, 7th floor, Chandra Lok Building, Janpath, Near Connaught Place, New Delhi – 110 001.

5. Guard file.

अखिल भारतीय तकनीकी शिक्षा परिषद्

ALL INDIA COUNCIL FOR TECHNICAL EDUCATION

(भारत सरकार का एक सांविधानिक संस्थान) (A Statutory Body of the Govt. of India)

EASTERN REGIONAL OFFICE, KOLKATA

Extension of Approval / Variation in Intake

F. No. ERO/AICTE/OR/ET/07/2009-10 / 5423

Dated – 06.07.2010

To
Commissioner –cum- Secretary
Dept. of Industries
Govt. of Orissa, Secretariat
Bhubaneswar 751 001

Sub: Extension of AICTE approval to **Purna Chandra Institute of Engineering & Technology (Polytechnic), At/PO Chhendipada, Angul 759 124, Orissa (Diploma Engineering).**

Sir,

Based on recommendations of the State Level Committee for Diploma Education vide letter no. Orissa IX-TTI-35/10 (pt). 9502/I, dated – 03.07.2010, the All India Council for Technical Education (AICTE), is pleased to accord approval to **Purna Chandra Institute of Engineering & Technology (Polytechnic), At/PO Chhendipada, Angul 759 124, Orissa** for Extension of approval / Introduction of new course(s) / Variation in Intake, as applicable for Diploma Engineering programme with annual intake of each course(s) as given below:

Approved Existing Course(s)	Entry Level	Duration	Approved Intake		Period of approval
			Existing	New	
Electrical Engineering	10+	3 Yrs.	60	90	2010-2011
Mechanical Engineering	10+	3 Yrs.	60	90	2010-2011
Civil Engineering	10+	3 Yrs.	60	60	2010-2011
Mining Engineering	10+	3 Yrs.	60	60	2010-2011
Total			**240**	**300**	

This approval has been accorded subject to fulfillment of Norms & Standards of the Council for the Course(s) and Intake approved above.

Further, the observation and specific conditions (if any) of the Expert Committee are enclosed in this letter. The institution shall fulfill all the conditions without any delay. Non-fulfillment shall lead to withdrawal of approval.

The approval accorded above is subject to fulfillment of the following conditions:

1. All full time faculty members as per AICTE norms must be recruited before making admissions. Admissions shall be made through the Central Counseling by the State/Central Govt. only.
2. AICTE pay scales are implemented to all faculty members & staffs.
3. All the required Laboratories/Workshops/Machineries/Equipment, as per approved syllabi of the concerned Technical Education Board, must be operational before making admissions.
4. If, this letter of approval is received by you after the closing date of State/National Level Central Counseling for admissions in the concerned State/Union Territory, this letter of approval will not be valid for making any admission during the above specified academic year.
5. No excess admission shall be made by the Institution during any academic year.

ब्लॉक - एस.बि., सेक्टर-III, राजकीय अभियांत्रिकी एवं चर्म प्रौद्योगिकी महाविद्यालय प्रांगण, साल्ट लेक सिटि, कोलकाता-700098
B-Block, Sector-III, Govt. College of Engg. & Leather Tech. Campus, Salt Lake City, Kolkata-700098
दूरभाष/Phone : 033 2335 7459 / 2445, फैक्स/Fax : 033 2335 9546, ई-मेल/e-mail : ero_aicte@yahoo.co.in, वेबसाइट/Website : www.aicte.ernet.in

Head Off. :
AICTE, 7th Floor, Chandralok Building, Janpath, New Delhi - 110001
मुख्यालय :
7वां तल, चन्द्रलोक भवन, जनपथ, नई दिल्ली – 110001

6. The approval is valid only for the academic year as mentioned in the above table. If, no further extension of AICTE approval is received beyond the academic year this approval letter will not be valid for making any admission for the subsequent years.
7. Name of the Institution, Name of the Trust/Society is not allowed to change without prior approval of AICTE. The name and title of the Institution should be such that "the emblems and Names (Prevention of improper use) Act (1950)" of Government of India is not violated in any manner.
8. In exercise of power conferred under 10(P) of the AICTE Act, AICTE may inspect the Institution any time it may deem fit to verify the progress/compliance of AICTE norms or for any other purpose.
9. Any other condition(s) as may be specified by AICTE from time to time.
10. It is to ensure that as per direction of Supreme Court of India in Writ Petition No. (C) 656/1998 that the ragging in educational institutions should be prevented and appropriate measures should be taken by AICTE for prevention of ragging in Technical Educational Institution. The Technical Institutions also to ensure that the ragging does not take place in their campuses in any form and that if such cases are reported to the Council.

It may please be noted that the AICTE had issued interim policy regulations, which has been notified in the Gazette of India on November 28, 2005. All the provisions contained in the interim policy regulations shall be applicable for all the AICTE approved Institutions.

In the event of infringement/contravention of non-compliance of the above Conditions and/or the provision of AICTE Act & Regulations/Guidelines/Norms and Standards as prescribed by AICTE, further actions leading to "Reduced Intake, no admission or withdrawal of approval" may be take by AICTE and the liability arising out of such actions will be solely of the Management of the Institutions.

Deficiencies / Suggestions / Improvements are as follows:

NIL

Thanking you,

Yours faithfully,

(Narender Singh)
Regional Officer

Copy to:

1. The Director, Dept. of Technical Education & Training, Govt. of Orissa, Killa Maidan, Cuttack 753 001
(With a request to ensure the compliance of norms & standards of AICTE for the approved Intake).

2. The Principal / Director, Purna Chandra Institute of Engineering & Technology (Polytechnic), At/PO Chhendipada, Angul 759 124, Orissa
(A request to fulfill the deficiencies (if any) to this letter and submit the Compliance Report by 31st August every year to the Director of Technical Education of concerned State Govt./UT and a copy this Regional Office).

3. The Secretary, State Council of Technical Education & Industrial Training, Orissa,

4. Guard file.

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)

7th Floor, Chandralok Building, Janpath, New Delhi- 110 001
PHONE: 23724151/52/53/54/55/56/57 FAX: 011-23724183 www.aicte-india.org

F.No. Eastern/1-445778291/2011/EOA

Date: 01-09-2011

To,
The Commissioner cum Secretary,
Deptt. Of Higher & Technical Education,
Govt. of Orissa, Orisas Sectt.
Bhubaneshwar-751001

Sub: Extension of approval for the academic year 2011-12.
Ref : Application of the Institution for Extension of Approval for the Year 2011-12

Sir/Madam,

In terms of the Regulations notified by the Council vide F.No. 37-3/Legal/2011 dated 10/12/2010 and norms, standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the extension of approval of the Council to

Regional Office	Eastern	Application Id	1-445778291
		Permanent Id	
Name of the Institute	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	Institute Address	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL PIN-759124 ORISSA,VILL-CHHENDIPADA,ANGUL,Orissa,759124
Name of the Society/Trust	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	Society/Trust Address	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL ORISSA PIN-759124,CHHENDIPADA,ANGUL,Orissa,759124
Institute Type	Unaided - Private		

to conduct following courses with the intake indicated below for the academic year 2011-12

Application Id: 1-445778291			Course	Full/Part Time	Affiliating Body	Intake 2010-11	Intake Approved for 11-12	NRI	PIO	Foreign Collaboration
Program	Shift	Level								
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	CIVIL ENGINEERING	FULL TIME	Board of Technical Education, Orissa	60	60	No	No	No
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	ELECTRICAL ENGINEERING	FULL TIME	Board of Technical Education, Orissa	90	90	No	No	No

Note: This is a Computer generated Extension of Approval Letter. No signature is required.
Printed By : AIC001789

Date of printing: 23-02-2012

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)

7th Floor, Chandralok Building, Janpath, New Delhi- 110 001
PHONE: 23724151/52/53/54/55/56/57 FAX: 011-23724183 www.aicte-india.org

Application Id: 1-445778291			Course	Full/Part Time	Affiliating Body	Intake 2010-11	Intake Approved for 11-12	NRI	PIO	Foreign Collaboration
Program	Shift	Level								
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MECHANICAL ENGINEERING	FULL TIME	Board of Technical Education, Orissa	90	90	No	No	No
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MINING ENGINEERING	FULL TIME	Board of Technical Education, Orissa	60	60	No	No	No

The above mentioned approval is subject to the condition that PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY shall follow and adhere to the Regulations, guidelines and directions issued by AICTE from time to time and the undertaking / affidavit given by the institution along with the application submitted by the institution on portal.

In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

Strict compliance of Anti-Ragging Regulation:- Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 37-3/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

(Dr. K P Isaac)

Member Secretary, AICTE

Copy to:

1. **The Regional Officer,**
   All India Council for Technical Education
   College of Leather Technology Campus
   Block LB, Sector III, Salt Lake City
   Kolkata - 700 098, West Bengal
2. **The Director Of Technical Education,**
   Orissa
3. **The Registrar,**
   Board of Technical Education, Orissa
4. **The Principal / Director,**

PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
AT-CHHENDIPADA
PO-CHHENDIPADA
PS-CHHENDIPADA
DIST-ANGUL
PIN-759124
ORISSA,
VILL-CHHENDIPADA,ANGUL,
Orissa,759124

5. **The Secretary / Chairman,**
PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
AT-CHHENDIPADA
PO-CHHENDIPADA
PS-CHHENDIPADA
DIST-ANGUL
ORISSA
PIN-759124,
CHHENDIPADA,ANGUL,
Orissa,759124

6. **Guard File(AICTE)**

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)

7th Floor, Chandralok Building, Janpath, New Delhi- 110 001
PHONE: 23724151/52/53/54/55/56/57 FAX: 011-23724183 www.aicte-india.org

F.No. Eastern/1-687414111/2012/EOA

Date: 10 May 2012

To,
The Commissioner cum Secretary,
Deptt. Of Higher & Technical Education,
Govt. of Orissa, Orissa Sectt.
Bhubaneshwar-751001

Sub: Extension of approval for the academic year 2012-13

Ref: Application of the Institution for Extension of approval for the academic year 2012-13

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2010 notified by the Council vide notification number F-No.37-3/Legal/2010 dated 10/12/2010 and amendment vide notification number F-No.37-3/Legal/2011 dated 30/09/2011 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

Regional Office	Eastern	Application Id	1-687414111
		Permanent Id	1-445778291
Name of the Institute	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	Institute Address	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL PIN-759124 ORISSA, VILL-CHHENDIPADA, ANGUL, Orissa, 759124
Name of the Society/Trust	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	Society/Trust Address	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL ORISSA PIN-759124,CHHENDIPADA,ANGUL,Orissa,759124
Institute Type	Unaided - Private		

Opted for change from Women to Co-ed	No	Opted for change of name	No	Opted for change of site	No
Change from Women to Co-ed approved	Not Applicable	Change of name Approved	Not Applicable	Change of site Approved	Not Applicable

to conduct following courses with the intake indicated below for the academic year 2012-13

Note: This is a Computer generated Extension of Approval Letter. No signature is required.

Letter Printed On:17 May 2012.

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All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)

7th Floor, Chandralok Building, Janpath, New Delhi- 110 001
PHONE: 23724151/52/53/54/55/56/57 FAX: 011-23724183 www.aicte-India.org

Application Id: 1-687414111			Course	Full/Part Time	Affiliating Body	Intake 2011-12	Intake Approved for 12-13	NRI	PIO	Foreign Collaboration
Program	Shift	Level								
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	CIVIL ENGINEERING	FULL TIME	Board of Technical Education, Orissa	60	60	No	No	No
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	ELECTRICAL ENGINEERING	FULL TIME	Board of Technical Education, Orissa	90	120	No	No	No
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MECHANICAL ENGINEERING	FULL TIME	Board of Technical Education, Orissa	90	120	No	No	No
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MINING ENGINEERING	FULL TIME	Board of Technical Education, Orissa	60	60	No	No	No

The above mentioned approval is subject to the condition that PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY shall follow and adhere to the Regulations, guidelines and directions issued by AICTE from time to time and the undertaking / affidavit given by the institution along with the application submitted by the institution on portal.

In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)

7th Floor, Chandralok Building, Janpath, New Delhi- 110 001
PHONE 23724151/52/53/54/55/56/57 FAX 011-23724183 www.aicte-india.org

Strict compliance of Anti-Ragging Regulation:- Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 37-3/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

(Dr. K P Isaac)

Member Secretary, AICTE

Copy to:

1. **The Regional Officer,**
   All India Council for Technical Education
   College of Leather Technology Campus
   Block LB, Sector III, Salt Lake City
   Kolkata - 700 098, West Bengal

2. **The Director Of Technical Education,**
   Orissa

3. **The Registrar,**
   Board of Technical Education, Orissa

4. **The Principal / Director,**
   PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
   AT-CHHENDIPADA
   PO-CHHENDIPADA
   PS-CHHENDIPADA
   DIST-ANGUL
   PIN-759124
   ORISSA,
   VILL-CHHENDIPADA,ANGUL,
   Orissa,759124

5. **The Secretary / Chairman,**
   PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
   AT-CHHENDIPADA
   PO-CHHENDIPADA
   PS-CHHENDIPADA
   DIST-ANGUL
   ORISSA
   PIN-759124,
   CHHENDIPADA,ANGUL,
   Orissa,759124

6. **Guard File(AICTE)**

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)

7th Floor, Chandralok Building, Janpath, New Delhi- 110 001
PHONE: 23724151/52/53/54/55/56/57 FAX: 011-23724183 www.aicte-india.org

F.No. Eastern/1-1476843933/2013/EOA

Date: 19-Mar-2013

To,
The Commissioner cum Secretary,
Deptt. Of Higher & Technical Education,
Govt. of Orissa, Orisas Sectt.
Bhubaneshwar-751001

Sub: Extension of approval for the academic year 2013-14

Ref: Application of the Institution for Extension of approval for the academic year 2013-14

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2012 notified by the Council vide notification number F-No.37-3/Legal/2012 dated 27/09/2012 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

Regional Office	Eastern	Application Id	1-1476843933
		Permanent Id	1-445778291
Name of the Institute	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	Institute Address	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL PIN-759124 ORISSA, VILL-CHHENDIPADA, ANGUL, Orissa, 759124
Name of the Society/Trust	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	Society/Trust Address	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL ORISSA PIN-759124,CHHENDIPADA,ANGUL,Orissa,759124
Institute Type	Unaided - Private		

Opted for change from Women to Co-ed	No	Opted for change of name	No	Opted for change of site	No
Change from Women to Co-ed approved	Not Applicable	Change of name Approved	Not Applicable	Change of site Approved	Not Applicable

to conduct following courses with the intake indicated below for the academic year 2013-14

Note: This is a Computer generated Extension of Approval Letter. No signature is required.

Letter Printed On:20 March 2013.

Printed By : aic001789

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)

7th Floor, Chandralok Building, Janpath, New Delhi- 110 001
PHONE: 23724151/52/53/54/55/56/57 FAX: 011-23724183 www.aicte-india.org

Application Id: 1-1476843933			Course	Full/Part Time	Affiliating Body	Intake 2012-13	Intake Approved for 13-14	NRI	PIO	Foreign Collaboration
Program	Shift	Level								
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	CIVIL ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	60	60	No	No	No
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	ELECTRICAL ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	120	120	No	No	No
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MECHANICAL ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	120	120	No	No	No
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MINING ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	60	120	No	No	No

- Validity of the course details may be verified at www.aicte-india.org>departments>approvals

The above mentioned approval is subject to the condition that PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY shall follow and adhere to the Regulations, guidelines and directions issued by AICTE from time to time and the undertaking / affidavit given by the institution along with the application submitted by the institution on portal.

In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

Strict compliance of Anti-Ragging Regulation:- Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 37-3/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

(Dr. Kuncheria P. Isaac)

Member Secretary, AICTE

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)

7th Floor, Chandralok Building, Janpath, New Delhi- 110 001
PHONE: 23724151/52/53/54/55/56/57 FAX: 011-23724183 www.aicte-india.org

Copy to:

1. **The Regional Officer,**
   All India Council for Technical Education
   College of Leather Technology Campus
   Block LB, Sector III, Salt Lake City
   Kolkata - 700 098, West Bengal

2. **The Director Of Technical Education,**
   Orissa

3. **The Registrar,**
   Directorate of Technical Education and Training , Cuttack

4. **The Principal / Director,**
   PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
   AT-CHHENDIPADA
   PO-CHHENDIPADA
   PS-CHHENDIPADA
   DIST-ANGUL
   PIN-759124
   ORISSA,
   VILL-CHHENDIPADA,ANGUL,
   Orissa,759124

5. **The Secretary / Chairman,**
   PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
   AT-CHHENDIPADA
   PO-CHHENDIPADA
   PS-CHHENDIPADA
   DIST-ANGUL
   ORISSA
   PIN-759124,
   CHHENDIPADA,ANGUL,
   Orissa,759124

6. **Guard File(AICTE)**

Note: This is a Computer generated Extension of Approval Letter. No signature is required. Letter Printed On: 20 March 2013.

Printed By : aic001789

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)

7th Floor, Chandralok Building, Janpath, New Delhi- 110 001
PHONE: 23724151/52/53/54/55/56/57 FAX: 011-23724183 www.aicte-India.org

F.No. Eastern/1-2019865297/2014/EOA

Date: 11-Mar-2014

To,
The Commissioner cum Secretary,
Deptt. Of Higher & Technical Education,
Govt. of Orissa, Orissa Sectt.
Bhubaneshwar-751001

Sub: Extension of approval for the academic year 2014-15

Ref: Application of the Institution for Extension of approval for the academic year 2014-15

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2012 notified by the Council vide notification number F-No.37-3/Legal/2012 dated 27/09/2012 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

Regional Office	Eastern	Application Id	1-2019865297
		Permanent Id	1-445778281
Name of the Institute	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	Institute Address	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL PIN-759124 ORISSA, VILL-CHHENDIPADA, ANGUL, Orissa, 759124
Name of the Society/Trust	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	Society/Trust Address	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL ORISSA PIN-759124,CHHENDIPADA,ANGUL,Orissa,759124
Institute Type	Unaided - Private		

Opted for change from Women to Co-ed	No	Opted for change of name	No	Opted for change of site	No
Change from Women to Co-ed approved	Not Applicable	Change of name Approved	Not Applicable	Change of site Approved	Not Applicable

to conduct following courses with the intake indicated below for the academic year 2014-15

Note: This is a Computer generated Letter of Approval.No signature is required.

Letter Printed On:3 April 2014

Printed By : aic001789

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)

7th Floor, Chandralok Building, Janpath, New Delhi- 110 001
PHONE: 23724151/52/53/54/55/56/57 FAX: 011-23724183 www.aicte-india.org

Application Id: 1-2019866297			Course	Full/Part Time	Affiliating Body	Intake 2013-14	Intake Approved for 14-15	NRI Approval status	PIO Approval status
Program	Shift	Level							
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	CIVIL ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	60	60	No	No
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	ELECTRICAL ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	120	120	No	No
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MECHANICAL ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	120	120	No	No
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MINING ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	120	120	No	No

- Validity of the course details may be verified at www.aicte-india.org>departments>approvals

The above mentioned approval is subject to the condition that PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY shall follow and adhere to the Regulations, guidelines and directions issued by AICTE from time to time and the undertaking / affidavit given by the institution along with the application submitted by the institution on portal.

In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

Strict compliance of Anti-Ragging Regulation:- Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 37-3/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

(Dr. Kuncheria P. Isaac)

Member Secretary, AICTE

Note: This is a Computer generated Letter of Approval.No signature is required.

Letter Printed On:3 April 2014

Printed By : a-c001789

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)

7th Floor, Chandralok Building, Janpath, New Delhi- 110 001
PHONE: 23724151/52/53/54/55/56/57 FAX: 011-23724183 www.aicte-India.org

Copy to:

1. **The Regional Officer,**
   All India Council for Technical Education
   College of Leather Technology Campus
   Block LB, Sector III, Salt Lake City
   Kolkata - 700 098, West Bengal

2. **The Director Of Technical Education,**
   Orissa

3. **The Principal / Director,**
   PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
   AT-CHHENDIPADA
   PO-CHHENDIPADA
   PS-CHHENDIPADA
   DIST-ANGUL
   PIN-759124
   ORISSA.
   VILL-CHHENDIPADA,ANGUL.
   Orissa,759124

4. **The Secretary / Chairman,**
   PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
   AT-CHHENDIPADA
   PO-CHHENDIPADA
   PS-CHHENDIPADA
   DIST-ANGUL
   ORISSA
   PIN-759124.
   CHHENDIPADA,ANGUL.
   Orissa,759124

5. **Guard File(AICTE)**

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)

7th Floor, Chandrook Building, Janpath, New Delhi, 110 001
PHONE: 23724151 62/63/54/56/57 FAX: 011-23724183 www.aicte-india.org

F.No. Eastern/1-2452886341/2015/EOA

Date: 07-Apr-2015

To,

Sub: Extension of approval for the academic year 2015-16

Ref: Application of the institution for Extension of approval for the academic year 2015-16

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2012 notified by the Council vide notification number F-No.37-3/Legal/2012 dated 27/09/2012 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

Regional Office	Eastern	Application Id	1-2452886341
		Permanent Id	1-445778291
Name of the Institute	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	Institute Address	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL PIN-759124 ORISSA, VILL-CHHENDIPADA, ANGUL, Odisha, 759124
Name of the Society/Trust	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	Society/Trust Address	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL ORISSA PIN-759124,CHHENDIPADA,ANGUL,Orissa,759124
Institute Type	Unaided - Private		

Opted for change from Women to Co-ed	No	Opted for change of name	No	Opted for change of site	No
Change from Women to Co-ed approved	Not Applicable	Change of name Approved	Not Applicable	Change of site Approved	Not Applicable

To conduct following courses with the intake indicated below for the academic year 2015-16

Note: This is a Computer generated Letter of Approval.No signature is required.

Letter Printed On:11 April 2015

Printed By : AIC001769

An Indian Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)
7th Floor, Chandralok Building, Janpath, New Delhi- 110 001
PHONE: 91-24151[illegible]/5954-58/59/7, FAX: (011-2372416), www.aicte-india.org

Application Id: 1-2452886341			Course	Full/Part Time	Affiliating Body	Intake 2014-15	Intake Approved for 15-16	NRI Approval status	PIO Approval status	Foreign Collaboration Approval status
Program	Shift	Level								
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	CIVIL ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	60	60	NA	NA	NA
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	ELECTRICAL ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	120	120	NA	NA	NA
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MECHANICAL ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	120	120	NA	NA	NA
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MINING ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	120	120	NA	NA	NA

Note: Validity of the course details may be verified at www.aicte-india.org>departments>approvals

The above mentioned approval is subject to the condition that PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY shall follow and adhere to the Regulations, guidelines and directions issued by AICTE from time to time and the undertaking / affidavit given by the institution along with the application submitted by the institution on portal.

In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

Strict compliance of Anti-Ragging Regulation:- Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 37-3/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)
7th Floor, Chandrauk Building, Janpath, New Delhi-110 001
PHONE: 23724151/52/53/54/55/56/57 FAX: 011 23724183 www.aicte-india.org

Dr. Avinash S Pant
Actg Chairman, AICTE

Copy to:

1. **The Regional Officer,**
   All India Council for Technical Education
   College of Leather Technology Campus
   Block LB, Sector III, Salt Lake City
   Kolkata - 700 098, West Bengal

2. **The Director Of Technical Education,**
   Odisha

3. **The Registrar,**
   Directorate of Technical Education and Training , Cuttack

4. **The Principal / Director,**
   PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
   AT-CHHENDIPADA
   PO-CHHENDIPADA
   PS-CHHENDIPADA
   DIST-ANGUL
   PIN-759124
   ORISSA,
   VILL-CHHENDIPADA,ANGUL,
   Odisha,759124

5. **The Secretary / Chairman,**
   PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
   AT-CHHENDIPADA
   PO-CHHENDIPADA
   PS-CHHENDIPADA
   DIST-ANGUL
   ORISSA
   PIN-759124,
   CHHENDIPADA,ANGUL,
   Orissa,759124

6. **Guard File(AICTE)**

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)
7th Floor, Chanderlok Building, Janpath, New Delhi-110 001
PHONE: 23724151/52/53/54/56/57 FAX: 011-23724183 www.aicte-india.org

F.No. Eastern/1-2811708208/2016/EOA

Date: 05-Apr-2016

To,

Sub: Extension of approval for the academic year 2016-17

Ref: Application of the Institution for Extension of approval for the academic year 2016-17

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2012 notified by the Council vide notification number F-No.37-3/Legal/2012 dated 27/09/2012 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

Regional Office	Eastern	Application Id	1-2811708208
Name of the Institute	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	Permanent Id	1-445778291
Name of the Society/Trust	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	Institute Address	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL PIN-759124 ORISSA, VILL-CHHENDIPADA, ANGUL, Odisha, 759124
Institute Type	Unaided - Private	Society/Trust Address	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL ORISSA PIN-759124,CHHENDIPADA,ANGUL,Orissa,759124

Opted for change from Women to Co-ed and Vice versa	No	Opted for change of name	No	Opted for change of site	No
Change from Women to Co-ed approved and Vice versa	Not Applicable	Change of name Approved	Not Applicable	Change of site Approved	Not Applicable

To conduct following courses with the intake indicated below for the academic year 2016-17

Application Id: 1-2811708208			Course	Full/Part Time	Affiliating Body	Intake 2015-16	Intake Approved for 16-17	NRI Approval status	PIO / FN / Gulf quota Approval status	Foreign Collaboration/Twinning Program Approval status
Program	Shift	Level								
ENGINEERIN	1st Shift	DIPLOMA	CIVIL ENGINEERING	FULL TIME	Directorate of Technical	60	60	NA	NA	NA

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)
7th Floor, Chandralok Building, Janpath, New Delhi- 110 001
PHONE: 23724151/52/53/54/55/56/57 FAX: 011-23724183 www.aicte-india.org

G AND TECHNOLOGY					Education and Training , Cuttack					
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	ELECTRICAL ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	120	120	NA	NA	NA
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MECHANICAL ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	120	120	NA	NA	NA
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MINING ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	120	120	NA	NA	NA

The above mentioned approval is subject to the condition that PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY shall follow and adhere to the Regulations, guidelines and directions issued by AICTE from time to time and the undertaking / affidavit given by the institution along with the application submitted by the institution on portal.

In case of any differances in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

Strict compliance of Anti-Ragging Regulation:- Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 37-3/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

Note: Validity of the course details may be verified at www.aicte-india.org

Dr. Avinash S Pant
Vice - Chairman, AICTE

Copy to:

1. **The Regional Officer,**
   All India Council for Technical Education
   College of Leather Technology Campus
   Block LB, Sector III, Salt Lake City
   Kolkata - 700 098, West Bengal
2. **The Director Of Technical Education,**
   Odisha
3. **The Registrar,**
   Directorate of Technical Education and Training , Cuttack

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)
7th Floor, Chandralok Building, Janpath, New Delhi-110 001
PHONE: 23724151/52/53/54/55/56/57 FAX: 011-23724183 www.aicte-india.org

4. **The Principal / Director,**
PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
AT-CHHENDIPADA
PO-CHHENDIPADA
PS-CHHENDIPADA
DIST-ANGUL
PIN-759124
ORISSA
VILL-CHHENDIPADA,ANGUL,
Odisha,759124

5. **The Secretary / Chairman,**
PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
AT-CHHENDIPADA
PO-CHHENDIPADA
PS-CHHENDIPADA
DIST-ANGUL
ORISSA
PIN-759124,
CHHENDIPADA,ANGUL,
Orissa,759124

6. **Guard File(AICTE)**

All India Council for Technical Education

(A Statutory body under Ministry of HRD, Govt. of India)

Nelson Mandela Marg,Vasant Kunj, New Delhi-110067

PHONE: 23724151/52/53/54/55/56/57 FAX: 011-23724183 www.aicte-india.org

F.No. Eastern/1-3324460940/2017/EOA

Date: 30-Mar-2017

To,

The Commissioner cum Secretary,
Deptt. Of Higher & Technical Education,
Govt. of Orissa, Orisas Sectt.
Bhubaneshwar-751001

Sub: Extension of approval for the academic year 2017-18

Ref: Application of the Institution for Extension of approval for the academic year 2017-18

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2016 notified by the Council vide notification number F.No.AB/AICTE/REG/2016 dated 30/11/2016 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

Permanent Id	1-445778291	Application Id	1-3324460940
Name of the Institute	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	Institute Address	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL PIN-759124 ORISSA, VILL-CHHENDIPADA, ANGUL, Odisha, 759124
Name of the Society/Trust	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	Society/Trust Address	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL ORISSA PIN-759124,CHHENDIPADA,ANGUL,Orissa,759124
Institute Type	Unaided - Private	Region	Eastern

Opted for change from Women to Co-ed and Vice versa	No	Opted for change of name	No	Opted for change of site	No
Change from Women to Co-ed approved and Vice versa	Not Applicable	Change of name Approved	Not Applicable	Change of site Approved	Not Applicable
Opted for Conversion from degree to diploma	No	Opted for Conversion from diploma to degree	No	Conversion (degree to diploma or vice-a-versa) Approved	Not Applicable

To conduct following courses with the intake indicated below for the academic year 2017-18

Application Id: 1-3324460940			Course	Full/Part Time	Affiliating Body	Intake Approved for 2016-17	Intake Approved for 2017-18	NRI Approval status	PIO / FN / Gulf quota/ OCI Approval status	Foreign Collaboration/Twining Program Approval status
Program	Shift	Level								

ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	CIVIL ENGINEERING	FULL TIME	Directorate of Technical Education, Odisha	60	60	NA	NA	NA
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	ELECTRICAL ENGINEERING	FULL TIME	Directorate of Technical Education, Odisha	120	120	NA	NA	NA
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MECHANICAL ENGINEERING	FULL TIME	Directorate of Technical Education, Odisha	120	120	NA	NA	NA
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MINING ENGINEERING	FULL TIME	Directorate of Technical Education, Odisha	120	120	NA	NA	NA

The above mentioned approval is subject to the condition that
PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
shall follow and adhere to the Regulations, guidelines and directions issued by AICTE from time to time and the undertaking / affidavit given by the institution along with the application submitted by the institution on portal.

In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

Strict compliance of Anti-Ragging Regulation:- Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 37-3/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

Note: Validity of the course details may be verified at www.aicte-India.org

Prof. A.P Mittal
Member Secretary, AICTE

Copy to:

1. **The Regional Officer,**
   All India Council for Technical Education
   College of Leather Technology Campus
   Block LB, Sector III, Salt Lake City
   Kolkata - 700 098, West Bengal
2. **The Director Of Technical Education**,**
   Odisha
3. **The Registrar**,**
   Directorate of Technical Education , Odisha

4. **The Principal / Director,**
PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
AT-CHHENDIPADA
PO-CHHENDIPADA
PS-CHHENDIPADA
DIST-ANGUL
PIN-759124
ORISSA,
VILL-CHHENDIPADA,ANGUL,
Odisha,759124

5. **The Secretary / Chairman,**
PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
AT-CHHENDIPADA
PO-CHHENDIPADA
PS-CHHENDIPADA
DIST-ANGUL
ORISSA
PIN-759124,
CHHENDIPADA,ANGUL,
Orissa,759124

6. **Guard File(AICTE)**

Note: ** - Approval letter copy will not be communicated through post/email. However, provision is made in the portal for downloading Approval letter through Authorized login credentials allotted to concerned DTE/Registrar.

All India Council for Technical Education

(A Statutory body under Ministry of HRD, Govt. of India)

Nelson Mandela Marg,Vasant Kunj, New Delhi-110070 Website: www.aicte-india.org

APPROVAL PROCESS 2018-19

Extension of Approval (EoA)

F.No. Eastern/1-3508999181/2018/EOA

Date: 04-Apr-2018

To,

The Commissioner cum Secretary,
Deptt. Of Higher & Technical Education,
Govt. of Orissa, Orisas Sectt.
Bhubaneshwar-751001

Sub: Extension of Approval for the Academic Year 2018-19

Ref: Application of the Institution for Extension of approval for the Academic Year 2018-19

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2016 notified by the Council vide notification number F.No.AB/AICTE/REG/2016 dated 30/11/2016 and amended on December 5, 2017 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

Permanent Id	1-445778291	**Application Id**	1-3508999181
Name of the Institute	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	**Name of the Society/Trust**	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
Institute Address	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL PIN-759124 ORISSA, VILL-CHHENDIPADA, ANGUL, Odisha, 759124	**Society/Trust Address**	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL ORISSA PIN-759124,CHHENDIPADA,ANGUL,Orissa,759124
Institute Type	Unaided - Private	**Region**	Eastern

Opted for Change from Women to Co-Ed and vice versa	No	**Change from Women to Co-Ed and vice versa Approved or Not**	NA
Opted for Change of Name	No	**Change of Name Approved or Not**	NA
Opted for Change of Site	No	**Change of Site Approved or Not**	NA
Opted for Conversion from Degree to Diploma or vice versa	No	**Conversion for Degree to Diploma or vice versa Approved or Not**	NA
Opted for Organization Name Change	No	**Change of Organization Name Approved or Not**	NA

To conduct following Courses with the Intake indicated below for the Academic Year 2018-19

Program	Shift	Level	Course	FT/PT+	Affiliating Body (Univ/Body)	Intake Approved for 2018-19	NRI Approval Status	PIO / FN / Gulf quota/ OCI/ Approval Status	Foreign Collaboration /Twining Program Approval Status*
ENGINEERING AND TECHNOLOGY	1st	DIPLOMA	CIVIL ENGINEERING	FT	Directorate of Technical Education , Odisha	60	NA	NA	NA
ENGINEERING AND TECHNOLOGY	1st	DIPLOMA	ELECTRICAL ENGINEERING	FT	Directorate of Technical Education , Odisha	120	NA	NA	NA

ENGINEERING AND TECHNOLOGY	1st	DIPLOMA	MECHANICAL ENGINEERING	FT	Directorate of Technical Education , Odisha	120	NA	NA	NA
ENGINEERING AND TECHNOLOGY	1st	DIPLOMA	MINING ENGINEERING	FT	Directorate of Technical Education , Odisha	120	NA	NA	NA

+FT –Full Time,PT-Part Time

In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

Strict compliance of Anti-Ragging Regulation: - Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 37-3/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

Prof. A.P Mittal
Member Secretary, AICTE

Copy to:

1. The Regional Officer,
   All India Council for Technical Education
   College of Leather Technology Campus
   Block LB, Sector III, Salt Lake City
   Kolkata - 700 098, West Bengal
2. The Director Of Technical Education**,
   Odisha
3. The Registrar**,
   Directorate of Technical Education , Odisha
4. The Principal / Director,
   PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
   AT-CHHENDIPADA
   PO-CHHENDIPADA
   PS-CHHENDIPADA
   DIST-ANGUL
   PIN-759124
   ORISSA,
   VILL-CHHENDIPADA,ANGUL,
   Odisha,759124
5. The Secretary / Chairman,
   PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
   AT-CHHENDIPADA
   PO-CHHENDIPADA
   PS-CHHENDIPADA
   DIST-ANGUL
   ORISSA
   PIN-759124,
   CHHENDIPADA,ANGUL,
   Orissa,759124
6. Guard File(AICTE)

Note: Validity of the Course details may be verified at http://www.aicte-india.org/

** Individual Approval letter copy will not be communicated through Post/Email. However, consolidated list of Approved Institutions(bulk) will be shared through official Email Address to the concerned Authorities mentioned above.

All India Council for Technical Education

(A Statutory body under Ministry of HRD, Govt. of India)

Nelson Mandela Marg,Vasant Kunj, New Delhi-110070 Website: www.aicte-india.org

APPROVAL PROCESS 2019-20

Extension of Approval (EoA)

F.No. Eastern/1-4259577305/2019/EOA

Date: 10-Apr-2019

To,

The Commissioner cum Secretary,
Deptt. Of Higher & Technical Education,
Govt. of Orissa, Orisas Sectt.
Bhubaneshwar-751001

Sub: Extension of Approval for the Academic Year 2019-20

Ref: Application of the Institution for Extension of approval for the Academic Year 2019-20

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2018 notified by the Council vide notification number F.No.AB/AICTE/REG/2018 dated 31/12/2018 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

Permanent Id	1-445778291	**Application Id**	1-4259577305
Name of the Institute	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	**Name of the Society/Trust**	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
Institute Address	AT-CHHENDIPADAPO-CHHENDIPADAPS-CHHENDIPADADIST-ANGULPIN-759124ORISSA, VILL-CHHENDIPADA, ANGUL, Odisha, 759124	**Society/Trust Address**	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL ORISSA PIN-759124,CHHENDIPADA,ANGUL,Orissa,759124
Institute Type	Unaided - Private	**Region**	Eastern

Opted for Change from Women to Co-Ed and vice versa	No	**Change from Women to Co-Ed and vice versa Approved or Not**	NA
Opted for Change of Name	No	**Change of Name Approved or Not**	NA
Opted for Change of Site/Location	No	**Change of Site/Location Approved or Not**	NA
Opted for Conversion from Degree to Diploma or vice versa	No	**Conversion for Degree to Diploma or vice versa Approved or Not**	NA
Opted for Organization Name Change	No	**Change of Organization Name Approved or Not**	NA
Opted for Merger of Institution	No	**Merger of Institution Approved or Not**	NA
Opted for Introduction of New Program/Level	No	**Introduction of Program/Level Approved or Not**	NA

To conduct following Courses with the Intake indicated below for the Academic Year 2019-20

Program	Shift	Level	Course	FT/PT+	Affiliating Body (Univ/Body)	Intake Approved for 2019-20	NRI Approval Status	PIO / FN / Gulf quota/ OCI/ Approval Status
Engineering And Technology	1st	DIPLOMA	Civil Engineering	FT	Directorate of Technical Education , Odisha	60	NA	NA
Engineering And	1st	DIPLOMA	Electrical	FT	Directorate of Technical	120	NA	NA

Technology			Engineering		Education , Odisha			
Engineering And Technology	1st	DIPLOMA	Mechanical Engineering	FT	Directorate of Technical Education , Odisha	120	NA	NA
Engineering And Technology	1st	DIPLOMA	Mining Engineering	FT	Directorate of Technical Education , Odisha	120	NA	NA

+FT –Full Time,PT-Part Time

In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

Strict compliance of Anti-Ragging Regulation: - Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 37-3/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

It is mandatory to comply all the essential requirements as given in APH 2019-20(appendix 6)

NOTE: If the State Government / UT / DTE / DME has a reservation policy for admission in Technical Education Institutes and the same is applicable to Private & Self-financing Technical Institutions, then the State Government / UT/ DTE / DME shall ensure that 10 % of Reservation for EWS would be operational from the Academic year 2019-20 without affecting the percentage reservations of SC/ST/OBC/General . However, this would not be applicable in the case of Minority Institutions referred to the clause (1) of Article 30 of Constitution of India.

Prof. A.P Mittal
Member Secretary, AICTE

Copy to:

1. **The Director Of Technical Education**, Odisha**

2. **The Registrar**,**
   Directorate Of Technical Education , Odisha

3. **The Principal / Director,**
   Puma Chandra Institute Of Engineering & Technology
   At-Chhendipadapo-Chhendipadaps-Chhendipadadist-Angulpin-759124Orissa,
   Vill-Chhendipada,Angul,
   Odisha,759124

4. **The Secretary / Chairman,**
   Puma Chandra Institute Of Engineering & Technology
   At-Chhendipada
   Po-Chhendipada
   Ps-Chhendipada
   Dist-Angul
   Orissa
   Pin-759124,
   Chhendipada,Angul,
   Orissa,759124

5. **The Regional Officer,**
   All India Council for Technical Education
   College of Leather Technology Campus
   Block LB, Sector III, Salt Lake City
   Kolkata - 700 098, West Bengal

6. **Guard File(AICTE)**

Note: Validity of the Course details may be verified at http://www.aicte-india.org/

** Individual Approval letter copy will not be communicated through Post/Email. However, consolidated list of Approved Institutions(bulk) will be shared through official Email Address to the concerned Authorities mentioned above.

All India Council for Technical Education

(A Statutory body under Ministry of HRD, Govt. of India)

Nelson Mandela Marg,Vasant Kunj, New Delhi-110070 Website: www.aicte-india.org

APPROVAL PROCESS 2020-21

Extension of Approval (EoA)

F.No. Eastern/1-7011559054/2020/EOA Date: 30-Apr-2020

To,

Sub: Extension of Approval for the Academic Year 2020-21

Ref: Application of the Institution for Extension of Approval for the Academic Year 2020-21

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2020 notified by the Council vide notification number F.No. AB/AICTE/REG/2020 dated 4th February 2020 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

Permanent Id	1-445778291	**Application Id**	1-7011559054
Name of the Institute	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	**Name of the Society/Trust**	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
Institute Address	AT-CHHENDIPADAPO-CHHENDIPADAPS-CHHENDIPADADIST-ANGULPIN-759124ORISSA, VILL-CHHENDIPADA, ANGUL, Odisha, 759124	**Society/Trust Address**	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL ORISSA PIN-759124,CHHENDIPADA,ANGUL,Orissa,759124
Institute Type	Private-Self Financing	**Region**	Eastern

To conduct following Courses with the Intake indicated below for the Academic Year 2020-21

Program	Level	Course	Affiliating Body (University /Body)	Intake Approved for 2019-20	Intake Approved for 2020-21	NRI Approval Status	PIO / FN / Gulf quota/ OCI/ Approval Status
ENGINEERING AND TECHNOLOGY	DIPLOMA	CIVIL ENGINEERING	Directorate of Technical Education , Odisha	60	60	NA	No
ENGINEERING AND TECHNOLOGY	DIPLOMA	ELECTRICAL ENGINEERING	Directorate of Technical Education , Odisha	120	120	NA	No
ENGINEERING AND TECHNOLOGY	DIPLOMA	MECHANICAL ENGINEERING	Directorate of Technical Education , Odisha	120	120	NA	No

ENGINEERING AND TECHNOLOGY	DIPLOMA	MINING ENGINEERING	Directorate of Technical Education , Odisha	120	120	NA	No

It is mandatory to comply with all the essential requirements as given in APH 2020-21 (Appendix 6)

Important Instructions

1. The State Government/ UT/ Directorate of Technical Education/ Directorate of Medical Education shall ensure that 10% of reservation for Economically Weaker Section (EWS) as per the reservation policy for admission, operational from the Academic year 2020-21 is implemented without affecting the reservation percentages of SC/ ST/ OBC/ General. However, this would not be applicable in the case of Minority Institutions referred to the Clause (1) of Article 30 of Constitution of India. Such Institution shall be permitted to increase in annual permitted strength over a maximum period of two years beginning with the Academic Year 2020-21

2. The Institution offering courses earlier in the Regular Shift, First Shift, Second Shift/Part Time now amalgamated as total intake shall have to fulfil all facilities such as Infrastructure, Faculty and other requirements as per the norms specified in the Approval Process Handbook 2020-21 for the Total Approved Intake. Further, the Institutions Deemed to be Universities/ Institutions having Accreditation/ Autonomy status shall have to maintain the Faculty: Student ratio as specified in the Approval Process Handbook. All such Institutions/ Universities shall have to create the necessary Faculty, Infrastructure and other facilities WITHIN 2 YEARS to fulfil the norms based on the Affidavit submitted to AICTE.

3. In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

4. Strict compliance of Anti-Ragging Regulation: - Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 373/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

Prof.Rajive Kumar
Member Secretary, AICTE

Copy to:

1. **The Director Of Technical Education**, Odisha**

2. **The Principal / Director,**
   PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
   At-Chhendipadapo-Chhendipadaps-Chhendipadadist-Angulpin-759124Orissa,
   Vill-Chhendipada,Angul,
   Odisha,759124

3. **The Secretary / Chairman,**
   AT-CHHENDIPADA
   PO-CHHENDIPADA
   PS-CHHENDIPADA
   DIST-ANGUL
   ORISSA
   PIN-759124
   CHHENDIPADA,ANGUL
   Orissa,759124

4. **The Regional Officer,**
   All India Council for Technical Education
   College of Leather Technology Campus
   Block LB, Sector III, Salt Lake City
   Kolkata - 700 098, West Bengal

5. **Guard File(AICTE)**

Note: Validity of the Course details may be verified at http://www.aicte-india.org/

****** Individual Approval letter copy will not be communicated through Post/Email. However, consolidated list of Approved Institutions(bulk) will be shared through official Email Address to the concerned Authorities mentioned above.

All India Council for Technical Education

(A Statutory body under Ministry of Education, Govt. of India)

Nelson Mandela Marg,Vasant Kunj, New Delhi-110070 Website: www.aicte-india.org

APPROVAL PROCESS 2021-22

Extension of Approval (EoA)

F.No. Eastern/1-9317994728/2021/EOA Date: 25-Jun-2021

To,

The Commissioner cum Secretary,
Deptt. Of Higher & Technical Education,
Govt. of Orissa, Orisas Sectt.
Bhubaneshwar-751001

Sub: Extension of Approval for the Academic Year 2021-22

Ref: Application of the Institution for Extension of Approval for the Academic Year 2021-22

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations, Notified on 4th February, 2020 and amended on 24th February 2021 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to:

Permanent Id	1-445778291	**Application Id**	1-9317994728
Name of the Institution /University	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	**Name of the Society/Trust**	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
Institution /University Address	AT-CHHENDIPADAPO-CHHENDIPADAPS-CHHENDIPADADIST-ANGULPIN-759124ORISSA, VILL-CHHENDIPADA, ANGUL, Odisha, 759124	**Society/Trust Address**	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL ORISSA PIN-759124,CHHENDIPADA,ANGUL,Orissa,759124
Institution /University Type	Private-Self Financing	**Region**	Eastern

To conduct following Programs / Courses with the Intake indicated below for the Academic Year 2021-22

Program	Level	Course	Affiliating Body (University /Body)	Intake Approved for 2020-21	Intake Approved for 2021-22	NRI Approval Status	FN / Gulf quota/ OCI/ Approval Status
ENGINEERING AND TECHNOLOGY	DIPLOMA	CIVIL ENGINEERING	Directorate of Technical Education , Odisha	60	60	NA	NA
ENGINEERING AND TECHNOLOGY	DIPLOMA	ELECTRICAL ENGINEERING	Directorate of Technical Education , Odisha	120	120	NA	NA

ENGINEERING AND TECHNOLOGY	DIPLOMA	MECHANICAL ENGINEERING	Directorate of Technical Education , Odisha	120	120	NA	NA
ENGINEERING AND TECHNOLOGY	DIPLOMA	MINING ENGINEERING	Directorate of Technical Education , Odisha	120	120	NA	NA

It is mandatory to comply with all the essential requirements as given in APH 2021-22 (Appendix 6)

Important Instructions

1. The State Government/ UT/ Directorate of Technical Education/ Directorate of Medical Education shall ensure that 10% of reservation for Economically Weaker Section (EWS) as per the reservation policy for admission, operational from the Academic year 2019-20 is implemented without affecting the reservation percentages of SC/ ST/ OBC/ General. However, this would not be applicable in the case of Minority Institutions referred to the Clause (1) of Article 30 of Constitution of India. Such Institution shall be permitted to increase in annual permitted strength over a maximum period of two years.

2. The Institution offering courses earlier in the Regular Shift, First Shift, Second Shift/Part Time now amalgamated as total intake shall have to fulfil all facilities such as Infrastructure, Faculty and other requirements as per the norms specified in the Approval Process Handbook 2021-22 for the Total Approved Intake. Further, the Institutions Deemed to be Universities/ Institutions having Accreditation/ Autonomy status shall have to maintain the Faculty: Student ratio as specified in the Approval Process Handbook.

3. Strict compliance of Anti-Ragging Regulation, Establishment of Committee for SC/ ST, Establishment of Internal Complaint Committee (ICC), Establishment of Online Grievance Redressal Mechanism, Barrier Free Built Environment for disabled and elderly persons, Fire and Safety Certificate should be maintained as per the provisions made in Approval Process Handbook and AICTE Regulation notified from time to time.

4. In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

Prof.Rajive Kumar
Member Secretary, AICTE

Copy ** to:

1. **The Director of Technical Education**, Odisha**

2. **The Principal / Director,**
   PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
   At-Chhendipadapo-Chhendipadaps-Chhendipadadist-Angulpin-759124Orissa,
   Vill-Chhendipada,Angul,
   Odisha,759124

3. **The Secretary / Chairman,**
   AT-CHHENDIPADA
   PO-CHHENDIPADA
   PS-CHHENDIPADA
   DIST-ANGUL
   ORISSA
   PIN-759124

CHHENDIPADA,ANGUL
Orissa,759124

4. **The Regional Officer,**
All India Council for Technical Education
College of Leather Technology Campus
Block LB, Sector III, Salt Lake City
Kolkata - 700 098, West Bengal

5. **Guard File(AICTE)**

Note: Validity of the Course details may be verified at http://www.aicte-india.org/ .

****** Individual Approval letter copy will not be communicated through Post/Email. However, consolidated list of Approved Institutions(bulk) will be shared through official Email Address to the concerned Authorities mentioned above.

This is a computer generated Statement. No signature Required

All India Council for Technical Education

(A Statutory body under Ministry of Education, Govt. of India)

Nelson Mandela Marg,Vasant Kunj, New Delhi-110070 Website: www.aicte-india.org

APPROVAL PROCESS 2022-23

Extension of Approval (EoA)

F.No. Eastern/1-10967939322/2022/EOA Date: 03-Jul-2022

To,

Sub: Extension of Approval for the Academic Year 2022-23

Ref: Application of the Institution for Extension of Approval for the Academic Year 2022-23

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations, 2022 Notified on 4th February, 2022 and amended on 24th February 2022 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

Permanent Id	1-445778291	**Application Id**	1-10967939322
Name of the Institution	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	**Name of the Society/Trust**	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
Institution Address	AT-CHHENDIPADAPO-CHHENDIPADAPS-CHHENDIPADADIST-ANGULPIN-759124ORISSA, VILL-CHHENDIPADA, ANGUL, Odisha, 759124	**Society/Trust Address**	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL ORISSA PIN-759124,CHHENDIPADA,ANGUL,Orissa,759124
Institution Type	Private-Self Financing	**Region**	Eastern
Year of Establishment	2009		

To conduct following Courses with the Intake indicated below for the Academic Year 2022-23

Level	Program	Course	Affiliating Body (University /Body)	Intake Approved for 2021-22	Intake Approved for 2022-23	NRI Approval Status	FN / Gulf quota/ OCI/ Approval Status
DIPLOMA	ENGINEERING AND TECHNOLOGY	CIVIL ENGINEERING	Directorate of Technical Education , Odisha	60	60	NA	NA
DIPLOMA	ENGINEERING AND TECHNOLOGY	ELECTRICAL ENGINEERING	Directorate of Technical Education , Odisha	120	120	NA	NA
DIPLOMA	ENGINEERING AND TECHNOLOGY	MECHANICAL ENGINEERING	Directorate of Technical Education , Odisha	120	120	NA	NA

Level	Program	Course	Affiliating Body (University /Body)	Intake Approved for 2021-22	Intake Approved for 2022-23	NRI Approval Status	FN / Gulf quota/ OCI/ Approval Status
DIPLOMA	ENGINEERING AND TECHNOLOGY	MINING ENGINEERING	Directorate of Technical Education , Odisha	120	120	NA	NA

It is mandatory to comply with all the essential requirements as given in APH 2022-23 (Appendix 6)

Important Instructions

1. The State Government/ UT/ Directorate of Technical Education/ Directorate of Medical Education shall ensure that 10% of reservation for Economically Weaker Section (EWS) as per the reservation policy for admission, operational from the Academic year 2019-20 is implemented without affecting the reservation percentages of SC/ ST/ OBC (NCL)/ General. However, this would not be applicable in the case of Minority Institutions referred to the Clause (1) of Article 30 of Constitution of India. Such Institution shall be permitted to increase in annual permitted strength over a maximum period of two years.

2. The Institution offering courses earlier in the Regular Shift, First Shift, Second Shift/Part Time are now amalgamated as total intake and shall have to fulfil all facilities such as Infrastructure, Faculty and other requirements as per the norms specified in the Approval Process Handbook 2022-23 for the Total Approved Intake. Further, the Institutions Deemed to be Universities/ Institutions having Accreditation/ Autonomy status shall have to maintain the Faculty: Student ratio as specified in the Approval Process Handbook. All such Institutions/ Universities shall have to create the necessary Faculty, Infrastructure and other facilities WITHIN 2 YEARS to fulfil the norms based on the Affidavit submitted to AICTE beginning with the Academic Year 2022-23

3. Strict compliance of Anti-Ragging Regulation, Establishment of Committee for SC/ ST, Establishment of Internal Complaint Committee (ICC), Establishment of Online Grievance Redressal Mechanism, Barrier Free Built Environment for disabled and elderly persons, Fire and Safety Certificate should be maintained as Approval Process Handbook and provisions made in AICTE Regulation notified from time to time.

4. In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

Pharmacy Institute: In compliance with the order dated 05.03.2020 passed by the Hon'ble Supreme Court of India in Transferred Petitions (CIVIL) No 87-101 of 2014, for the existing institutions offering courses in Pharmacy Programme, approval of Pharmacy Council of India (PCI) is mandatory and AICTE approval is NOT required. The requirements for running the Programme (Diploma / UG / PG) such as Land & Build-up Area, Student-faculty ratio, Intake etc. will be as per the respective regulatory body (PCI).
In case of any inconsistency in the course name and intake for EoA issued by AICTE and the approval by PCI, the approval of PCI shall prevail.

Architecture Institute: In compliance with the order dated 08.11.2019 passed by the Hon'ble Supreme Court of Indian CA No.364/ 2005, for the existing Institutions offering Courses in Architecture Programme, approval by the Council of Architecture (CoA) is mandatory and AICTE approval is NOT required. The requirements for running the Programme (Diploma / UG / PG) such as Land & Build-up Area, Student-faculty ratio, Intake etc. will be as per respective regulatory body (CoA). In case of any inconsistency in the course name and intake for EoA issued by AICTE and the approval by CoA, the approval of CoA shall prevail.

Deemed to be University: Institutions Deemed to be Universities (Running Technical Education Programmes), it is mandatory to have AICTE approval from the Academic Year 2018-19 in compliance of the Hon'ble Supreme Court Order dated 03-11-2017 passed in CA No.17869- 17870 /2017.

Prof.Rajive Kumar
Member Secretary, AICTE

Copy to:

1. **The Director Of Technical Education**, Odisha**

2. **The Principal / Director,**
   PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
   At-Chhendipadapo-Chhendipadaps-Chhendipadadist-Angulpin-759124Orissa,
   Vill-Chhendipada,Angul,
   Odisha,759124

3. **The Secretary / Chairman,**
   AT-CHHENDIPADA
   PO-CHHENDIPADA
   PS-CHHENDIPADA
   DIST-ANGUL
   ORISSA
   PIN-759124
   CHHENDIPADA,ANGUL
   Orissa,759124

4. **The Regional Officer,**
   All India Council for Technical Education
   College of Leather Technology Campus
   Block LB, Sector III, Salt Lake City
   Kolkata - 700 098, West Bengal

5. **Guard File(AICTE)**

Note: Validity of the Course details may be verified at http://www.aicte-india.org/

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Nelson Mandela Marg,Vasant Kunj, New Delhi-110070 Website: www.aicte-india.org

APPROVAL PROCESS 2023-24

Extension of Approval (EoA)

F.No. Eastern/1-36206451311/2023/EOA Date: 15-May-2023

To,

Sub: Extension of Approval for the Academic Year 2023-24

Ref: Online application of the Institution submitted for Extension of Approval for the Academic Year 2023-24

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Education) Regulations, 2020 notified on 4th February 2020 and amended on 24th February 2021 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to:

Permanent Id	1-445778291	**Application Id**	1-36206451311
Name of the Institution	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	**Name of the Society/Trust**	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
Institution Address	AT-CHHENDIPADAPO-CHHENDIPADAPS-CHHENDIPADADIST-ANGULPIN-759124ORISSA, VILL-CHHENDIPADA, ANGUL, Odisha, 759124	**Society/Trust Address**	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL ORISSA PIN-759124,CHHENDIPADA,ANGUL,Orissa,759124
Institution Type	Private-Self Financing	**Region**	Eastern
Year of Establishment	2009		

To conduct following Courses with the Intake indicated below for the Academic Year 2023-24

Level	Program	Course	Affiliating Body (University /Body)	Intake Approved for 2022-23	Intake Approved for 2023-24	NRI Approval Status	FN / Gulf quota/ OCI/ Approval Status
DIPLOMA	ENGINEERING AND TECHNOLOGY	CIVIL ENGINEERING	Directorate of Technical Education , Odisha	60	60	No	No
DIPLOMA	ENGINEERING AND TECHNOLOGY	ELECTRICAL ENGINEERING	Directorate of Technical Education , Odisha	120	120	No	No
DIPLOMA	ENGINEERING AND TECHNOLOGY	MECHANICAL ENGINEERING	Directorate of Technical Education , Odisha	120	120	No	No

Level	Program	Course	Affiliating Body (University /Body)	Intake Approved for 2022-23	Intake Approved for 2023-24	NRI Approval Status	FN / Gulf quota/ OCI/ Approval Status
DIPLOMA	ENGINEERING AND TECHNOLOGY	MINING ENGINEERING	Directorate of Technical Education , Odisha	120	120	No	No

It is mandatory to comply with all the essential requirements as given in APH 2023-24 (Appendix 6)

Important Instructions

1. The State Government/ UT/ Directorate of Technical Education/ Directorate of Medical Education shall ensure that 10% of reservation for Economically Weaker Section (EWS) as per the reservation policy for admission, operational from the Academic year 2019-20 is implemented without affecting the reservation percentages of SC/ ST/ OBC(NCL) / General. However, this would not be applicable in the case of Minority Institutions referred to the Clause (1) of Article 30 of Constitution of India. Such Institution shall be permitted to increase in annual permitted strength over a maximum period of two years.

2. The Institution offering courses earlier in the Regular Shift, First Shift, Second Shift/Part Time are now amalgamated as total intake and shall have to fulfil all facilities such as Infrastructure, Faculty and other requirements as per the norms specified in the Approval Process Handbook 2023-24 for the Total Approved Intake. Further, the Institutions Deemed to be Universities/ Institutions having Accreditation/ Autonomy status shall have to maintain the Faculty: Student ratio as specified in the Approval Process Handbook.

3. Strict compliance of Anti-Ragging Regulation, Establishment of Committee for SC/ ST, Establishment of Internal Committee (IC), Establishment of Online Grievance Redressal Mechanism, Barrier Free Built Environment for disabled and elderly persons, Fire and Safety Certificate should be maintained as per the provisions made in Approval Process Handbook and AICTE Regulation notified from time to time.

4. In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

5. As per the AICTE Notification dated 29.01.2014 and amended thereto, it shall be mandatory for each Technical Education Institution, University Department and Institution Deemed to be University imparting Technical Education to get accreditation (NBA) for at least 60% of the eligible courses in the next ONE (1) Years' time, otherwise EoA for the subsequent Academic Year (A.Y. 2024-25) shall not be issued by the Council.

6. Deemed to be University**:** Institutions Deemed to be Universities (Running Technical Education Programmes), it is mandatory to have AICTE approval from the Academic Year 2018-19 in compliance of the Hon'ble Supreme Court Order dated 03-11-2017 passed in CA No.17869- 17870 /2017.

Prof.Rajive Kumar
Member Secretary, AICTE

Copy to:

1. **The Director Of Technical Education**, Odisha**

2. **The Principal / Director,**
PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
At-Chhendipadapo-Chhendipadaps-Chhendipadadist-Angulpin-759124Orissa,
Vill-Chhendipada,Angul,
Odisha,759124

3. **The Secretary / Chairman,**
AT-CHHENDIPADA
PO-CHHENDIPADA
PS-CHHENDIPADA
DIST-ANGUL
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PIN-759124
CHHENDIPADA,ANGUL
Orissa,759124

4. **Guard File(AICTE)**

Note: Validity of the Course details may be verified at http://www.aicte-india.org/

** Individual Approval letter copy will not be communicated through Post/Email. However, a consolidated list of Approved Institutions(bulk) may be downloaded from the respective login id's.

This is a computer generated Statement. No signature Required

All India Council for Technical Education

(A Statutory body under Ministry of Education, Govt. of India)

Nelson Mandela Marg,Vasant Kunj, New Delhi-110070 Website: www.aicte-india.org

APPROVAL PROCESS 2024-25

Extension of Approval (EoA)

F.No. Eastern/1-43659009959/2024/EOA

Date of Approval: 23-Mar-2024

To,

Sub: Extension of Approval for the Academic Year 2024-25

Ref: Online application of the Institution submitted for Extension of Approval for the Academic Year 2024-25

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Education), Powers delegated in AICTE ACT 1987, (No 52 of 1987) chapter II - u/s 2(g) to regulate Technical and subsequent Regulations of AICTE, I am directed to convey the approval to:

Permanent Id	1-445778291	**Application Id**	1-43659009959
Name of the Institution	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	**Name of the Society/Trust**	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
Institution Address	AT-CHHENDIPADAPO-CHHENDIPADAPS-CHHENDIPADADIST-ANGULPIN-759124ORISSA, VILL-CHHENDIPADA, ANGUL, Odisha, 759124	**Society/Trust Address**	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL ORISSA PIN-759124,CHHENDIPADA,ANGUL,Orissa,759124
Institution Type	Private-Self Financing	**Region**	Eastern
Year of Establishment	2009		

To conduct following Programs/Courses with the Intake indicated below for the Academic Year 2024-25

Level	Program	Course	Affiliating Body (University /Body)	Intake Approved for 2023-24	Intake Approved for 2024-25	NRI Approval Status	FN / Gulf quota/ OCI/ Approval Status
DIPLOMA	ENGINEERING AND TECHNOLOGY	CIVIL ENGINEERING	Directorate of Technical Education , Odisha	60	60	No	No
DIPLOMA	ENGINEERING AND TECHNOLOGY	ELECTRICAL ENGINEERING	Directorate of Technical Education , Odisha	120	120	No	No
DIPLOMA	ENGINEERING AND TECHNOLOGY	MECHANICAL ENGINEERING	Directorate of Technical Education , Odisha	120	120	No	No

Level	Program	Course	Affiliating Body (University /Body)	Intake Approved for 2023-24	Intake Approved for 2024-25	NRI Approval Status	FN / Gulf quota/ OCI/ Approval Status
DIPLOMA	ENGINEERING AND TECHNOLOGY	MINING ENGINEERING	Directorate of Technical Education , Odisha	120	120	No	No

All AICTE approved Institutions are empowered to nurture ecosystems for Skilling (through Vocational courses) via making effective use of existing infrastructure facilities and human resources.

It is mandatory to comply with all the essential requirements as given in APH 2024-25 to 2027 (Chapter-VI)

Important Instructions

1. As per mandatory Disclosure of APH 2024-27(Annexure-18, page180) Institutions must disclose the following information submitted to Council at the Prominent location on its website.
   i. Department wise availability of Infrastructure along with approved courses and intake approved by the Council.
   ii. Faculty details: Department wise: Name& Designation of the faculty members/teaching staff along with their qualification, tenure of service in your organization, total experience, Institution should also disclose Student Faculty Ratio, Cadre Ratio.
   iii. Additionally Audited Financial Statements for last 3 Financial years.
2. Reservation Policy of the Central Government (Including EWS) / Respective State Government/ UT as the case shall be applicable to all the Programmes. The concerned State Government/ UT Admission authority shall decide Modalities of Admission.
3. The Institution offering courses earlier in the Regular Shift, First Shift, Second Shift/Part Time are now amalgamated as total intake and shall have to fulfil all facilities such as Infrastructure, Faculty and other requirements as per the norms specified in the Approval Process Handbook 2024-25 to 2027 for the Total Approved Intake.
4. In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the **Executive Council / General Council as available on the record of AICTE shall be final and binding.**
5. All AICTE institutions are highly encouraged to get NBA/NAAC accreditation. All eligible AICTE institutions are thoroughly encouraged to participate in NIRF ranking process.
6. Deemed to be University: Institutions Deemed to be Universities (Running Technical Education Programmes), it is mandatory to have AICTE approval from the Academic Year 2018-19 in compliance of the Hon'ble Supreme Court Order dated 03-11-2017 passed in CA No.17869- 17870 /2017.
7. AICTE Approved Institutes are encouraged to utilize SWAYAM PLUS Courses up-to 40%
8. Internship is mandatory for all admitted students.
9. AICTE Approved Institutes are encouraged to make efficient use of the flagship schemes like:
   a. Parakh: Student Gap analysis portal bases services.
   b. Students Scholarship schemes like Pragati, Saksham, Swanath, ADF, etc.
   c. Course in Indian Languages.
   d. ATAL FDPs: Faculty training for Emerging areas and cutting edge Technologies.
   e. Augmenting Utilization of Research Assets (AURA).
   f. Smart India Hackathon: World's largest Open Innovation Platform.

Prof.Rajive Kumar
Member Secretary, AICTE

Copy to:

1. **The Director Of Technical Education**, Odisha**
2. **The Principal / Director,**
   PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
   At-Chhendipadapo-Chhendipadaps-Chhendipadadist-Angulpin-759124Orissa,
   Vill-Chhendipada,Angul,
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3. **The Secretary / Chairman,**
AT-CHHENDIPADA
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Orissa,759124

4. **Guard File(AICTE)**

Note: Validity of the Course details may be verified at http://www.aicte-india.org/

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All India Council for Technical Education

(A Statutory body under Ministry of Education, Govt. of India)

Nelson Mandela Marg,Vasant Kunj, New Delhi-110070 Website: www.aicte-india.org

APPROVAL PROCESS 2025-26

Extension of Approval (EoA)

F.No. Eastern/1-44640214390/2025/EOA

Date of Approval: 02-Apr-2025

To,

Sub: Extension of Approval for the Academic Year 2025-26

Ref: Online application of the Institution submitted for Extension of Approval for the Academic Year 2025-26

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Education), Powers delegated in AICTE ACT 1987, (No 52 of 1987) chapter II - u/s 2(g) to regulate Technical and subsequent Regulations of AICTE, I am directed to convey the approval to:

Permanent Id	1-445778291	**Application Id**	1-44640214390
Name of the Institution	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY	**Name of the Society/Trust**	PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
Institution Address	AT-CHHENDIPADAPO-CHHENDIPADAPS-CHHENDIPADADIST-ANGULPIN-759124ORISSA, VILL-CHHENDIPADA, ANGUL, Odisha, 759124	**Society/Trust Address**	AT-CHHENDIPADA PO-CHHENDIPADA PS-CHHENDIPADA DIST-ANGUL ORISSA PIN-759124,CHHENDIPADA,ANGUL,Orissa,759124
Institution Type	Private-Self Financing	**Region**	Eastern
Year of Establishment	2009		

To conduct following Programs/Courses with the Intake indicated below for the Academic Year 2025-26

Level	Program	Course	Affiliating Body (University /Body)	Intake Approved for 2024-25	Intake Approved for 2025-26	NRI Approval Status	FN / Gulf quota/ OCI/ Approval Status
DIPLOMA	ENGINEERING AND TECHNOLOGY	CIVIL ENGINEERING	Directorate of Technical Education , Odisha	60	60	No	No
DIPLOMA	ENGINEERING AND TECHNOLOGY	COMPUTER SCIENCE & ENGINEERING	Directorate of Technical Education , Odisha	0	60##	No	No
DIPLOMA	ENGINEERING AND TECHNOLOGY	ELECTRICAL ENGINEERING	Directorate of Technical Education , Odisha	120	120	No	No

Level	Program	Course	Affiliating Body (University /Body)	Intake Approved for 2024-25	Intake Approved for 2025-26	NRI Approval Status	FN / Gulf quota/ OCI/ Approval Status
DIPLOMA	ENGINEERING AND TECHNOLOGY	MECHANICAL ENGINEERING	Directorate of Technical Education , Odisha	120	120	No	No
DIPLOMA	ENGINEERING AND TECHNOLOGY	MINING ENGINEERING	Directorate of Technical Education , Odisha	120	180	No	No

Approved New Course(s)

All AICTE approved Institutions are empowered to nurture ecosystems for Skilling (through Vocational courses) via making effective use of existing infrastructure facilities and human resources.

It is mandatory to comply with all the essential requirements as given in APH 2024-27 (Chapter-VI)

Important Instructions

1. As per mandatory Disclosure of APH 2024-27(Annexure-18, page180) Institutions must disclose the following information submitted to Council at the Prominent location on its website.
   i. Department wise availability of Infrastructure along with approved courses and intake approved by the Council.
   ii. Faculty details: Department wise: Name& Designation of the faculty members/teaching staff along with their qualification, tenure of service in your organization, total experience, Institution should also disclose Student Faculty Ratio, Cadre Ratio.
   iii. Additionally Audited Financial Statements for last 3 Financial years.
2. Reservation Policy of the Central Government (Including EWS) / Respective State Government/ UT as the case shall be applicable to all the Programmes. The concerned State Government/ UT Admission authority shall decide Modalities of Admission.
3. The Institution offering courses earlier in the Regular Shift, First Shift, Second Shift/Part Time are now amalgamated as total intake and shall have to fulfil all facilities such as Infrastructure, Faculty and other requirements as per the norms specified in the Approval Process Handbook 2024-25 to 2027 for the Total Approved Intake.
4. In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the **Executive Council / General Council as available on the record of AICTE shall be final and binding.**
5. All AICTE institutions are highly encouraged to get NBA/NAAC accreditation. All eligible AICTE institutions are thoroughly encouraged to participate in NIRF ranking process.
6. Deemed to be University: Institutions Deemed to be Universities (Running Technical Education Programmes), it is mandatory to have AICTE approval from the Academic Year 2018-19 in compliance of the Hon'ble Supreme Court Order dated 03-11-2017 passed in CA No.17869- 17870 /2017.
7. AICTE Approved Institutes are encouraged to utilize SWAYAM PLUS Courses up-to 40%
8. Internship is mandatory for all admitted students.
9. AICTE Approved Institutes are encouraged to make efficient use of the flagship schemes like:
   a. Parakh: Student Gap analysis portal bases services.
   b. Students Scholarship schemes like Pragati, Saksham, Swanath, ADF, etc.
   c. Course in Indian Languages.
   d. ATAL FDPs: Faculty training for Emerging areas and cutting edge Technologies.
   e. Augmenting Utilization of Research Assets (AURA).
   f. Smart India Hackathon: World's largest Open Innovation Platform.

Prof.Rajive Kumar
Member Secretary, AICTE

Copy to:

1. **The Director Of Technical Education**, Odisha**
2. **The Principal / Director,**
   PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
   At-Chhendipadapo-Chhendipadaps-Chhendipadadist-Angulpin-759124Orissa,
   Vill-Chhendipada,Angul,
   Odisha,759124

3. **The Secretary / Chairman,**
AT-CHHENDIPADA
PO-CHHENDIPADA
PS-CHHENDIPADA
DIST-ANGUL
ORISSA
PIN-759124
CHHENDIPADA,ANGUL
Orissa,759124

4. **Guard File(AICTE)**

Note: Validity of the Course details may be verified at http://www.aicte-india.org/

** Individual Approval letter copy will not be communicated through Post/Email. However, a consolidated list of Approved Institutions(bulk) may be downloaded from the respective login id's.

This is a computer generated Statement. No signature Required

MURARILAL AGARWALLA & CO.
CHARTERED ACCOUNTANTS

GANESH KUNJ
DURGA VIHAR, TURANG
ANGUL -759122 (ODISHA)
CELL: 9437038900

AUDITOR'S REPORT

WE HAVE AUDITED THE ANNEXED BALANCE SHEET OF PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY, AT/PO : CHHENDIPADA, DIST: ANGUL (ORISSA), AS AT 31ST MARCH,2023 AND THE ANNEXED INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED ON THAT DATE AND REPORT AS FOLLOWS:-

WE HAVE OBTAINED ALL THE INFORMATION AND EXPLANATIONS WHICH TO THE BEST OF OUR KNOWLEDGE AND BELIEF WERE NECESSARY FOR THE PURPOSE OF OUR AUDIT.

THE STATEMENTS OF ACCOUNTS DEALT WITH BY THIS REPORT ARE IN AGREEMENT WITH THE BOOKS OF ACCOUNT MAINTAINED BY THE INSTITUTE.

IN OUR OPINION AND TO THE BEST OF OUR INFORMATION AND ACCORDING TO THE EXPLANATIONS GIVEN TO US THE ACCOUNTS DEALT WITH BY THIS REPORT GIVES A TRUE AND FAIR VIEW:-

i) IN THE CASE OF BALANCE SHEET OF THE STATE OF AFFAIRS OF THE INSTITUTE AS AT 31ST MARCH, 2023

AND

ii) IN THE CASE OF INCOME AND EXPENDITURE ACCOUNT OF THE EXCESS OF INCOME OVER EXPENDITURE FOR THE YEAR ENDED ON 31ST MARCH,2023.

PLACE: ANGUL.
DATE : 31/08/2023.
UDIN: 23059905BGTOYS7833

For Murarilal Agarwalla & Co.
Chartered Accountants

Proprietor
M. L. Agarwalla
M. No.:059905

MURARILAL AGARWALLA & CO. ANGUL Chartered Accountants

MURARILAL AGARWALLA & CO.
CHARTERED ACCOUNTANTS

GANESH KUNJ
DURGA VIHAR, TURANGA
ANGUL -759122 (ODISHA)
CELL: 9437068040

PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
AT/PO: CHHENDIPADA, DIST: ANGUL - 759124 (ORISSA)

BALANCE SHEET AS AT 31ST MARCH, 2023

LIABILITIES	AMOUNT	ASSETS	AMOUNT
CAPITAL FUND		FIXED ASSETS	95010714.16
Opening Balance	10010958.29	As per Schedule "I"	
Add: Excess of Income over Expenditure	6501633.24		
	16512591.53		
Less: Income Tax & TDS	25096.00	CASH & BANK BALANCE	
	16487495.53		
		S.B. A/c. with Canara Bank, Chhendipada	13447.60
LOANS & BORROWINGS			
		C. A/c. with Canara Bank, Chhendipada	1176223.42
Term Loan from S.B.I., Chhendipada	773548.32		
		S.B. A/c. with S.B.I., Chhendipada	15150.00
Term Loan from Canara Bank, Chhendipada	979468.00		
		Current A/c. with S.B.I., Chhendipada	188427.66
Term Loan from Canara Bank, Chhendipada	151833.00		
		C. A/c. with ICICI Bank, Chhendipada	99657.39
Term Loan from SBI, Chhendipada	3308700.19		
		Fixed Deposit with S.B.I., Chhendipada (Including Accrued Interest)	5000000.00
Unsecured Loans	76842109.00		
		Fixed Deposit with S.B.I., Chhendipada (Including Accrued Interest)	1021592.00
CURRENT LIABILITIES			
		Cash in Hand	83519.81
Salary Payable	3221170.00		
EPF Payable	793924.00		
Audit Fees	15000.00		
Esic Payable	35484.00		
	102608732.04		102608732.04

In terms of our report of even date annexed

PLACE: ANGUL
DATE: 31/08/2023
UDIN: 23059905BGTOYS7833

For Murarilal Agarwalla & Co.
Chartered Accountants

MURARILAL AGARWALLA & CO. * Chartered Accountants * ANGUL

Proprietor
M. L. Agarwalla
M. No.:059905

MURARILAL AGARWALLA & CO.
CHARTERED ACCOUNTANTS

GANESH KUNJ
DURGA VIHAR, TURANG
ANGUL-759122 (ODISHA)
CELL: 9437038900

PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
AT/PO: CHHENDIPADA, DIST: ANGUL - 759124 (ORISSA)

INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED ON 31ST MARCH,2023.

ACCOUNTING YEAR : 2022-2023

	EXPENDITURE	AMOUNT		INCOME	AMOUNT
To	Annual Function	77500.00	By	Fees Received	58646059.00
To	Advertisement	769265.00			
To	AICTE Exp.	119000.00			
To	SCTE & VT	30000.00			
To	Bank Charges	29575.32			
To	Consumables	1570244.00	BY	Interest on SB A/c.	840.00
To	Workshop Raw Material	941642.00			
To	Donation	155500.00			
To	Electricity	901431.00	BY	Interest on FD	250942.00
To	E.P.F.	911378.00			
To	E.S.I.	144645.00			
To	Examination Exp.	1800857.00			
To	Fuel Exp.	3454790.52			
To	Fire safety	77875.00			
To	Food safety fees	10000.00			
To	QCI Fees	1000.00			
To	Hire Charges	573665.00			
To	Insurance	332790.00			
To	Interest	687452.12			
To	Medical Exp.	452941.00			
To	Membership & Subscription	20000.00			
To	Electrical Exp.	617684.00			
To	Misc. Exp.	49747.00			
To	Gardening Exp.	84172.00			
To	Newspaper & Periodicals	9885.00			
To	Office Exp.	310213.00			
To	Postage	12846.80			
To	Printing & Stationery	1110518.00			
To	Puja Exp.	453354.00			
To	Canteen Exp.	6338616.00			
To	Refreshment	337316.00			
To	Rent	57207.00			
To	Repair & Maintenance	2223062.00			
To	Road Tax & Fitness	71912.00			
To	Remuneration to visiting /Guest	347967.00			
To	Salary				
	Teaching Staff	15046746.00			
	Non Teaching Staff	3498818.00			
To	Student Registration Fees	76650.00			
To	Student Welfare Fees	7000.00			
To	Seminar Exp.	45876.00			
To	Telephone & Internet Exp.	527280.00			
To	Travelling Exp.	871761.00			
To	Trainning Exp.	9600.00			
To	Computer Exp.	379915.00			
To	Audit Fees	15000.00			
To	Depreciation	6831511.00			
To	Excess of Income over Expenditure Transferred to Capital Fund	6501633.24			
		58897841.00			58897841.00

In terms of our report of even date annexed

PLACE: ANGUL
DATE: 31/08/2023
UDIN: 23059905BGTOYS7833

For Murarilal Agarwalla & Co.
Chartered Accountants

MURARILAL AGARWALLA & CO. * ANGUL * Chartered Accountants *

Proprietor
M. L. Agarwalla
M. No.:059905

PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
AT/PO: CHHENDIPADA, DIST: ANGUL - 759124 (ORISSA)

Schedule - I
DETAILS OF FIXED ASSETS AS ON 31ST MARCH, 2023

Sl.No.	Particulars	Rate of Depreciation	W.D.V. as on 01.04.2022	Addition		Dèduction during the Year	Total	Depreciation Amount	W.D.V. as on 31.03.2023
				More than Six months	Less than Six months				
1	BUILDING	5.00%	72470059.00	6810315.00	4383651.00	0.00	83664025.00	4073610.00	79590415.00
2	FURNITURE & FIXTURES	10.00%	3387012.00	123300.00	55859.00	0.00	3566171.00	353824.00	3212347.00
3	COMPUTERS	40.00%	973273.00	403240.00	30000.00	0.00	1406513.00	556605.00	849908.00
4	ELECTRICAL FITTINGS	15.00%	2937776.16	0.00	22300.00	0.00	2960076.16	442339.00	2517737.16
5	LIBRARY BOOKS	15.00%	1672355.00	0.00	26250.00	0.00	1698605.00	252822.00	1445783.00
6	TOOLS & EQUIPMENTS	15.00%	6272618.00	37877.00	151395.00	0.00	6461890.00	957929.00	5503961.00
7	VEHICLE	15.00%	1091528.00	0.00	0.00	0.00	1091528.00	163729.00	927799.00
8	CCTV	15.00%	107243.00	0.00	0.00	0.00	107243.00	16086.00	91157.00
9	XEROX MACHINE	15.00%	58054.00	0.00	78120.00	0.00	136174.00	14567.00	121607.00
10	LAND	0.00%	0	0	750000.00	0	750000.00	0.00	750000.00
	Grand Total		88969918.16	7374732.00	5497575.00	0.00	101842225.16	6831511.00	95010714.16

MURARILAL AGARWALLA & CO. Chartered Accountants ANGUL

Acknowledgement Number:248976440120923 Date of filing : 12-Sep-2023

INDIAN INCOME TAX RETURN ACKNOWLEDGEMENT

Assessment Year 2023-24

(Where the data of the Return of Income in Form ITR-1(SAHAJ), ITR-2, ITR-3, ITR-4(SUGAM), ITR-5, ITR-6, ITR-7 filed and verified)

(Please see Rule 12 of the Income-tax Rules, 1962)

PAN	AABTP9144K		
Name	PURNA CHANDRA INSTITUTE OF ENGINEERING AND TECHNOLOGY		
Address	CHHENDIPADA, CHHENDIPADA, CHHENDIPADA, CHHENDIPADA , CHHENDIPADA , 24-Odisha, 91-INDIA, 759124		
Status	05-AOP/BOI	Form Number	ITR-7
Filed u/s	139(4)-Belated	e-Filing Acknowledgement Number	248976440120923

Taxable Income and Tax Details	Current Year business loss, if any	1	0
	Total Income	2	0
	Book Profit under MAT, where applicable	3	0
	Adjusted Total Income under AMT, where applicable	4	0
	Net tax payable	5	0
	Interest and Fee Payable	6	1,000
	Total tax, interest and Fee payable	7	1,000
	Taxes Paid	8	25,096
	(+) Tax Payable /(-) Refundable (7-8)	9	(-) 24,100
Accreted Income and Tax Detail	Accreted Income as per section 115TD	10	0
	Additional Tax payable u/s 115TD	11	0
	Interest payable u/s 115TE	12	0
	Additional Tax and interest payable	13	0
	Tax and Interest paid	14	0
	(+) Tax Payable /(-) Refundable (13-14)	15	0

Income Tax Return submitted electronically on 12-Sep-2023 17:18:46 from IP address 49.37.47.149 and verified by LAMBODAR PRADHAN having PAN ALFPP9515R on 12-Sep-2023 using paper ITR-Verification Form /Electronic Verification Code 78487MUPDI generated through Aadhaar OTP mode

System Generated Barcode/QR Code

AABTP9144K072489764401209233 8c87ee631b943ca9d6de3e908852473e23d8250

DO NOT SEND THIS ACKNOWLEDGEMENT TO CPC, BENGALURU

MURARILAL AGARWALLA & CO.
CHARTERED ACCOUNTANTS

GANESH KUNJ
DURGA VIHAR, TURANG
ANGUL -759122 (ODISHA)
CELL: 9437038900

AUDITOR'S REPORT

WE HAVE AUDITED THE ANNEXED BALANCE SHEET OF PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY, AT/PO : CHHENDIPADA, DIST: ANGUL (ORISSA), AS AT 31ST MARCH,2024 AND THE ANNEXED INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED ON THAT DATE AND REPORT AS FOLLOWS:-

WE HAVE OBTAINED ALL THE INFORMATION AND EXPLANATIONS WHICH TO THE BEST OF OUR KNOWLEDGE AND BELIEF WERE NECESSARY FOR THE PURPOSE OF OUR AUDIT.

THE STATEMENTS OF ACCOUNTS DEALT WITH BY THIS REPORT ARE IN AGREEMENT WITH THE BOOKS OF ACCOUNT MAINTAINED BY THE INSTITUTE.

IN OUR OPINION AND TO THE BEST OF OUR INFORMATION AND ACCORDING TO THE EXPLANATIONS GIVEN TO US THE ACCOUNTS DEALT WITH BY THIS REPORT GIVES A TRUE AND FAIR VIEW:-

i) IN THE CASE OF BALANCE SHEET OF THE STATE OF AFFAIRS OF THE INSTITUTE AS AT 31ST MARCH, 2024

AND

ii) IN THE CASE OF INCOME AND EXPENDITURE ACCOUNT OF THE EXCESS OF INCOME OVER EXPENDITURE FOR THE YEAR ENDED ON 31ST MARCH,2024.

PLACE: ANGUL
DATE : 27/09/2024.
UDIN: 24059905BKAQZQ1795

For Murarilal Agrawalla & Co.
Chartered Accountants

MURARILAL AGARWALLA & CO. ANGUL Chartered Accountants

Proprietor
M L Agarwal
M. No.-059905

MURARILAL AGARWALLA & CO.
CHARTERED ACCOUNTANTS

GANESH KUNJ
DURGA VIHAR, TURANG
ANGUL -759123 (ODISHA)
CELL: 9437038900

PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
AT/PO: CHHENDIPADA, DIST: ANGUL - 759124 (ORISSA)

BALANCE SHEET AS AT 31ST MARCH, 2024

LIABILITIES	AMOUNT	ASSETS	AMOUNT
CAPITAL FUND		FIXED ASSETS	100936006.16
Opening Balance	16487495.53	As per Schedule "I"	
Add: Excess of Income over Expenditure	1917794.81		
	18405290.34		
Less: Income Tax & TDS	452977.00	CASH & BANK BALANCE	
	17952313.34	S.B. A/c. with Canara Bank, Chhendipada	5810.60
LOANS & BORROWINGS		C. A/c. with Canara Bank, Chhendipada	539381.19
Term Loan from S.B.I., Chhendipada	9585618.00	S.B. A/c. with S.B.I., Chhendipada	15150.00
Term Loan from Canara Bank, Chhendipada	622016.00	Current A/c. with S.B.I., Chhendipada	38942.42
Term Loan from Canara Bank, Chhendipada	31757.00	C. A/c. with ICICI Bank, Chhendipada	99657.39
Term Loan from SBI, Chhendipada	8104073.28	Fixed Deposit with S.B.I., Chhendipada (Including Accrued Interest)	9419617.00
Term Loan from Canara Bank, Chhendipada	3638298.00		
Unsecured Loans	64742109.00	SBI C. A/C. 186 (Including Accrued Interest)	68909.41
CURRENT LIABILITIES		Cash in Hand	8326.45
Salary Payable	5193393.00		
EPF Payable	1139555.00		
Audit Fees	15000.00		
Esic Payable	107668.00		
Fuel Payble	682320.00		
	111131800.62		111131800.62

In terms of our report of even date annexed

PLACE: ANGUL
DATE: 27/09/2024
UDIN: 24059905BKAQZQ1795

For Murarilal Agrawalla & Co.
Chartered Accountants

Proprietor
M L Agarwal
M. No.-059905

MURARILAL AGARWALLA & CO.
CHARTERED ACCOUNTANTS

GANESH KUNJ
DURGA VIHAR, TURANG
ANGUL -759122 (ODISHA)
CELL: 9437038900

PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
AT/PO: CHHENDIPADA, DIST: ANGUL - 759124 (ORISSA)

INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED ON 31ST MARCH 2024.
ACCOUNTING YEAR : 2023-2024

	EXPENDITURE	AMOUNT		INCOME	AMOUNT
To	Annual Function	16000.00	By	Fees Received	55808046.00
To	Advertisement	778525.00			
To	AICTE Exp.	140200.00	By	Interest on Refund of IT	1730.00
To	SCTE & VT	30000.00			
To	Bank Charges	234340.50			
To	Consumables	2082898.00	BY	Interest on SB A/c.	399.00
To	Workshop Raw Material	385580.00			
To	Donation	41500.00			
To	Electricity	949073.00	BY	Interest on FD	466244.00
To	E.P.F.	1647327.00			
To	E.S.I.	315672.00			
To	Examination Exp.	1855910.80			
To	Fuel Exp.	2597660.87			
To	Fire safety	82220.00			
To	Food safety fees	10000.00			
To	QCI Fees	1000.00			
To	Hire Charges	389348.00			
To	Insurance	99164.00			
To	Interest	1493955.52			
To	Medical Exp.	82878.00			
To	Membership & Subscription	20000.00			
To	Electrical Exp.	1713732.00			
To	Misc. Exp.	75127.00			
To	Gardening Exp.	95500.00			
To	Newspaper & Periodicals	8214.00			
To	Office Exp.	281349.00			
To	Postage	17045.70			
To	Printing & Stationery	1024268.00			
To	Puja Exp.	352260.00			
To	Canteen Exp.	5621464.00			
To	Refreshment	235694.00			
To	Rent	50400.00			
To	Repair & Maintenance	1600721.00			
To	Road Tax & Fitness	34012.00			
To	Remuneration to visiting /Guest	435796.00			
To	Salary				
	Teaching Staff	17097443.00			
	Non Teaching Staff	3818354.00			
To	Student Registration Fees	70500.00			
To	Student Welfare Fees	64100.00			
To	Seminar Exp.	54922.00			
To	Telephone & Internet Exp.	413557.74			
To	Travelling Exp.	380405.06			
To	Trainning Exp.	10600.00			
To	Refund to Student	72950.00			
To	Audit Fees	15000.00			
To	Depreciation	7561557.00			
To	Excess of Income over Expenditure Transferred to Capital Fund	1917794.81			
		56276419.00			56276419.00

In terms of our report of even date annexed

PLACE: ANGUL
DATE: 27/09/2024
UDIN: 24059905BKAQZQ1795

For Murarilal Agrawalla & Co.
Chartered Accountants

MURARILAL AGARWALLA & CO. ANGUL Chartered Accountants

Proprietor
M L Agarwal
M. No.-059905

PURNA CHANDRA INSTITUTE OF ENGINEERING & TECHNOLOGY
AT/PO: CHHENDIPADA, DIST: ANGUL - 759124 (ORISSA)

Schedule - I
DETAILS OF FIXED ASSETS AS ON 31ST MARCH, 2024

Sl.No.	Particulars	Rate of Depreciation	W.D.V. as on 01.04.2023	Addition		Deduction during the Year	Total	Depreciation Amount	W.D.V. as on 31.03.2024
				More than Six months	Less than Six months				
1	BUILDING	5.00%	79590415.00	6043926.00	1530014.00	0.00	87164355.00	4319967.00	82844388.00
2	FURNITURE & FIXTURES	10.00%	3212347.00	300091.00	583931.00	0.00	4096369.00	380440.00	3715929.00
3	COMPUTERS	40.00%	849908.00	726419.00	284371.00	0.00	1860698.00	687405.00	1173293.00
4	ELECTRICAL FITTINGS	15.00%	2517737.16	495540.00	97794.00	0.00	3111071.16	459326.00	2651745.16
5	LIBRARY BOOKS	15.00%	1445783.00	4400.00	131633.00	0.00	1581816.00	227400.00	1354416.00
6	TOOLS & EQUIPMENTS	15.00%	5503961.00	3249130.00	39600.00	0.00	8792691.00	1315934.00	7476757.00
7	VEHICLE	15.00%	927799.00	0.00	0.00	0.00	927799.00	139170.00	788629.00
8	CCTV	15.00%	91157.00	0.00	0.00	0.00	91157.00	13674.00	77483.00
9	XEROX MACHINE	15.00%	121607.00	0.00	0.00	0.00	121607.00	18241.00	103366.00
10	LAND	0.00%	750000	0	0.00	0	750000.00	0.00	750000.00
	Grand Total		95010714.16	10819506.00	2667343.00	0.00	108497563.16	7561557.00	100936006.16

MURARILAL AGARWALLA & CO. ANGUL Chartered Accountants

INFOME & EXPENDITURE DETAILS 2023 – 24

INCOME (In Lakh)

1-	Incoe from Central Govt.	:	
2-	Income from State Govt.	:	
3-	Income from Student Fees	:	558.08
4-	Income from Donations	:	
5-	Income from UGC	:	
6-	Income from Other Bodies/Sources	:	4.68
7-	Total Income	:	562.76

EXPENDITURE (In Lakh)

1-	Salary Teaching Staff	:	170.97
2-	Salary Non-Teaching Staff	:	38.18
3-	Library	:	1.36
4-	Equipment	:	48.93
5-	Building Maintenance	:	16.01
6-	Other Expenditure	:	318.42
7-	Total Expenditure	:	593.87

INCOME & EXPENDITURE DETAILS 2022-23

INCOME (In Lakh)

1- Income from central Govt.	
2- Income from State Govt.	
3- Income From Student Govt.	586.46.
4- Income from Donations	
5- Income from UGC :	
6- Income from other Bodies /Sources	2.52
7- Total Income	588.98.

EXPENDITURE (In Lakh)

1- Salary Terachin Staff	150.47
2- Salary Non-teaching Staff	34.99
3- Library	0.26.
4- Equipment	7.23.
5- Building Maintainance	22.23
6- Other Expenditure	316.28
7- Total Expenditure	531.46.

Acknowledgement Number:446694050120925 **Date of filing : 12-Sep-2025**

INDIAN INCOME TAX RETURN ACKNOWLEDGEMENT

[Where the data of the Return of Income in Form ITR-1(SAHAJ), ITR-2, ITR-3, ITR-4(SUGAM), ITR-5, ITR-6, ITR-7 filed and verified]
(Please see Rule 12 of the Income-tax Rules, 1962)

Assessment Year 2025-26

PAN	AABTP9144K		
Name	PURNA CHANDRA INSTITUTE OF ENGINEERING AND TECHNOLOGY		
Address	CHHENDIPADA , CHHENDIPADA, ANGUL , CHHENDIPADA , 24-Odisha , 759124		
Status	05-AOP/BOI	Form Number	ITR-7
Filed u/s	139(1)-On or before due date	e-Filing Acknowledgement Number	446694050120925

Taxable Income and Tax Details	Current Year business loss, if any	1	0
	Total Income	1A	0
	Book Profit under MAT, where applicable	2	0
	Adjusted Total Income under AMT, where applicable	3	0
	Net tax payable	4	0
	Interest and Fee Payable	5	0
	Total tax, interest and Fee payable	6	0
	Taxes Paid	7	15,921
	(+) Tax Payable /(-) Refundable (6-7)	8	(-) 15,920
Accreted Income and Tax Detail	Accreted Income as per section 115TD	9	0
	Additional Tax payable u/s 115TD	10	0
	Interest payable u/s 115TE	11	0
	Additional Tax and interest payable	12	0
	Tax and interest paid	13	0
	(+) Tax Payable /(-) Refundable (12-13)	14	0

Income Tax Return electronically transmitted on 12-Sep-2025 21:07:42 from IP address 49.37.113.104 and verified by LAMBODAR PRADHAN havinng PAN ALFPP9515R on 12-Sep-2025 using paper ITR-Verification Form/Electronic Verification Code EB41USW2MI generated through Aadhaar OTP mode

System Generated Barcode/QR Code

AABTP9144K074466940501209254816d555b50f5a4f2061adc10d50821b2f661a13

DO NOT SEND THIS ACKNOWLEDGEMENT TO CPC, BENGALURU