Mandatory Disclosures

Name of the Institute:	GOVERNMENT POLYTECHNIC,BARGARH
Address:	At-Tentla,PO-Kantapali,Via-Bardol,Dist-Bargarh,Pin-768038,State-Odisha
Telephone:	9438258410
E-Mail:	govpolybgr@gmail.com

Name of the Principal:	Er. SACHINDRA KUMAR GOKHURA
Address:	O/O of the Principal, Govt. Polytechnic, Bargarh At-Tentla,PO-Kantapali,Via-Bardol,Dist-Bargarh,Pin-768038,State-Odisha
Telephone No:	9438258410
Mobile No:	9437221290
Email:	govpolybgr@gmail.com

Name of the affiliating Council	State Council for Technical Education and Vocational Training, Odisha, Bhubaneswar

Governance:

1. The institute functions under Skill Development and technical education Department,Govt. of Odisha .
2. Governing Body of institute consists of the following members:

1) The Collector-cum-District Magistrate,Bargarh - CHAIRMAN
2) Principal,Government Polytechnic Bargarh -MEMBER SECRETARY
3) The Honourable MP,Bargarh -MEMBER
4) District Employment Oficer ,Bargarh -MEMBER
5) Executive Engineer,R&B Division,Bargarh -MEMBER
6) Executive Engineer,GHPD,Sambalpur -MEMBER
7) Executive Engineer,WESCO,Bargarh -MEMBER
8) Executive Engineer,GED-III,Sambalpur -MEMBER
9) Regional Officer,ERO,AICTE,Kolkata -MEMBER
10) Nominee of DTE&T,Odisha,Cuttuck-MEMBER
11) Nominee of SCET&VT,Odisha,Bhubaneswar -MEMBER
12) DGM(HR),ACC Cement Ltd,Bargarh -MEMBER
13) Two nominated faculty members of Govt. Polytechnic, Bargarh-MEMBER

3. The Governing body meeting is held annually.

Organizational Chart :

1.Principal is the administrative and financial head of the institute.

2. Both teaching and non-teaching staff of the institute report him.

3.Teaching staff includes lecturers and Lab. Assistants.

4. Non-teaching staff includes ministerial staff and outsourced staff.

5.Ministerial staff includes Section Officer and Junior Assistants.

6.Outsourced staff includes DEO,Peon,Hostel Attendant, Lady Matron, Driver-cum-Mechanic, Security Guards.

Committees:

Various Committees have been formed to look after various areas for the smooth functioning of the institute. The committees are as follows;

1.Grievance Redressal Committee for students and staff

2.Anti-Ragging Committee

3.Anti-Ragging Squad

4.Internal Complaint Committee(ICC)

5.Commitee for SC/ST

6. Internal Quality Assurance Cell

7.Appointment of OMBUDSMAN

8.Online Grievance Redressal Mechanism(https://govtpolytechnicbargarh.edugrievance.com/)

Programmes:

Name of the Programme-Engineering and Technology

Name of the Level-Diploma in Engineering

Name of the courses-The institute is having three(03) courses.

For 1st Semester:

Sl No	Name of the courses	Intake sanctioned by AICTE	Duration
1	Civil Engineering	60	03 years
2	Electrical Engineering	60	03 years
3	Mechanical Engineering	60	03 years
Apart from above seats, there are three (03) TFW and six (06) EWS seats in each course.			

For 3rd Semester(Lateral Entry):

Sl No	Name of the courses	Intake sanctioned	Duration
1	Civil Engineering	6	02 years
2	Electrical Engineering	6	02 years
3	Mechanical Engineering	6	02years

NBA Accreditation Status-Not Applied

Fee structure (Approved by Govt. of Odisha):

Category	Amount(Rs.) per year
General/OBC	Rs.5800/-
SC/ST(Parents annual income more than Rs.250000/-)/TFW/EWS	Rs.3300/-
SC/ST(Parents annual income less than Rs.250000/-)/	Rs.800/-

Cut off marks for Admission(1st Semester) :

Admission Year	Branch	Cut-off percentage		
		General/0BC	ST	SC
2018	Civil	36	36.66	38
	Electrical	36.83	40	38
	Mechanical	36.50	39	38
2019	Civil	53.50	-------	40.67
	Electrical	60	38.00	38.50
	Mechanical	61.50	40.50	36.83
2020	Civil	48.67	------	40.5
	Electrical	53.5	41.67	40.83
	Mechanical	53.17	46.50	35.00

Placement Data:

Pass out Year	Branch	No of placements	Minimum Salary(in lacs)	Minimum Salary(in lacs)	Average Salary(in lacs)
2018	Civil	03	1.2	1.8	1.5
	Electrical	09	1.5	1.8	1.65
	Mechanical	20	1.5	1.8	1.65
2019	Civil	02	1.2	1.8	1.5
	Electrical	12	1.5	1.8	1.65
	Mechanical	60	1.5	2.5	2
2020	Civil	03	1.2	1.8	1.5
	Electrical	15	1.5	2.8	2.15
	Mechanical	21	1.5	1.8	1.65

Faculty List:

Branch	Permanent Faculty	Adjunct Faculty	Guest Facuty(PTGF)
Civil Engg.	1.Amit Kumar Sahu 2. Utkalika Pradhan	NIL	1.Manasi Pradhan 2.Priyajit Behera 3.Sushree Sulipi Tandakar
Electrical Engg.	1.Nitesh Kumar Acharya 2.Deepak Patra 3.Niranjan Nayak 4.Rashmita Gouda	NIL	1.Binayak Satpathy 2.Swati Sharma
Mechanical Engg.	1.Shradha Suman Adabar 2. Subhasis Sahoo	NIL	2.Arun Kumar Sahu 2. Chitta Ranjan Meher 3.Shekhar Sahu

Math & Sc. Dept.	1.Damayanti Khamari 2.Banani Mohanty 3.Sushreeta Behera 4. Jitendra Kumar Malik 5. Supriya Mishra	NIL	1.Pooja Sahu

Scholarship Data:

Sl No	Name of scholarship	Criteria for eligibility	Duration	Amount(Rs.)
1	Prerana(PMS)	1. Parents annual income less than 2.5 lakhs PA(for all catagory). 2.Resident of Odisha 3. Atleast secured 50% marks in the last exam for OBC students.	10 months per year	Upto Rs.6000/-
2	BOC	1.Guardian must have valid labour card.	10 months per year	Upto Rs. 24000/-
3.	Pragati (NSP)	1.Only for girl students 2.Must have passed 10^{th} exam on or after 2018. 3.Parents annual income less than 8 lakhs per annum.	10 months per year	Upto Rs.50000/-
4	Saksham(NSP)	1.For Divyang students 2.Must have passed 10^{th} exam on or after 2018. 3.Parents annual income less than 8 lakhs per annum	10 months per year	Upto Rs.50000/-

5	Minority(NSP)	1.For minority students. 2. Parents annual income less than 2.5 lakhs PA. 3. Atleast secured 50% marks in the last exam.	10 months per year	Upto Rs.6000/-
6	Merit-cum-Poverty	1.Atleast secured 60% marks in last exam. 2.Parents annual income less than 4.5 lakhs PA.	10 months per year	Rs.3000/-
7	EBMS	Selected by SCTE&VT,Odisha on merit basis.	10 months per year	Rs.6000/-
8	Welfare Scheme	1. Death of guardian during study period.	Onetime during the diploma level	Upto Rs.44000/-

Hostel Fees:

Hostel Type	Capacity	Yearly Hostel Admission Fee	Apprx. Mess Charges per month
Boys Hostel	100	Rs.3000/-	Rs. 1800/-
Girls Hostel	100	Rs.3000/-	Rs. 1800/-

Admission Figures:

Admission Year	Branch	Admitted Figure
2018	Civil	63
	Electrical	63
	Mechanical	63
2019	Civil	63
	Electrical	63
	Mechanical	63
2020	Civil	42
	Electrical	62
	Mechanical	60

Admission Procedure:

- **The candidates can apply online for admission in diploma. For registration the candidate has to visit http://skill.samsodisha.gov.in/Diploma.aspx**
- **The details of the admission procedure is available in www.dtetodisha.gov.in**

Criteria of Admission:

Candidates can check their eligibility for the course they are applying:

Admission to 1st Semester Diploma in Engineering/Technology:

□ **Qualifying Exam:** Candidates must qualify the HSC/10th examination from the recognized board and university of BSE, Odisha.

□ **Minimum Marks:** Candidate must secure 35% aggregate marks in Math, Science and English and 30% marks in each subject.

□ **Age:** age of the candidate must be 14 years for all courses except mining & drilling.

Admission to 3rd Semester (Lateral Entry) Diploma in Engineering & Technology:

□ **Qualifying Exam: Passed +2 Sc.or** equivalent with PCM subjects from Council of Higher Secondary Education, Odisha or 2-year ITI pass.

□ **Minimum Marks:** Candidate must pass 10th with minimum 30% marks from BSE, Odisha.

□ **Age Criteria:** The minimum age limit for this course is 14 years.

□ No upper age limit is applicable.

Library Facilities:

- The institute is having number of books for all the courses and magazines.
- E-library facility is also available having internet connectivity.
- Registered under National Digital Library (NDL).

Laboratory:

Sl No	Name of the Branch	Name of the Laboratory
1	Civil Engg.	1.Civil Engineering Laboratory 2.Structural Engineering Laboratory 3.Survey Store 4.CAD-CAM Lab
2	Electrical Engg.	1.Basic Electrical Engg. Laboratory 2.Basic Electronics Engg. Laboratory 3.Power electronics & PLC Lab 4.Anolog electronics Lab 5.Digital electronics Lab 6. Microprocessor Lab 7. Electrical Machine Lab 8.Circuit Theory Lab 9. Simulation Lab 10. Electrical Workshop
3	Mechanical Engg.	1.FMHM Lab 2.Workshop 3.RAC Lab 4.Mechanical Engineering Lab 5.Thermal engg. And Theory of machine lab
4	Math & Sc. Dept.	1.Communicative English Lab 2.Chemistry Lab 3.Physics Lab 4.Smart Classroom 5. CA lab

List of Major Equipments in various laboratories:

Sl No	Name of the Lab	Major Equipments
1	Civil Engineering Laboratory	1.Triaxial Shear Test apparatus 2.Los Angeles Apparatus 3. Bitumen Ductility Test apparatus 4.Centrifuge Extractor for bitumen Content 5.Permeability apparatus 6.Plate Load test apparatus 7.Sieve Shaker 8.Consolidation Test apparatus 9. CBR test apparatus
2	Structural Engineering Laboratory	1.Universal Testing Machine 2.Compression Testing Machine 3.Concrete mortal Cube Vibrator 4. Ultrasonic Pulse Velocity Tester
3	Survey Store	1.Total station 2.Digital Theodolite 3.Auto Level 4.Plane Table 4.Compass
4	CAD-CAM Lab	1.Computers 2.Plotter
5	Electrical Machine Lab	1.DC shunt motor 2.DC series motor 3.DC compound motor 4.DC compound motor-alternator set
6	Circuit Theory Lab	1. Trainer Kit for theorem 2. Trainer kit for parameters 3. Trainer kit for filter circuit

7	Digital electronics Lab	1.Trainer kit for various gates
8	Power electronics & PLC Lab	1.SCR,DIAC,TRIAC module 2.Cycloconvertor module 3. Chopper module 4.Invertor module 5. Trainer kit for PLC
9	Simulation Lab	1.Computer with MATLAB software
10	Basic Electrical Lab	1.Workbench 2.Trainer kit for KCL,KVL,Ohm's Law 3.Switch board Connection
11	Basic Electronics Lab	1.CRO 2.DSO 3.Function generator
12	Analog electronics Lab	1.CRO 2.DSO 3.Trainer kit for BJT,MOSFET,OPAMP
13	Microprocessor Lab	1.8085 microprocessor trainer kit & its interfacing
14	FMHM Lab	1.Bernoulli's apparatus 2.Losses in pipes apparatus 3. Venturimeter apparatus 4.Pitot's tube apparatus 5.Hydraulic RAM apparatus 6.Notch apparatus 7.Francis Turbine 8. Impulse turbine 9.Reaction turbine 10. Centrifugal pump 11.Reciprocating Pump

15	Workshop	1.Centre Lathe 2.Turret Lathe 3.Surface milling machine 4.grinding machine 5.TIG welding machine 6.Arc welding machine 9.Drilling machine
16	RAC Lab	1. Split AC test RIG 2. Window AC test RIG 3. Water cooling apparatus 4. Heat pump apparatus 5. Heat Engine apparatus 6. AC fault simulator 7. Vapour Compression-absorption apparatus
17	Mechanical Engineering Lab	1.UTM 2.Impact Testing Machine 3.Torsion Testing machine 4.Hardness Testing machine

Computing facilities:

Internet Bandwidth	40 MBPS BSNL Lease line
No of PCs	125 (all are connected through LAN)
Mojor software packages available	Staadpro,MATLAB,Auto CAD,C++,C,Simulink,Ni-Multisim

List of Facilities:

- Playground available

- Badminton court available
- Volley ball court available
- Cultural club available
- Bus facilities
- Separate hostels for boys & girls
- Cafeteria

Teaching Learing Process:

- Curriculum is designed and circulated by SCTE&VT,Odisha,Bhubaneswar for all the three(03) courses.
- The academic activities and examinations are conducted as per the academic calender of the council.
- Classes are conducted as per the time table for various semesters.

Information of Infrastructure and Other Resources Available

Sl No	Room No	Room Type(Class room/Tutorial Room/Lab)	Carpet Area in (Sq. Mtr)
1	C-1	Class Room	68
2	C-2	Class Room	68
3	C-3	Class Room	68
4	C-4	Class Room	68
5	C-5	Class Room	68
6	C-6	Class Room	68
7	C-7	Class Room	68
8	C-8	Class Room	68
9	C-9	Class Room	68
10	LAB-1	Laboratory	118
11	LAB-2	Laboratory	116
12	LAB-3	Laboratory	94
13	LAB-4	Laboratory	70
14	LAB-5	Laboratory	108
15	LAB-6	Laboratory	108
16	LAB-7	Auto CAD Lab	117
17	LAB-8	Laboratory	100
18	LAB-9	Laboratory	100
19	LAB-10	Laboratory	100
20	LAB-11	Laboratory	100
21	LAB-12	Laboratory	100
22	LAB-13	Laboratory	100
23	LAB-14	Laboratory	100
24	LAB-15	Laboratory	100
25	LAB-16	Laboratory	100
26	LAB-17	Laboratory	100
27	LAB-18	Laboratory	100
28	SEM-1	Seminar Hall	152
29	T-1	Tutorial Room	36
30	T-2	Tutorial Room	46
31	T-3	Tutorial Room	46
32	WS-1	Workshop	112
33	WS-2	Workshop	108
34	WS-22	Workshop	108
35	D1	Drawing Hall	200
36	D2	Drawing Hall	224
37	CS-1	Computer Centre	116
38	LIB-1	Library & Reading Room	116
39	LIB-2	Library & Reading Room	224
40	A-1	Principal Directors Office	40
41	A-1	Principal Directors Office	40
42	A-2	Faculty Room	16
43	A-3	Department Office	42
44	EXAM-1	Exam Control Office	46
45	HK-1	Housekeeping	15
46	MAINT-1	Maintenance	15
47	OFFICE	Office all Inclusive	198
48	SEC-1	Security	12
49	STORE	Central Store	46
50	TS-1	Placement Office	42

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OFFICE OF THE TAHASILDAR, BARGARH

OCCUPANCY CERTIFICATE

Certified that, The buildings belonging to Govt. Polytechnic, Bargarh viz Administrative, Academic, Workshop, Boy's Hostel, Girl's Hostel, Staff Quarters Cafeteria, SRBSETI Bargarh are covering total an area of 10 acres. The whole area has been occupied by Govt. Polytechnic, Bargarh. The details of land allotted is as follows:-

Name of the Recorded Tenants.	Village.	Khata No.	Plot No.	Area.	Kisam.
Silpa Bhibaga (Govt. Polytechnic, Bargarh)	Tentela	124/538	224/2310	Ac.10.00	Patita

Tahasildar,Bargarh
TAHASILDAR
BARGARH

Memo No. 1050 Dt. 4/2/17

Copy to Principal, Govt. Polytechnic, Bargarh for favour of information and necessary action.

Tahasildar,Bargarh
TAHASILDAR
BARGARH

Profile of Principal-

Name- SACHINDRA KUMAR GOKHURA

Date of Birth- 15th May 1969.

Unique ID- 1-4641109005

Education Qualification- M.E.

Work Experience-

- Teaching- 29 years
- Research -
- Industry -
- Others -

Area of specialization- Power System Engg.

Courses taught at Diploma level-

Research Guidance(Numbers of Students)

- No. of papers published
- Masters (Completed/ongoing)
- Ph.D.(Completed/ongoing)
- Projects carried out
- Patents
- Technology transfer
- Research publications
- No. of books published

Signature of the Principal

Profile of Faculty-

Name- DAMAYANTI KHAMARI

Date of Birth- 12-07-1983

Unique ID- 1-322055 9978

Education Qualification- M.Phil in English

Work Experience-

- Teaching- 07 years
- Research
- Industry
- Others

Area of specialization- Linguistic

Courses taught at Diploma level- English

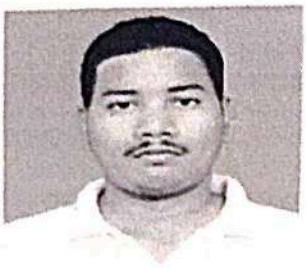
Research Guidance(Numbers of Students)

- No. of papers published — Nil
- Masters (Completed/ongoing) —
- Ph.D.(Completed/ongoing) — X
- Projects carried out — X
- Patents — X
- Technology transfer — X
- Research publications — X
- No. of books published — X

Damayanti Khamari

Signature of the Faculty

Profile of Faculty-



Name- Jitendra Kumar Malik

Date of Birth-12-07-1990

Unique ID-1-3218127967

Educational Qualification-Ph.D. (Thesis Submitted)

Work Experience-

- Teaching- 05 year 05 month
- Research -7Year
- Industry-Nil
- Other-Nil

Area of Specialization-Numerical Functional Analysis.

Course taught at Diploma level- Engineering Mathematics-I , Engineering Mathematics-II, Engineering Mathematics-III

Research Guidance (Number of students)

- Number of Paper Published-04
- Masters(Completed/Ongoing)-Nil
- Ph.D. (Completed/Ongoing)-Nil
- Projects carried out-Nil
- Patents-Nil
- Technology transfer-Nil
- Research Publication-04
- No. of book published-Nil

Jitendra Kumar Malik

Signature of the Faculty

Profile of Faculty-

Name- AMIT KUMAR SAHU

Date of Birth- 03rd Feb 1990

Unique ID- 1-3015-22458.

Education Qualification- B. Tech (Civil Engg).

Work Experience-

- Teaching- 05 Years
- Research
- Industry – 03 Years 03 Months.
- Others

Area of specialization-

Courses taught at Diploma level- Structural Mechanics, SD-I, SD-II, ECE-II, Surveying-II.

Research Guidance(Numbers of Students)

- No. of papers published -NIL
- Masters (Completed/ongoing) – NIL
- Ph.D.(Completed/ongoing) – NIL
- Projects carried out – NIL
- Patents – NIL
- Technology transfer – NIL
- Research publications – NIL
- No. of books published - NIL.

Signature of the Faculty

Profile of Faculty-

Name- UTKALIKA PRADHAN

Date of Birth- 1st April 1991

Unique ID- 1-32089066777

Education Qualification- B-Tech in Civil Engineering

Work Experience-

- Teaching- 05 years
- Research
- Industry
- Others

Area of specialization-

Courses taught at Diploma level- Highway Engg., GE, R&BE, CT, DM, FM HM

Research Guidance(Numbers of Students)

- No. of papers published NIL
- Masters (Completed/ongoing) NIL
- Ph.D.(Completed/ongoing) N.A.
- Projects carried out NIL
- Patents NIL
- Technology transfer NIL
- Research publications NIL
- No. of books published NIL

Utkalika Pradhan

Signature of the Faculty

Profile of Faculty-

Name- PRIYAJIT BEHERA

Date of Birth- 01-01-1992

Unique ID- 1-74304941011

Education Qualification- B-Tech in Civil Engg.

Work Experience-

- Teaching- 2 Year
- Research
- Industry
- Others

Area of specialization-

Courses taught at Diploma level- Estimating, Structural Mechanics, CED, Environmental Survey, Concrete Technology. Construction management

Research Guidance(Numbers of Students)

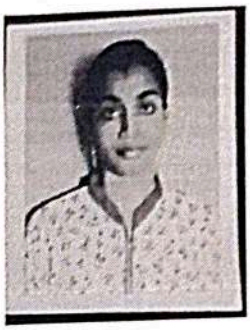
- No. of papers published
- Masters (Completed/ongoing)
- Ph.D.(Completed/ongoing)
- Projects carried out
- Patents
- Technology transfer
- Research publications
- No. of books published

} Nill

Priyajit Behera

Signature of the Faculty

Profile of Faculty-



Name- SUSHREE SULIPI TANDAKAR

Date of Birth-24-03-1993

Unique ID-1- 931370063 1

Educational Qualification-M.Tech. (Civil)

Work Experience-

- Teaching- 2 Years 6 months.
- Research -Nil
- Industry-Nil
- Other-Nil

Area of Specialization-Environmental Science & Engineering

Course taught at Diploma level- Estimation, Costing-II, EMST

Research Guidance (Number of students)

- Number of Paper Published- Nil
- Masters(Completed/Ongoing)- Nil
- Ph.D. (Completed/Ongoing)-Nil
- Projects carried out-Nil
- Patents-Nil
- Technology transfer-Nil
- Research Publication- Nil
- No. of book published-Nil

Sushree Sulipi Tandakar

Signature of the Faculty

Profile of Faculty-

Name- Shradha Suman Adabar

Date of Birth- 17/10/1991

Unique ID- 1-32089966785

Education Qualification- M.Tech

Work Experience-

- Teaching- 05 years
- Research -
- Industry -
- Others -

Area of specialization- Machine-Design

Courses taught at Diploma level- Strength of Material (SOM), Machine Design, Fluid Mechanics & Hydraulic Machines, Automobile Engg., Adv. manufacturing CAD/CAM, Production Technology.

Research Guidance(Numbers of Students)

- No. of papers published – NIL
- Masters (Completed/ongoing) – NA
- Ph.D.(Completed/ongoing) – NA
- Projects carried out – NA
- Patents – NA
- Technology transfer – NA
- Research publications – NA
- No. of books published – NA

Shradha Suman Adabar

Signature of the Faculty

Profile of Faculty-

Name- SUBHASIS SAHOO

Date of Birth- 03/05/1992

Unique ID- 1-447188 7363.

Educational Qualification- M. Tech in Heat Power Engg.

Work Experience-

- Teaching- 2 Years.
- Research - NIL
- Industry- NIL
- Other- NIL

Area of Specialization- Mechanical Engg. Thermal Engg, RAC, Manufacturing Technology. Industrial Mgt & organisational Research..

Course taught at Diploma level-

Research Guidance (Number of students)

- Number of Paper Published- NIL
- Masters(Completed/Ongoing)- NIL
- Ph.D. (Completed/Ongoing)- NIL
- Projects carried out- NIL
- Patents- NIL
- Technology transfer- NIL
- Research Publication- NIL
- No. of book published- NIL

Subhasis Sahoo

Signature of the Faculty

Profile of Faculty-

Name- ARUN KUMAR SAHU

Date of Birth- 01/06/1992

Unique ID- 1-3537909529

Education Qualification- B-Tech

Work Experience-

- Teaching- 3 yr
- Research
- Industry
- Others

Area of specialization- MECHANICAL ENGINEERING

Courses taught at Diploma level- Engg-mechanics, EM, PT, MT, AES & M, EM & ST,

Research Guidance(Numbers of Students)

- No. of papers published – NIL
- Masters (Completed/ongoing) – NIL
- Ph.D.(Completed/ongoing) – NIL
- Projects carried out – NIL
- Patents – NIL
- Technology transfer – NIL
- Research publications – NIL
- No. of books published – NIL

Arun Kumar Sahu

Signature of the Faculty

Profile of Faculty-

Name- CHITTA RANJAN MEHER

Date of Birth- 01/07/1987

Unique ID- 1-3736661493

Education Qualification- M Tech (Heat power Engineering)

Work Experience-

- Teaching- 2 Year. 3 month
- Research
- Industry – 2 Year. 6 month
- Others

Area of specialization- Heat power Engineering

Courses taught at Diploma level- EVS, Mechanics, Element of Mechanical Engg., Applied Thermodynamic

Research Guidance(Numbers of Students)

- No. of papers published → X
- Masters (Completed/ongoing) → X
- Ph.D.(Completed/ongoing) → X
- Projects carried out → X
- Patents → X
- Technology transfer → X
- Research publications → X
- No. of books published → X

Chitta ranjan Meher

Signature of the Faculty

Profile of Faculty-

Name- NITESH KUMAR ACHARYA

Date of Birth- 02.07.1992

Unique ID- 1-74307702023

Education Qualification- B.TECH

Work Experience-

- Teaching- 5 Yr. 4 Month.
- Research
- Industry
- Others

Area of specialization- —

Courses taught at Diploma level- Energy Conversion - I & II, Circuit Network theory, UEET, Electrical Engg. Material, Power Electronics, Basic Electrical, Control System Engg, Generation, transmission & Distribution

Research Guidance(Numbers of Students)

- No. of papers published - NIL
- Masters (Completed/ongoing) NIL
- Ph.D.(Completed/ongoing) NIL
- Projects carried out NIL
- Patents NIL
- Technology transfer
- Research publications NIL
- No. of books published NIL

25.03.2021

Signature of the Faculty

Profile of Faculty-

Name- Deepak Patra

Date of Birth- 12-05-1988

Unique ID- 1-3220408288

Education Qualification- B. Tech

Work Experience-

- Teaching- 05 years
- Research – } NIL
- Industry –
- Others –

Area of specialization-

Courses taught at Diploma level- CNT, ED, UEET, EI&E

Research Guidance(Numbers of Students)

- No. of papers published
- Masters (Completed/ongoing)
- Ph.D.(Completed/ongoing)
- Projects carried out
- Patents
- Technology transfer
- Research publications
- No. of books published

} NIL

Deepak Patra

Signature of the Faculty

Profile of Faculty-

Name- RASHMITA GOUDA

Date of Birth- 23.06.1988

Unique ID- 1-449509704440

Education Qualification- M. Tech

Work Experience-

- Teaching- 06 yrs
- Research
- Industry
- Others

Area of specialization- Applied Electronics & Instrumentation Engg.

Courses taught at Diploma level- Digital Electronics & Microprocessor, control System, Electrical Measurement & Instrumentation, Basic Electronics.

Research Guidance(Numbers of Students)

- No. of papers published - Nil -
- Masters (Completed/ongoing) - Nil -
- Ph.D.(Completed/ongoing) - Nil -
- Projects carried out - Nil -
- Patents - Nil -
- Technology transfer - Nil -
- Research publications - Nil -
- No. of books published - Nil -

Rashmita Gouda
Signature of the Faculty

Profile of Faculty-

Name- NIRANJAN NAYAK

Date of Birth- 14-04-1992

Unique ID- 1-7430682502

Education Qualification- M-TECH

Work Experience-

- Teaching- 2 years 1 month
- Research
- Industry
- Others

Area of specialization- Process control and Instrumentation.

Courses taught at Diploma level- DEE, ET, BEE, EVS, PE & PLC

Research Guidance(Numbers of Students)

- No. of papers published NIL
- Masters (Completed/ongoing) NIL
- Ph.D.(Completed/ongoing) NIL
- Projects carried out NIL
- Patents NIL
- Technology transfer NIL
- Research publications NIL
- No. of books published NIL

Niranjan Nayak
Signature of the Faculty

Profile of Faculty-

Name- BINAYAK SATPATHY

Date of Birth- 07 JANUARY 1987

Unique ID- 1-7430945636

Education Qualification- B.TECH (ELECTRONICS & TELECOMMUNICATION ENGG.)

Work Experience-

- Teaching- – 07 YEAR
- Research
- Industry – 02 YEAR
- Others

Area of specialization- ANALOG & DIGITAL ELECTRONICS & COMMUNICATION SYSTEM

Courses taught at Diploma level- PHYSICS, BASIC ELECTRONIC & ELECTRICAL, ANALOG ELECTRONIC DIGITAL ELECTRONICS, CIRCUIT N/W THEORY, CONTROL SYSTEM ENGG., ENVIROMENTAL ENGG. AND ENTREPRENEURSHIP MANAGEMENT & MICROPROCESSOR AND MICRO CONTROL ENGG.

Research Guidance(Numbers of Students)

- No. of papers published – NIL
- Masters (Completed/ongoing) – NIL
- Ph.D.(Completed/ongoing) – NIL
- Projects carried out – NIL
- Patents – NIL
- Technology transfer – NIL
- Research publications – NIL
- No. of books published – NIL

Binayak Satpathy

Signature of the Faculty

Profile of Faculty-

Name- Suvati Sharma

Date of Birth- 05/05/1993

Unique ID- 1-3539629392

Education Qualification- BTech (EEE branch)

Work Experience-

- ✓ Teaching- 4.5 Yrs.
- Research
- Industry
- Others

Area of specialization-

Courses taught at Diploma level- BETC, GTD, SGPD, E&M

Research Guidance(Numbers of Students)

- No. of papers published NIL
- Masters (Completed/ongoing) NIL
- Ph.D.(Completed/ongoing) NIL
- Projects carried out NIL
- Patents NIL
- Technology transfer NIL
- Research publications NIL
- No. of books published NIL

Suvati Sharma
Signature of the Faculty

Profile of Faculty-

Name- Pooja Sahu

Date of Birth- 20/05/1997

Unique ID-

Education Qualification- M.Sc (Physics)

Work Experience-

- Teaching- 1.5 years
- Research
- Industry
- Others

Area of specialization- Special paper (Electronics)

Courses taught at Diploma level- Engineering Physics

Research Guidance(Numbers of Students)

- No. of papers published
- Masters (Completed/ongoing)
- Ph.D.(Completed/ongoing)
- Projects carried out
- Patents
- Technology transfer
- Research publications
- No. of books published

Pooja Sahu

Signature of the Faculty

Profile of Faculty-

Name- Manasi Pradhan

Date of Birth- 09/06/1995

Unique ID- 1-4492661672

Education Qualification- B. Tech (Civil Engineering)

Work Experience- 2.5 years

- Teaching- Yes
- Research
- Industry
- Others

Area of specialization- Civil Engineering

Courses taught at Diploma level- WS & WWE, Irrigation, BMCT, Estimating, CM

Research Guidance(Numbers of Students)

- No. of papers published
- Masters (Completed/ongoing)
- Ph.D.(Completed/ongoing)
- Projects carried out
- Patents
- Technology transfer
- Research publications
- No. of books published

Manasi Pradhan

Signature of the Faculty

Profile of Faculty-

Name- SHEKHAR KUMAR SAHU

Date of Birth- 20 - FEB - 1992

Unique ID- 1-32430464 75

Education Qualification- B. Tech (Mechanical Engineering)

Work Experience-

- Teaching- — 5 years
- Research — Nil
- Industry — 14 months
- Others — Nil

Area of specialization- NO

Courses taught at Diploma level- MED, Thermodynamics, RAC, KDM, Mechanics IE & QC, TOM

Research Guidance(Numbers of Students)

- No. of papers published Nil
- Masters (Completed/ongoing) Nil
- Ph.D.(Completed/ongoing) Nil
- Projects carried out Nil
- Patents Nil
- Technology transfer Nil
- Research publications Nil
- No. of books published Nil

Shekhar kumar Sahu

Signature of the Faculty

Profile of Faculty-

Name- BANANI MOHANTY

Date of Birth- 24.05.1987

Unique ID- 1-3218568927

Education Qualification- M.Tech in COMPUTER SCIENCE

Work Experience-

- Teaching— 11 years
- Research – NIL
- Industry — NIL
- Others — NIL

Area of specialization- COMPUTER SCIENCE

Courses taught at Diploma level- COMPUTER APPLICATION, OBJECT ORIENTED PROGRAMMING USING C++

Research Guidance(Numbers of Students)

- No. of papers published NIL
- Masters (Completed/ongoing) NIL
- Ph.D.(Completed/ongoing)
- Projects carried out NIL
- Patents NIL
- Technology transfer NIL
- Research publications NIL
- No. of books published NIL

Banani Mohanty

Signature of the Faculty

Profile of Faculty-

Name- Sushreeta Behera

Date of Birth- 20/05/90

Unique ID- 1 - 3229192715

Education Qualification- M.Sc Chemistry

Work Experience-

- Teaching- 5 yrs
- Research
- Industry
- Others

Area of specialization- Inorganic Chemistry

Courses taught at Diploma level- Engg. chemistry, Environmental Studies

Research Guidance(Numbers of Students)

- No. of papers published – NA
- Masters (Completed/ongoing) – NA
- Ph.D.(Completed/ongoing) – NA
- Projects carried out – NA
- Patents – NA
- Technology transfer – NA
- Research publications – NA
- No. of books published – NA

Sushreeta Behera

Signature of the Faculty

DEPT.-MATH & SCIENCE
COMPUTER APPLICATION LAB
(1ST & 2ND SEM. COMMON)

SI.NO	LIST OF EQUIPMENTS	LIST OF EXPERIMENTS
1	1.60 NO.S OF COMPUTERS 2.01 NO. OF SERVER 3.ONLINE UPS	1.BASIC COMPUTER OPERATION:Identification of different components of Computer Switch on and Booting Process,Shut down, Restart of computeR
		2.OPERATING SYSTEM: Basic DOS commands (CLS, DIR, DATE, TIME, VERSION, MD, CD, RD, DEL, COPY, REN, USE OFWILD CARDS, PATH) Basic Windows OS operations (DESKTOP, ICONS,, START BUTTON, TASK BAR) MOUSE OPERATIONS- SINGLE CLICK, DOUBLE CLICK, DRAG,MAXIMIZE, MINIMIZE, RESTORE. Windows Explorer, My Computer,Files and Folders, Copy, Cut, Paste Utilities: Word, notepad, paint, calculator etc.
		3. WORKING WITH MS-OFFICE: Basic operations of Word Processing Package. (MS-Word / Apache Open Office Writer) Basic operations of Electronic Spread Sheet Package. (MS-Excel / Apache Open Office Calc) Basic operations of Presentation Package (MS- Power point / Apache Open Office Impress)(Create, Edit, Format, Save, Print/View in the above three packages)
		4.WORKING WITH INTERNET: Getting acquainted with Internet connection, Browser, website URL, webpage, http, WWW, net browsing,Creating E-Mail Id, sending and receiving E-mail Chatting
		5.C PROGRAMMING

DEPT.-MATH & SCIENCE

ENGG.CHEMISTRY LAB

SI.NO	NAME OF THE EXPT.	NAME OF THE APPARATUS
1	PREPARATION & STUDY OF PHYSICAL&CHEMICAL PROPERTIES OF CARBON DIOXIDE GAS	1-WOULF'S BOTTLE 2-THISTLE FUNNEL 3-DELIVERY TUBE 4-RUBBER CORK 5-GAS JAR WITH LID 6-TEST TUBES
2	PREPARATION & STUDY OF PHYSICAL&CHEMICAL PROPERTIES OF AMMONIA GAS	1-HARD GLASS TEST TUBE 2-DELIVERY TUBE 3-RUBBER CORK 4-GAS JAR WITH LID 5-TEST TUBE
3	CRYSTALLIZATION OF COPPER SULPHATE FROM COPPER CARBOANATE	1-BEAKER 2-FUNNEL 3-FILTER PAPER 4-GLASS ROD 5-FILTER STAND 6-PORCELAIN BASIN 7-WIRE GAUGE 8-BURNER 9-WATER BATH
4	SIMPLE ACID-BASE TITRATIONS 1-ACIDIMETRY 2-ALKALI METRY	1-BURETTE 2-PIPETTE 3-CONICAL FLASK 4-BEAKER 5-WASH BOTTLE 6-BURETTE STAND WITH CLAMP 7-FUNNEL 8-DROPPER 9-VOLUMETRIC FLASK 10-WEIGHT BALANCE MACHINE 11-MEASURING CYLINDER
5	TEST FOR KNOWN ACID RADICALS & BASIC RADICALS	1-TEST TUBES 2-TEST TUBE STAND 3-TEST TUBE BRUSH 4-DROPPER 5-BURNER 6-CHARCOAL CAVITY 7-BLOW PIPE 8-TEST TUBE HOLDER

6	TEST FOR UNKNOWN ACID RADICALS & BASIC RADICALS	1-TEST TUBES 2-TEST TUBE STAND 3-TEST TUBE BRUSH 4-DROPPER 5-BURNER 6-CHARCOAL CAVITY 7-BLOW PIPE 8-TEST TUBE HOLDER
7	TEST FOR UNKNOWN SALT	1-TEST TUBES 2-TEST TUBE STAND 3-TEST TUBE BRUSH 4-DROPPER 5-BURNER 6-CHARCOAL CAVITY 7-BLOW PIPE 8-TEST TUBE HOLDER

ELECTRICAL ENGINEERING DEPARTMENT

SL NO.	NAME OF THE LABORATORY	LIST OF EQUIPMENTS	LIST OF EXPERIMENTS
1	ENERGY CONVERSION LAB-I	DC SHUNT MOTOR	
		3-POINT STARTER	
		3-PHASE RECTIFIER	TO STUDY ABOUT 3-POINT STARTER,CONNECTING AND RUNNING OF A DC SHUNT MOTOR
		PANEL BOARD	
		DC COMPUND MOTOR	
		4-POINT STARTER	TO STUDY ABOUT 4-POINT STARTER,CONNECTING AND RUNNING OF A DC COMPOUND MOTOR
		PANEL BOARD	
2	CIRCUIT THEORY LAB	TRAINER KIT FOR	
		LCL,KVL,SUPERPOSITION	VERIFY KCL,LVL.
		THEOREM,NORTON THEOREM,	VERIFY SUPERPOSITION THEREM,NORTON THEOREM,
		MAXIMUM POWER TRANSFER THEOREM	VERIFY MAX. POWER TRANSFER THEOREM
		CHARACTERISTICS OF RLC SERIES CIRCUIT	STUDY CHARACTERISTICS OF RLC SERIES CIRCUIT.
3	ENERGY CONVERSION LAB-II	COMPOUND MOTOR	PARALLEL OPERATION OF TWO ALTERNATORS
		SYNCHRONOUS GENERATOR SET WITH CONTROL PANEL	
		3-PHASE VARIAC	OPEN CIRCUIT AND SHORT CIRCUIT TEST OF ALTERNATOR
4	POWER ELECTRONICS LAB	POWER ELECTRONICS LAB TRAINER	
		TRAINER BOARD FOR SCR,TRIAC,DIAC,GTO,LASCR IGBT	VI CHARACTERSTICS OF SCR,TRIAC,DIAC.
		SINGLE PHASE CYCLOCONVERTOR	STUDY OF MID POINT 1-PHASE CYCLOCONVERTOR WITH RESISTIVE LOAD.
		BATTERY CHARGER	TO CONSTRUCT A BATTERY CHARGER OF 12 V.
5	DIGITAL ELECTRONICS LAB	DIGITAL IC TRAINER KIT	
		BASIC LOGIC GATES	FAMILIARIZATION WITH LOGIC GATES,TRUTH TABLES.
		ANALOG DIGITAL TRAINER CIRCUIT	
		HALF/FULL ADDER & SUBTRACTOR	DESIGN & IMPLEMENT HALF ADDER,FULL ADDER,HALF SUBTRACTOR
		3 XOR LOGIC GATE	DESIGN AND IMPLEMENT BINARY TO GRAY CODE CONVERTER CIRCUIT & VICE VERSA.
		DIGITAL EXPT PANEL	TO DESIGN AND IMPLEMENT 1-BIT COMPARATOR CIRCUIT USING LOGIC GATE.
		MULTIPLEXURE & DEMULTIPLEXURE PANEL	TO DESIGN AND IMPLEMENT 4: 1 MULTIPLEXURE AND 1:4 DEMULTIPLEXURE CIRCUIT.
6	ANALOG ELECTRONICS LAB	DC REGULATED POWER SUPPLY	INPUT &OUTPUT CHARACTERISTICS OF TRANSISTOR
		TRANSISTOR CHARACTERSTICS MODEL	
		FET CHARACTERISTICS MODEL	OUPUT AND TRANSFER CHARACTERISTICS OF FET.
		AMPLIFIER TRAINER KIT	CONSTRUCTION OF BRIDGE RECTIFIER.
		CRO	STUDY OF SINGLE STAGE COMMON EMITTER AMPLIFIER.

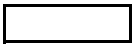
		FREQUENCY GENERATOR	
		FUNCTION GENERATOR	
		HARTLEY OSCILLATOR	CONSTRUCT & CALCULATE THE FREQUENCY OF
		COLPITT'S OSCILLATOR	HARTLEY OSCILLATOR
		WEIN -BRIDGE OSCILLATOR	COLPITT'S OSCILLATOR
		DIODE AND ZENER DIODE	WEIN -BRIDGE OSCILLATOR
		OSCILLOSCOPE	
7	PLC LAB	PLC TRAINER	EXPT ON PLC DENSITY BASED TRAFFIC LIGHT CONTROL.
8	MAT LAB	MATLAB SOFTWARE	EXPT USING MATLAB IE. WRITE A SCRIPT FOR DIFFERENT ARITHMATIC OPERATION

DEPT.-MATH & SCIENCE

COMMUNICATIVE ENGLISH LAB

(1ST & 2ND SEM. COMMON)

SI.NO	NAME OF THE EXPT.	NAME OF THE APPARATUS
1	LISTENING SKILL	1. STUDENT CONSOLE 2. TEACHER CONSOLE 3. WIRED MICROPHONE 4. WIRELESS MICROPHONE 5. LAPTOP 6.SPEAKER 7.PROJECTOR 8. SCREEN
2	SPEAKING SKILL	
3	PERSONALITY DEVELOPMENT	
4	INTER PERSONAL SKILLS	
5	PRESENTING IN GD , SEMINAR & CONFERENCES	



DEPARTMENT: CIVIL ENGINEERING

SL NO	NAME OF THE LABORATORY	NAMES OF THE EQUIPMENTS	NAMES OF THE EXPERIMENTS
1	STRUCTURAL ENGG. LAB	UNIVERSAL TESTING MACHINE(UTM)	Determination of Young's Modulus of a material in a tensile testing machine
		COMPRESSION TESTING MACHINE(CTM)	Determination of Compressive Strength of cement .
		SLUMP CONE	Determination of Workability of concrete
		COMPACTION FACTOR APPARATUS	Determination of Workability of concrete
		OVEN	Determination of water absorption of bricks and aggregates.
		ULTRASONIC PULSE VELOCITY MEASUREMENT APPARATUS(NDT)	Non Destructive test on Concrete.
		LE CHATILIERS APPARATUS	Determination of soundness of Cement by Le-Chatelier apparatus.
		VICAT'S APPARATUS	Determination of initial and final setting time of cement.
		MORTAR CUBE VIBRATOR	Determination of Compressive Strength of cement .
2	GEOTECHNICAL ENGG. LAB	CBR APPARATUS	Determination of CBR value using Laboratory CBR Testing device.
		CONSOLIDATION TEST APPARATUS	Determination of Coefficient of Consolidation of soil with Consolidation apparatus
		TRIAXIAL SHEAR APPARATUS	Determination of C and Φ of Soil sample by Triaxial Test device.
		SIEVE SHAKER	Determination of Particle Size gradation of sand/Gravel by sieve analysis.
		PERMEABILITY APPARATUS	Determination of Coefficient of permeability of course grained soils under constant head method.
		PLATE LOAD TEST APPARATUS	Determination of SBC of soil .
		DCPT APPARATUS	Determination of SBC of soil .
		SWELLING INDEX APPARATUS	Determination of Swelling Index, Swelling factor & Swelling pressure of expansion.
		PLASTIC LIMIT APPARATUS	Determination of Plastic limit of soil.
		SHRINKAGE LIMIT APPARATUS	Determination of Shrinkage limit of soil.
		SPECIFIC GRAVITY APPARATUS	Determination of Specific gravity of Soil by Pycnometer/Density bottle.
		CORE CUTTER	Determination of Field Density of Soil by Core Cutter Method.
3	TRANSPORTATION ENGG. LAB	BITUMEN EXTRACTOR	Determination of Bitumen content by centrifuge extractor.
		DUCTILITY TEST OF BITUMEN	Ductility Test of Bitumen.
		SOFTENING POINT TEST APPARATUS	Softening point Test of Bitumen
		ELONGATION,FLAKINESS INDEX APPARATUS	Determination of Flakiness, Elongation & Angularity No. of Road aggregates
		CRUSHING VALUE OF AGGREGATE	Determination of Crushing Value Test of aggregates
		LOS ANGEL'S APPARATUS	Los-Angles Abrasion Test of aggregate.
		IMPACT TEST APPARATUS	Impact test of aggregate
4	SURVEYING LAB	METRIC ,REVENUE,GUNTER'S,ENGINEER CHAIN,STEEL BAND	Testing and adjusting of a metric chain,Measurement of distance between two points (more than 2 chain lengths apart) with chain including direct ranging.
		TOTAL STATION	Preparation of maps,volume calculations.
		AUTO LEVEL,DUPMY LEVEL	Determination of RLs of any point w.r.t. any datum.

		PRISMATIC,SURVEYOR COMPASS	Measurement of bearings of lines (at least 3 lines) and determination of included angles using Prismatic compass and Surveyor's compas
		CROSS STAFF,OPTICAL SQUARE	Setting perpendicular offsets to various objects (at least 3) from a chain line
		MEASURING TAPE	Setting out different types of triangles, given the lengths of sides with chain and tape.
		CLINOMETER	Measurement of distance between two points by chaining across a sloped ground using stepping method and a clinometer
		PLANE TABLE	Conducting Plane Table surveying in a given plot of area by traversing
		TRANSIT THEODOLITE	Measurement of horizontal angles and verical angles.
		ELECTRONICS THEODOLITE	Measurement of horizontal angles and verical angles.
		RANGING RODS	Measurement of distance between two points (more than 2 chain lengths apart) with chain including direct ranging
		PLANIMETER	Determination of area of land from maps.
5	PUBLIC HEALTH ENGG. LAB	PH METER	Determination of pH of Water sample using pH – meter .

DEPT-MECHANICAL ENGINEERING

SL No	Name of the Laboratory	List of equipments	List of Experiments
1	Strength of Material Laboratory	Universal testing machine	Determine end reaction in s beam
		Torsion testing machine	Determination of torsional rigidity of the shaft using torsion testing machine
		Impact testing machine	Determination of salient point(Ypung's modulus,yield point,fracture point) from stress-strain curve using Universal Testing Machine
		Brinells Hardness testing machine	Determination of hardness number by Rockwell/Vickers hardness testing machine
			Determination of toughness using impact testing machine(Chsrpy/Izod)
2	Thermal Engineering Labrotary	2 stroke petrol engine	Study of 2-S,4-S petrol engine
		4 stroke petrol engine	study of 2-S,4-S dieselengine
		2 stroke diesel engine	Study of boiler (Fire tube,Water tube)
		4 stroke diesel engine	Study of steam engine
		4 stroke computerised diesel engine	calculation of brake thermal efficiency and specific fuel consuption.
		4 stroke computerised petrol engine	
		Models of babcock and wilcox boiler	
		Model of lancashire boiler	
3	Workshop	Capstan turret lathe	Preparation of try suare
		universal grinding machine	Preparation of hammer
		surface grinding machine	Preparation of male -female joint
		Universal Milling machine	Preparation of hexagonal flat bolt
		Radial Drilling machine	Preparation of octagonal flat chisel
		ARC Welding machine	Cutting of slot,botch,mortise and tenon
		TIG welding machine	Plane turning
		Pedestral grinding machine	Step turining
		Horizontal ginding machine	Taper turning
		Shaper machine	Grooving
		Power hack saw	Chamfering
		Hand drill Machine	External threading
			preparation of simple mouls
			preparation of cores
			job involving drilling and boring
			job involving turret lathe
			internal threading
			joint through arc welding
			Joint through gas welding
			joining two non ferrous through TIG welding
			joints involving carpentry.

4	FLUID MECHANICS AND HYDRAULIC MACHINES	Orificemeter apparatus	Study of pressure measuring devices manometers,bourdon tube pressure gauge
		venturimeter apparatus	verification of bernoullis theorem
		pitot static apparatus	determination of Cd from venturimeter
		losses in pipe apparatus	determination od Cc,Cv and Cd from orificemeter
		hydraulic ram apparatus	determination of darcys coefficient from flow through pipes
		Metacentric height apparatus	performane testing impulse turbine
		Impact of jet apparartus	performance testing reaction turbine
		Bernoullis theorem apparatus	performance testing centrifugal pump
		Notch appparatus	performance testing reciprocating pump
		Orifice and mouthpiece apparatus	
		Pelton wheel turbine	
		Francis turbine	
		Reciprocating pump	
		Centrifugal pump	
5	HEAT POWER LAB	2 stroke petrol engine	calculation of brake thermal efficiency and specific fuel consuption of disel engine
		4 stroke petrol engine	calculation of brake thermal efficiency and specific fuel consuption of petrol engine
		2 stroke diesel engine	Determine the BHP,HO,IHP,BSFC of a multi cylinder engine
		4 stroke diesel engine	Determine the mechanical efficiency of an air compressor
		4 stroke computerised diesel engine	Study the constrution features of domestic refrigerator
		4 stroke computerised petrol engine	study of construction features of Window AC
		air compressor	Study of construction features of split AC
		experimental split AC trainer	Determine the COP of a refrigerator
		Experimantal window AC trainer	
		water cooling tower	
		Ice plant trainer	
		Mechanical heat pump	
		AC fault simulator	
		Oil hydraulic trainer	
		Pneumatic Trainer	
5	THEORY OF MACHINE & MEASUREMENTV LAB	Governor	Determination of centrifugal force of a governor
		Static balancing machine	Study and determination of static balancing apparatus
		Epicyclic gear train	study and demonstraion of epicyclic gear train
		Vernier calliper	Determination of the thickness of ground MS flat to an accuracy of 0.02 mm using vernier calliper
		Slip gauge	Determination of diameter of a cylindrical componrnt to an accuracy of 0.01 using micrometer
		Micrometer	Determine the thickness of grounf MS PLATE using slip gauge.

		corriolis component	
6	AUTOMOBILE ENGINEERING LAB		Study of differential mechanism of an automobile
			study of braking systems(Hydraulic and air brake)
			Study of Multiple clutch
			study of automobile chassis
			study of gear trains
			study of electrical system of automobile
7	CAD/CAM Lab		study of air compressor.
			2D Drafting:
			Dimentioning and command essential for creating 2D drawing
			create rectangle circle and polygon
			3D Drafting:
			create various drawing view of 3D parts

SL NO.	NAME OF THE LABORATORY	LIST OF EQUIPMENTS	LIST OF EXPERIMENTS
1	PHYSICS	1. VERNIER CALIPERS 2. HOLLOW CYLINDERICAL BOD	MEASUREMENT OF VOLUME OF A SOLID/HOLLOW CYLINDER BY VERNIER CALIPERS.
2	PHYSICS	1. SCREW GAUGE 2. WIRE	MEASUREMENT OF CROSS - SECTIONAL AREA OF A WIRE BY SCREW GAUGE.
3	PHYSICS	1. SPHEROMETER 2. CONVEX SURFACE 3. BIG SIZE PLANE GLASS	MEASUREMENT OF RTADIOUS OF CURVATURE OF A SPHERICAL SURFACE BY A SPHEROMETER.
4	PHYSICS	1. WOODEN BLOCK 2. HORIZONTAL PLANE FITTED WITH A FRICTION LESS PULLEY AT ONE END. 3. WEIGHT BOX 4. SPRING BALANCE 5. THREAD	DETERMINATION OF CO - EFFICIENT OF FRICTION BY INCLINED PLANE METHODE.
5	PHYSICS	1. DRAWING BOARD 2. SHEETS OF PAPER 3. PRISM 4. DRAWING PINS 5. GRAPH PAPER 6. COMPASS BOX	DETERMINE THE REFRACTIVE INDEX OF A PRISM BY DRAWING I - D CURVE.
6	PHYSICS	1. MAGNETS 2. NAILS 3. COMPASSES 4. SHEETS OF PAPER	TRACING OF LINE OF FORCE DUE TO A BAR MAGNET WITH N - POLE POINTING NORTH & N- POLE POINTING SOUTH AND LOCATE THE NEUTRAL POINT.
7	PHYSICS	1. PHYSICAL BALANCE 2. WEIGHT BOX WITH FRACTIONAL WEIGHT 3. TWO OBJECTS WHOSES MASSES ARE TO BE DETERMINE	DETERMINATION OF SPECIFIC GRAVITY OF INSOLUBLE SOLID HEAVIER THEN WATER BY PHYSICAL BALANCE BY EQUAL OSCILLATION METHODE.
8	PHYSICS	1. RETORT STAND 2. PENDULUM BUB 3. THREAD 4. METRE RULE 5. STOP WATCH	DETERMINATION OF "g" BY SIMPLE PENDULUM.

9	PHYSICS	1. RESISTORS 2. MULTIMETERS 3. DC POWER SUPPLY	VERIFICATION THE LAW OF RESISTANCE BY CONNECTING TWO STANDARD RESISTANCES IN SERIES & IN PARALLEL USING OHM'S LAW.

10	PHYSICS	1. METER BRIDGE 2. GALVANOMETER 3. RESISTORS 4. CONNECTING WIRE	MEASUREMENT OF SPECIFIC RESISTANCE OF WIRE BY A METER BRIDGE.

11	PHYSICS	1. AN OPTICAL BENCH WITH THREE UPRIGHTS 2. CONVEX LENS WITH LENS HOLDER 3. TWO OPTICAL NEEDLES 4. KNITTING NEEDLE 5. METRE SCALE	DETERMINATION OF FOCAL LENGTH OF CONVEX LENS BY U - V METHODE.

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA

ରାଜ୍ୟ ବୈଷୟିକ ଶିକ୍ଷା ଓ
ପ୍ରଶିକ୍ଷଣ ପରିଷଦ, ଓଡ଼ିଶା

No. 464 Date. 01.03.2021
SCTE(D)-95/2010

To

The Principals of all Polytechnics & PDIS Institutions

Sub: 4th Revised Academic Calendar for 2020-21

Sir,

Consequent upon decision of Govt. on opening of Institutions for students of all semesters to attend physical classes w.e.f. 17/2/2021, I am to enclose herewith the 4th revised Academic Calendar for 2020-21 session with due approval from DTE&T, Odisha vide letter No. 2682 dt.01.03.2021 of Dy. Director(TT) for further action at your end. In view of Covid19 pandemic, the revised Academic Calendar is subject to last minute change upon instructions from AICTE/Govt.

Yours faithfully

1/3/21

Controller of Examinations

Encl: as above

Memo No. 465 Date 01.03.21

Copy to DTE&T, Odisha, Cuttack for kind information .

1/3/21

Controller of Examinations

Memo No. 466 Date 01.03.2021

Copy to Additional Secretary, SD&TE Department, Govt. of Odisha for kind information.

1/3/21

Controller of Examinations

4th Revised ACADEMIC CALENDAR of Diploma and PDIS courses for the Session 2020-21

Sl.No.	Activity	1st Semester	3rd /5th /7th (PT) Semester
1*	Induction Programme for 1st semester Diploma Courses & Coverage of Bridge Course	2.11.2020 to 7.11.2020	-
2*	Commencement of Semester Classes	9.11.2020	1.9.2020
3*	Readmission at Institute Level	-	1.9.2020 to 15.9.2020
4*	Reporting Readmission Data to SCTEVT online	-	15.9.2020 to 22.9.2020
5*	Puja Holidays	22.10.2020 to 31.10.2020	22.10.2020 to 31.10.2020
6	Issue of SCTE&VT Registration Numbers	26.2.2021	15.2.2021(3rd sem LE students)
7	Semester Exams Registration(Regular students)	1st week of March 2021	2nd week of Feb. 2021
8	Internal Assesment for 1st , 3rd & 5thSem (Last date)	2nd week of March. 2021	1st week of March. 2021
9	Closing of Attendance	31.3.2021	19.3.2021
*10	X'Mas Holidays	-	-
11	Tentative Date of Semester Examination	5.4.2021	22.3.2021
Sl.No.	**Activity**	**2nd Semester**	**4th/6th/8th(PT) Semester**
12	Commencement of Classes	19.4.2021	5.4.2021
13	Readmission	19.4.2021 to 1.5.2021	5.4.21 to 17.4.2021
14	Reporting Readmission Data to SCTEVT online	1.5.21 to 7.5.2021	19.4.21 to 26.4.2021
15	Semester Exams Registration(Regular students)	2nd week of May 2021	5th week of April 2021
16	Internal Assesment for 2nd/4th /6th Sem.	4th week of June 2021	1st week of June 2021
17	Closing of Attendance	10.7.2021	30.6.2021
18	Branch Change of 2nd sem. Students by Principals	Up to 31.3.2021	-
19	Reporting Branch Change case to SCTE&VT online	2.4.2021 to 8.4.2021	-
20	Tentative Date of Semester Examination	19.7.2021	5.7.2021
21	Tentative Date of Publication of Results	30.10.2021	31.8.2021
22	Internship and Summer Break for Students	-	-
23	Tentative date for starting of next Session		22/7/2021

1. There shall be 39 periods of class per week and each of minimum 55 minutes duration for all semesters.
2. Principals are required to arrange extra classes during Holidays and Off hours, wherever necessary, to complete the coverage of syllabus in time.
3. Annual Athletic Meet, Annual Cultural Meet may not be conducted due to Covid restriction
4. The Internship Policy of AICTE is to be scrupulously followed and to be arranged at Institution level. Induction Programme for 1st semester students is to be implemented as per AICTE Guidelines subject to covid restriction.
5. Activities of Academic Calendar are subject to last minute change due to Covid19 Pandemic restrictions of Govt and/or instructions from AICTE.
6. Online mode of Classes may be adopted during the period for which Physical mode of classes are restricted by Govt. due to Covid19 Pandemic.
7. * indicated activities are already over as per the schedule mentioned against such activities

STATE COUNCIL FOR TECHNICAL
EDUCATION & VOCATIONAL
TRAINING, ODISHA

ରାଜ୍ୟ ବୈଷୟିକ ଶିକ୍ଷା ଓ
ପ୍ରଶିକ୍ଷଣ ପରିଷଦ, ଓଡ଼ିଶା

No. 3939 Date 6/9/18

To
Principals of All Polytechnics

Sub: Final Revised syllabus of 1st & 2nd semester w.e.f 2018-19 session

Sir,

In continuation to this office letter No. 3684 dt. 16.8.2018, I am to say that , after discussion in the Polytechnic Principals' meeting held on 25/8/2018, and subsequent deliberations in the council, the final revised Syllabus for 1st & 2nd semester Diploma Engineering courses effective from 2018-19 session is hereby circulated with the following changes in the norms and contents. This syllabus shall be applicable for all diploma courses approved by AICTE, New Delhi under Engineering and Technology Programme and affiliated to this council w.e.f. 2018-19.

1. The conditions on selection of subjects specified in the above letter is hereby relaxed. Individual institution can select the subjects, where alternatives are available depending on the students strength and varieties of branches available with them, subject to condition that all students of a particular branch shall be offered only one of the alternative subjects and no part of students in a branch can be offered different alternative subject. The Institutions are to upload the subjects offered for different branches in SCTE&VT web portal to be notified in due course of time, so that the same can be followed from coming 1st semester onwards.
2. Engg. Mechanics and Basic Electrical Engg. & Electronics Engg. shall be offered as alternate to each other in both 1st & 2nd semester to be selected by the institute.
3. Subject contents of Communicative English, Basic Electrical & Electronics Engineering have been partially modified.
4. The Total Marks in a semester have been made as 750

Lateral Entry students admitted during 2018-19 shall appear the subjects of 1st and 2nd semester like previous year.

The students should be encouraged to undergo Internship Training during Summer Vacation to enhance their Skill and Employability.

Yours faithfully

Encl: As above

Controller of Examination 6/9/18

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 1st Semester (COMMON TO ALL ENGINEERING COURSES)(wef 2018-19)

Subject Code	Subject	Periods/week			Evaluation Scheme			
		L	T	P	Mid Sem Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
	Theory							
Th.1a Th.1b	Communicative English ***OR*** Computer Application	4	-	-	20	80	3	100
Th.2a Th.2b	Engineering Physics **OR** Enggineering Chemistry	4	-	-	20	80	3	100
Th.3	Engineering Mathematics-I	5	1	-	20	80	3	100
Th.4 Th.4a&b	Engg. Mechanics **OR** Basic Electrical & Electronics Engg.	4			20	80	3	100
	Total	17	-		80	320	-	400
	Practical							
Pr.1a Pr.1b	Comm. English Lab **OR** Computer application Lab	-	-	4	50	-	-	50
Pr.2a Pr.2b	Engg. Physics Lab **OR** Engg. Chemistry Lab	-	-	4	50	50	3	100
Pr.3a Pr.3b	Engineering Drawing **OR** Workshop Practice	-	-	6	50	100	3 4	150
Pr.4	Seminar			4	50			50
	Student Centred Activities(SCA)		-	3	-	-	-	-
	Total	-	-	*21*	*200*	*150*	-	*350*
	Grand Total	**17**	**1**	**21**	**280**	**470**	**-**	**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 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

In Th.4a&b Basic Electrical & Electronics Engg. paper there shall be examination in separate Answer books for Th.4a Basic Electrical Engg. and Th.4b Basic Elecronics Engg. in the same sitting

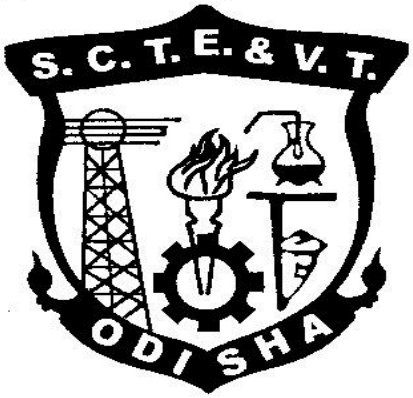
STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA								
TEACHING AND EVALUATION SCHEME FOR 2nd Semester (COMMON TO ALL ENGINEERING COURSES)(wef 2018-19)								
Subject Code	Subject	Periods/week			Evaluation Scheme			
		L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
	Theory							
Th.1a Th.1b	Communicative English ***OR*** Computer Application	4	-	-	20	80	3	100
Th.2a Th.2b	Engineering Physics **OR** Enggineering Chemistry	4	-	-	20	80	3	100
Th.3	Engineering Mathematics-II	5	1	-	20	80	3	100
Th.4 Th.4a&b	Engg. Mechanics **OR** Basic Electrical & Electronics Engg.	4			20	80	3	100
	Total	*17*	*1*		*80*	*320*	-	*400*
	Practical							
Pr.1a Pr.1b	Comm. English Lab **OR** Computer application Lab	-	-	4	50	-	-	50
Pr.2a Pr.2b	Engg. Physics Lab **OR** Engg. Chemistry Lab	-	-	4	50	50	3	100
Pr.3a Pr.3b	Engineering Drawing **OR** Workshop Practice	-	-	6	50	100	3 4	150
Pr.4	Seminar			4	50			50
	Student Centred Activities(SCA)		-	3	-	-	-	-
	Total	-	-	*21*	*200*	*150*	-	*350*
	Grand Total	**17**	**1**	**21**	**280**	**470**	**-**	**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 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								
In Th.4a&b Basic Electrical & Electronics Engg. paper there shall be examination in separate Answer books for Th.4a Basic Electrical Engg. and Th.4b Basic Elecronics Engg. in the same sitting								

CURRICULLUM OF 1ST & 2ND SEMESTER

For

DIPLOMA IN ENGINEERING

(Effective FROM 2018-19 Session)



STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

Th.1a. COMMUNICATIVE ENGLISH
(1st & 2nd sem Common)

Theory: 4 Periods per Week — I.A : 20 Marks
Total Periods: 60 Periods — Term End Exam : 80 Marks
Examination: 3 Hours — TOTAL MARKS : 100 Marks

Topic- wise distribution of periods with marks

S.L. No.	Topics	Periods
I	Literature Appreciation	20
II	Vocabulary	05
III	Application of Grammar	08
IV	Formal writing skills	15
V	Elements of communication	12
	• Introduction to communication	
	• Professional communication	
	• Nonverbal communication	
	Total	60

OBJECTIVE
To comprehend the given passage
To answer correctly the questions on seen and unseen passages
To increase the vocabulary
To apply rules of grammar for flawless writing
To understand and use the basic concepts of communication in an organized set up and social context
To give a positive feedback in various situation, to use appropriate body language and to avoid barrier for effective communication
To improve writing skill

Unit-I
LITERATURE APPRECIATION
1. Reading comprehension

Sub-skills of reading comprehension are to be worked out and tested through an unseen passage in about 200-500 words.
A student should get acquainted with sub-skills of reading for the purpose of:

- Skimming the gist
- Scanning for necessary information
- Close reading for inference and evaluation
- Main idea and supporting points
- Guessing the meaning of un-familiar words
- Note- making
- Summarizing
- Supplying a suitable title

2. Text
The following chapter from **"Invitation to English", Book-1** for +2 students of CHSE, Odisha.**2016 reprint** to be covered in class room:

- **Standing Up For Yourself** By Yevgeny Yevtushenko

- **The Magic Of Teamwork** By Sam Pitroda
- **Inchcape Rock** By Robert Southey
- **To My True Friend** By Elizabeth Pinard

The student is to answer comprehension questions from these chapters in the end examination.

UNIT- II

VOCABULARY

Use of synonyms, antonyms

- Same word used in different situations in different meaning
- Single word substitute

Unit-III

APPLICATION OF ENGLISH GRAMMAR

- Countable an Uncountable Noun
- Articles and Determiners
- Modal Verbs
- Tenses
- Voice-change
- Subject-verb Agreement

UNIT-IV

FORMAL WRITING SKILLS

1. Paragraph writing
   - Meaning
   - Features of Paragraph Writing (Topic Statement, Supporting Points and Plot Compatibility)
   - Developing Ideas into Paragraphs **(** Describing Place/ Person/ Object /Situation and any general topic of interest)
2. Notice
3. Agenda
4. Report writing (Format of a Report, Reporting an event / news)
5. Writing personal letter
6. Letter to the Principal, Librarian, Head of the Deptt, and Hostel Superintendent
7. Writing Business letters
   - Layout of a Business Letter
   - Letter of Enquiry, Placing an Order, Execution of an Order, Complaint, Cancellation of an order(Features, Format and example)
8. Job application and C.V.(Features, Format and example)

UNIT-V

ELEMENTS OF COMMUNICATION

A. Introduction to Communication

1. Meaning, Definition and concept of communication
2. Good Communication and Bad Communication
3. Communication model
   - One-way Communication Model and Two-way Communication Model with examples
4. Process of communication and factors responsible for it
   - Sender, Message, Channel, Receiver / Audience, Feedback, Noise, Context

B. Professional Communication

1. Meaning of professional communication
2. Types of professional communication

   2.1. Formal or Systematic Communication
   - Upward communication (How it takes place, symbol, merits and demerits)
   - Down-ward communication (How it takes place, symbol, merits and demerits)

- Parallel communication (How it takes place, symbol, merits and demerits)

2.2. Informal communication

- Grape vine communication (How it takes place, symbol, merits and demerits)

D. Non- Verbal Communication

1. Meaning of nonverbal Communication
2. Different areas of Non-verbal Communication
    - Kinesics or Body Language (Postures and Gestures, Facial Expression and Eye Contact)
    - Proxemics or Spatial Language (Private Space, Personal Space, Social Space, Public Space)
    - Language of Signs and Symbols(Audio Sign and Visual Sign in everyday life with merits and demerits)

Syllabus Coverage up to I.A

1. Reading Comprehension
2. Standing Up by Yourself
3. Use of Synonyms and Antonyms
4. Notice
5. Agenda

Books Recommended:

Invitation to English, Book-1, (for +2 students), CSHE (2016 reprint), Odisha
Invitation to English, Book-2, (for +2 students), CSHE (2016 reprint), Odisha
Invitation to English, Book-3, (for +2 students), CSHE (2016 reprint), Odisha
Invitation to English, Book-4, (for +2 students), CSHE (2016 reprint), Odisha
Wren and Martin High School English Grammar, Dr. NDV Prasad Rao, S. Chand Publication
Communication Skills, Sanjay Kumar and Puspalata, Oxford University Press

Th.1b. COMPUTER APPLICATION
(1st / 2nd sem Common)

Theory: 4 Periods per Week — I.A : 20 Marks
Total Periods: 60 Periods — End Sem Exam : 80 Marks
Examination: 3 Hours — TOTAL MARKS : 100 Marks

Objective:
The students will get to know about the fundamentals of computer. They will get acquainted with various components of computer hardware, software etc. Idea on Role of operating system and its usability will also be known. Knowledge on word processing, electronic spreadsheet, presentation software and Internet will also be acquired. The students will be given brief knowledge about Programming methodology and C programming.

Topic wise distribution of periods

Sl. No.	Topics	Periods
1	Computer Organisation	05
2	Computer Software	07
3	Computer Network and Internet	08
4	File Management and Data Processing	05
5	Problem Solving Methodology	05
6	Overview of C Programming language	15
7	Advanced features of C	15
	TOTAL	**60**

1. COMPUTER ORGANISATION

Introduction to Computer Evolution of Computers Generation of Computers Classification of Computers
Basic Organisation of Computer (Functional Block diagram) Input Devices, CPU & Output Devices.
Computer Memory and Classification of Memory

2. COMPUTER SOFTWARE

Software concept, System software, Application software
Overview of Operating System Objectives and Functions of O.S ,
Types of Operating System: Batch Processing, Multiprogramming, Time Sharing OS
Features of DOS, Windows and UNIX
Programming Languages Compiler, interpreter Computer Virus
Different Types of computer virus
Detection and prevention of Virus
Application of computers in different Domain

3. COMPUTER NETWORK AND INTERNET

Networking concept, Protocol, Connecting Media, Date Transmission mode
Network Topologies, Types of Network
Networking Devices like Hub, Repeater, Switch, Bridge, Router, Gateway & NIC
Internet Services like E-Mail, WWW, FTP, Chatting, Internet Conferencing, Electronic Newspaper & Online Shopping
Different types of Internet connectivity and ISP

4. FILE MANAGEMENT AND DATA PROCESSING

Concept of File and Folder
File Access and Storage methods. Sequential, Direct, ISAM
Data Capture, Data storage
Data Processing and Retrieval

5. PROBLEM SOLVING METHODOLOGY

Algorithm, Pseudo code and Flowchart Generation of Programming Languages
Structured Programming Language
Examples of Problem solving through Flowchart

6. OVERVIEW OF C PROGRAMMING LANGUAGE

Constants, Variables and Data types in C Managing Input and Output operations.
Operators, Expressions, Type conversion & Typecasting
Decision Control and Looping Statements (If, If-else, If-else-if, Switch, While, Do-while, For, Break, Continue & Goto)
Programming Assignments using the above features.

7. ADVANCED FEATURES OF C

Functions and Passing Parameters to the Function (Call by Value and Call by Reference) Scope of Variables and Storage Classes
Recursion Function and Types of Recursion
One Dimensional Array and Multidimensional Array
String Operations and Pointers
Pointer Expression and Pointer Arithmetic Programming Assignments using the above features. Structure and Union (Only concepts, No Programming)

Syllabus coverage upto I.A

Chapter- 1,2 3,4

Books Recommended

1. Computer Fundamentals and Programming in C by Reema Thareja, Oxford Unversity Press
2. Programming in ANSI C by A.N Kamthane, Pearson Education
3. Computer Application by Kalyani Publisher
4. Let us C by Y. Kanetkar, BPB
5. Computer Fundamentals, by E. Balaguruswamy, TMH

Th.2a. Engineering Physics
(1st / 2nd sem Common)

Theory: 4 Periods per Week — I.A: 20 Marks
Total Periods: 60 Periods — End Sem Exam : 80 Marks
Examination: 3 Hours — TOTAL MARKS : 100 Marks

Unit	Topic	No. of periods
1	UNITS & DIMENSIONS	03
2	SCALARS & VECTORS	03
3	KINEMATICS	06
4	WORK & FRICTION	05
5	GRAVITATION	05
6	OSCILLATIONS & WAVES	06
7	HEAT & THERMODYNAMICS	07
8	OPTICS	04
9	ELECTROSTATICS & MAGNETOSTATICS	07
10	CURRENT ELECTRICITY	06
11	ELECTROMAGNETISM & ELECTROMAGNETIC INDUCTION	05
12	MODERN PHYSICS	03
	TOTAL :	60 Periods

UNIT 1 - UNITS AND DIMENSIONS

1.1 Physical quantities - (Definition).
1.2 Definition of fundamental and derived units, systems of units (FPS, CGS, MKS and SI units).
1.3 Definition of dimension and Dimensional formulae of physical quantities.
1.4 Dimensional equations and Principle of homogeneity.
1.5 Checking the dimensional correctness of Physical relations.

UNIT 2 - SCALARS AND VECTORS

2.1 Scalar and Vector quantities (definition and concept), Representation of a Vector – examples, types of vectors.
2.2 Triangle and Parallelogram law of vector Addition (Statement only). Simple Numerical.
2.3 Resolution of Vectors – Simple Numericals on Horizontal and Vertical components.
2.4 Vector multiplication (scalar product and vector product of vectors).

UNIT 3 - KINEMATICS

3.1 Concept of Rest and Motion.
3.2 Displacement, Speed, Velocity, Acceleration & FORCE (Definition, formula, dimension & SI units).
3.3 Equations of Motion under Gravity (upward and downward motion) - no derivation.
3.4 Circular motion: Angular displacement, Angular velocity and Angular acceleration (definition, formula & SI units).
3.5 Relation between –(i) Linear & Angular velocity, (ii) Linear & Angular acceleration).
3.6 Define Projectile, Examples of Projectile.
3.7 Expression for Equation of Trajectory, Time of Flight, Maximum Height and Horizontal Range for a projectile fired at an angle, Condition for maximum Horizontal Range.

UNIT 4 – WORK AND FRICTION

4.1 Work – Definition, Formula & SI units.
4.2 Friction – Definition & Concept.
4.3 Types of friction (static, dynamic), Limiting Friction (Definition with Concept).
4.4 Laws of Limiting Friction (Only statement, No Experimental Verification).
4.5 Coefficient of Friction – Definition & Formula, Simple Numericals.
4.6 Methods to reduce friction.

UNIT 5 - GRAVITATION

5.1 Newton's Laws of Gravitation – Statement and Explanation.
5.2 Universal Gravitational Constant (G)- Definition, Unit and Dimension.
5.3 Acceleration due to gravity (g)- Definition and Concept.

5.4 Definition of mass and weight.
5.5 Relation between g and G.
5.6 Variation of g with altitude and depth (No derivation – Only Explanation).
5.7 Kepler's Laws of Planetary Motion (Statement only).

UNIT 6 - OSCILLATIONS AND WAVES

6.1 Simple Harmonic Motion (SHM) - Definition & Examples.
6.2 Expression (Formula/Equation) for displacement, velocity, acceleration of a body/ particle in SHM.
6.3. Wave motion – Definition & Concept.
6.4 Transverse and Longitudinal wave motion – Definition, Examples & Comparison.
6.5 Definition of different wave parameters (Amplitude, Wavelength, Frequency, Time Period.
6.6 Derivation of Relation between Velocity, Frequency and Wavelength of a wave
6.7 Ultrasonics – Definition, Properties & Applications.

UNIT 7 - HEAT AND THERMODYNAMICS

7.1 Heat and Temperature – Definition & Difference
7.2 Units of Heat (FPS, CGS, MKS & SI).
7.3 Specific Heat (concept, definition, unit, dimension and simple numerical)
7.4 Change of state (concept), Latent Heat (concept, definition, unit, dimension and simple numerical)
7.5 Thermal Expansion – Definition & Concept
7.6 Expansion of Solids (Concept)
7.7 Coefficient of linear, superficial and cubical expansions of Solids – Definition & Units.
7.8 Relation between α, β & γ
7.9 Work and Heat - Concept & Relation.
7.10 Joule's Mechanical Equivalent of Heat (Definition, Unit)
7.11 First Law of Thermodynamics (Statement and concept only)

UNIT 8 – OPTICS

8.1 Reflection & Refraction – Definition.
8.2 Laws of reflection and refraction (Statement only)
8.3 Refractive index – Definition, Formula &Simple numerical.
8.4 Critical Angle and Total internal reflection – Concept, Definition & Explanation
8.5 Refraction through Prism (Ray Diagram & Formula only – NO derivation)..
8.6 Fiber Optics – Definition, Properties & Applications.

UNIT 9 – ELECTROSTATICS & MAGNETOSTATICS

9.1 Electrostatics – Definition & Concept.
9.2 Statement & Explanation of Coulombs laws, Definition of Unit charge.
9.3 Absolute & Relative Permittivity (ε) – Definition, Relation & Unit.

9.4 Electric potential and Electric Potential difference (Definition, Formula & SI Units).
9.5 Electric field, Electric field intensity (E) – Definition, Formula & Unit.
9.6 Capacitance - Definition, Formula & Unit.
9.7 Series and Parallel combination of Capacitors (No derivation, Formula for effective/Combined/total capacitance & Simple numericals).
9.8 Magnet, Properties of a magnet.
9.9 Coulomb's Laws in Magnetism – Statement & Explanation, Unit Pole (Definition).
9.10 Magnetic field, Magnetic Field intensity (H) - (Definition, Formula & SI Unit).
9.11 Magnetic lines of force (Definition and Properties)
9.12 Magnetic Flux (**Φ**) & Magnetic Flux Density (B) – Definition, Formula & Unit.

UNIT 10 – CURRENT ELECTRICITY

10.1 Electric Current – Definition, Formula & SI Units.
10.2 Ohm's law and its applications.
10.3 Series and Parallel combination of resistors (No derivation, Formula for effective/ Combined/ total resistance & Simple numericals).
10.4 Kirchhoff's laws (Statement & Explanation with diagram).
10.5 Application of Kirchhoff's laws to Wheatstone bridge - Balanced condition of Wheatstone's Bridge – Condition of Balance (Equation).

UNIT 11 – ELECTROMAGNETISM & ELECTROMAGNETIC INDUCTION

11.1 Electromagnetism – Definition & Concept.
11.2 Force acting on a current carrying conductor placed in a uniform magnetic field, Fleming's Left Hand Rule
11.3 Faraday's Laws of Electromagnetic Induction (Statement only)
11.4 Lenz's Law (Statement)
11.5 Fleming's Right Hand Rule
11.6 Comparison between Fleming's Right Hand Rule and Fleming's Left Hand Rule.

UNIT 12 - MODERN PHYSICS

12.1 LASER & laser beam (Concept and Definition)
12.2 Principle of LASER (Population Inversion & Optical Pumping)
12.3 Properties & Applications of LASER
12.4 Wireless Transmission – Ground Waves, Sky Waves, Space Waves (Concept & Definition)

RECOMMENDED BOOKS

1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
2. Text Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T
3. Text Book of Engineering Physics by Barik, Das, Sharma, Kalyani Publisher
4. Concepts in Physics by H. C. Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi

Syllabus coverage upto I.A

Units 1,2,3,4,5,6

Th.2b. Engineering Chemistry
(1st / 2nd sem Common)

Theory: 4 Periods per Week — I.A : 20 Marks
Total Periods: 60 Periods — Term End Exam : 80 Marks
Examination: 3 Hours — TOTAL MARKS : 100 Marks

Objective:
Engineering Chemistry is concerned with the changes of matters with its environment and an ever growing subject. So, the aim of teaching Engineering Chemistry in Diploma Courses is to acquaint the students with the basic Chemistry of different materials used in industry and to equip the students with the basic principles of chemical changes taking place in different aspects connected to engineering fields. They also develop the right attitude to cope up with the continuous flow of new technology.

Topic wise distribution of periods

Sl. No	Topics/ Units	Periods
A	Physical Chemistry	22
B	Inorganic Chemistry	08
C	Organic Chemistry	10
D	Industrial Chemistry	20
	TOTAL	**60**

A. PHYSICAL CHEMISTRY

Chapter 1: Atomic structure : Fundamental particles (electron, proton & neutron Definition, mass and charge).Rutherford's Atomic model (postulates and failure), Atomic mass and mass number, Definition, examples and properties of Isotopes, isobars and isotones. Bohr's Atomic model (Postulates only), Bohr-Bury scheme, Aufbau's principle, Hund's rule, Electronic configuration (up to atomic no 30).
Chapter 2 : Chemical Bonding : Definition , types (Electrovalent, Covalent and Coordinate bond with examples (formation of NaCl, $MgCl_2$, H_2,Cl_2, O_2, N_2, H_2O, CH_4, NH_3, NH_4^+, SO_2).
Chapter 3 : Acid base theory : Concept of Arrhenius, Lowry Bronsted and Lewis theory for acid and base with examples (Postulates and limitations only). Neutralization of acid & base. Definition of Salt, Types of salts (Normal, acidic, basic, double, complex and mixed salts, definitions with 2 examples from each).

Chapter 4: Solutions : Definitions of atomic weight, molecular weight, Equivalent weight. Determination of equivalent weight of Acid, Base and Salt.
Modes of expression of the concentrations (Molarity , Normality & Molality) with Simple Problems. pH of solution (definition with simple numericals)
Importance of pH in industry (sugar, textile, paper industries only)
Chapter 5 : Electrochemistry : Definition and types (Strong & weak) of Electrolytes with example. Electrolysis (Principle & process) with example of NaCl (fused and aqueous solution).
Faraday's 1st and 2nd law of Electrolysis (Statement, mathematical expression and Simple numerical) Industrial application of Electrolysis- Electroplating (Zinc only).

Chapter 6 : Corrosion: Definition of Corrosion, Types of Corrosion- Atmospheric Corrosion, Waterline corrosion. Mechanism of rusting of Iron only. Protection from Corrosion by (i) Alloying and (ii) Galvanization.

B. INORGANIC CHEMISTRY

Chapter 7 : Metallurgy: Definition of Mineral, ores , gangue with example. Distinction between Ores And Minerals. General methods of extraction of metals,

i) Ore Dressing
ii) Concentration (Gravity separation, magnetic separation, Froth floatation & leaching)
iii) Oxidation (Calcinations, Roasting)
iv) Reduction (Smelting, Definition & examples of flux, slag)
v) Refining of the metal (Electro refining, & Distillation only)

Chapter 8 : Alloys: Definition of alloy. Types of alloys (Ferro, Non Ferro & Amalgam) with example. Composition and uses of Brass, Bronze, Alnico, Duralumin

C. ORGANIC CHEMISTRY

Chapter 9 : Hydrocarbons : Saturated and Unsaturated Hydrocarbons (Definition with example)
Aliphatic and Aromatic Hydrocarbons (Huckle's rule only). Difference between Aliphatic and aromatic hydrocarbons
IUPAC system of nomenclature of Alkane, Alkene, Alkyne, alkyl halide and alcohol (up to 6 carbons) with bond line notation.
Uses of some common aromatic compounds (Benzene, Toluene, BHC, Phenol, Naphthalene, Anthracene and Benzoic acid) in daily life.

D. INDUSTRIAL CHEMISTRY

Chapter 10 : **Water Treatment** : Sources of water, Soft water, Hard water, hardness, types of Hardness (temporary or carbonate and permanent or non-carbonate), Removal of hardness by lime soda method (hot lime & cold lime—Principle, process & advantages) , Advantages of Hot lime over cold lime process.
Organic Ion exchange method (principle, process, and regeneration of exhausted resins)
Chapter 11 : Lubricants: Definition of lubricant, Types (solid, liquid and semisolid with examples only) and specific uses of lubricants (Graphite, Oils, Grease), Purpose of lubrication
Chapter 12 : Fuel: Definition and classification of fuel, Definition of calorific value of fuel, Choice of good fuel.
Liquid: Diesel, Petrol, and Kerosene --- Composition and uses.
Gaseous: Producer gas and Water gas (Composition and uses). Elementary idea about LPG, CNG and coal gas (Composition and uses only).

Chapter 13 : Polymer: Definition of Monomer, Polymer, Homo-polymer, Co-polymer and Degree of polymerization. Difference between Thermosetting and Thermoplastic, Composition and uses of Polythene, & Poly-Vinyl Chloride and Bakelite.
Definition of Elastomer (Rubber). Natural Rubber (it's draw backs). Vulcanisation of Rubber. Advantages of Vulcanised rubber over raw rubber.

Chapter 14: Chemicals in Agriculture: Pesticides: Insecticides, herbicides, fungicides- Examples and uses.
Bio Fertilizers: Definition, examples and uses.

Syllabus Coverage upto I.A

Chapter 1,2,3,4,5,6

Books Recommended

1. Text Book of Intermediate Chemistry Part-1 and Part-2 by Nanda, Das, Sharma, Kalyani Publishers
2. Engg. Chemistry by B.K. Sharma, Krishna Prakashan Media Pvt. Ltd
3. Engineering Chemistry by Y.R. Sharma and P. Mitra, Kalyani Publishers
4. Engineering Chemistry for Diploma – Dr. R K Mohapatra, PHI Publication, New Delhi.
5. Engineering Chemistry- Jain & Jain, Dhanpat Roy and Sons.

Th.3. ENGINEERING MATHEMATICS-I
(1ST Sem Common)

Theory: 5 Periods per Week — I.A : 20 Marks
Total Periods: 75 Periods — End Sem Exam : 80 Marks
Examination: 3 Hours — TOTAL MARKS : 100 Marks

OBJECTIVE:

1. This subject helps the students to develop logical thinking which is useful in comprehending the principles of all to the subjects.
2. Analytical and systematic approach towards any problem is developed through learning of this subject.
3. Mathematics being a versatile subject can be used at every stage of human life.

Topic wise distribution of periods and marks

Sl. No.	Subject	Unit	Topic	Periods
A	Algebra	1	Matrices and Determinant	18
B	Trigonometry	2	Trigonometry	15
C	Two Dimensional Geometry	3 4	Co-ordinate Geometry in Two Dimensions (Straight Line) Circle	13 07
D	Three Dimensional Geometry	5 6	Co-ordinate Geometry in Three Dimensions Sphere	15 07
			TOTAL	**75**

1) MATRICES AND DETERMINANTS

a) Types of matrices
b) Algebra of matrices
c) Determinant
d) Properties of determinant
e) Inverse of a matrix (second and third order)
(Question should be on second order matrix)
f) Cramer's Rule (Question should be on two variables)
g) Solution of simultaneous equations by matrix inverse method
(Question should be on two variables)

2) TRIGONOMETRY

a) Trigonometrical ratios
b) Compound angles, multiple and sub-multiple angles (only formulae)
c) Define inverse circular functions and its properties (no derivation)

3) CO-ORDINATE GEOMETRY IN TWO DIMENSIONS (Straight line)

a) Introduction of geometry in two dimension
b) Distance formulae, division formulae, area of a triangle (only formulae no derivation)
c) Define slope of a line, angle between two lines (only F),
condition of perpendicularity and parallelism.
d) Different forms of straight lines (only formulae)
i) One point form (ii) two point form (iii) slope form (iv) intercept form
(v) Perpendicular form
e) Equation of a line passing through a point and (i) parallel to a line
(ii) Perpendicular to a line
f) Equation of a line passing through the intersection of two lines
g) Distance of a point from a line

4) CIRCLE

a) Equation of a circle
(i) center radius form
(ii) general equation of a circle
(iii) end point of diameter form

5) CO-ORDINATE GEOMETRY IN THREE DIMENSIONS

a) Distance formulae, section formulae, direction ratio, direction cosine, angle between two lines (condition of parallelism and perpendicularity)
b) Equation of a plane
i) General form, angle between two planes, perpendicular distance of a point from a plane, equation of a plane passing through a point and
i) parallel to a plane (ii) perpendicular to a plane

6) SPHERE

a) Equation of a sphere
i) center radius form
ii) general form
iii) two end points of a diameter form (only formulae and problems)

Books Recommended:

1. Elements of Mathematics _ Vol. _ 1 & 2 (Odisha State Bureau of Text Book preparation & Production)

Reference Books:

1. Mathematics Part- I & Part- II- Textbook for Class XII, NCERT Publication

<u>Syllabus to be covered up to IA</u>

Ch.1, Ch,2, and Ch,3,(a,b,c)

Th. 4. ENGINEERING MECHANICS
(2nd sem Common)

Theory: 4 Periods per Week — I.A : 20 Marks
Total Periods: 60 Periods — End Sem Exam : 80 Marks
Examination: 3 Hours — TOTAL MARKS : 100 Marks

Objective:

On completion of the subject, the student will be able to do:

1. Compute the force, moment & their application through solving of simple problems on coplanar forces.
2. Understand the concept of equilibrium of rigid bodies.
3. Know the existence of friction & its applications through solution of problems on above.
4. Locate the C.G. & find M.I. of different geometrical figures.
5. Know the application of simple lifting machines.
6. Understand the principles of dynamics.

Topic wise distribution of periods

Sl. No.	Topics	Periods
1	Fundamentals of Engineering Mechanics	14
2	Equilibrium	08
3	Friction	10
4	Centroid & moment of Inertia	14
5	Simple Machines	08
6	Dynamics	06
	TOTAL	**60**

1. FUNDAMENTALS OF ENGINEERING MECHANICS

1.1 Fundamentals.

Definitions of Mechanics, Statics, Dynamics, Rigid Bodies,

1.2 Force

Force System.

Definition, Classification of force system according to plane & line of action.

Characteristics of Force & effect of Force. Principles of Transmissibility & Principles of Superposition. Action & Reaction Forces & concept of Free Body Diagram.

1.3 Resolution of a Force.

Definition, Method of Resolution, Types of Component forces, Perpendicular components & non-perpendicular components.

1.4 Composition of Forces.

Definition, Resultant Force, Method of composition of forces, such as

1.4.1 Analytical Method such as Law of Parallelogram of forces & method of resolution.

1.4.2. Graphical Method.

Introduction, Space diagram, Vector diagram, Polygon law of forces.

1.4.3 Resultant of concurrent, non-concurrent & parallel force system by Analytical & Graphical Method.

1.5 Moment of Force.

Definition, Geometrical meaning of moment of a force, measurement of moment of a force & its S.I units. Classification of moments according to

direction of rotation, sign convention, Law of moments, Varignon's Theorem, Couple – Definition, S.I. units, measurement of couple, properties of couple.

2. EQUILIBRIUM

2.1 Definition, condition of equilibrium, Analytical & Graphical conditions of equilibrium for concurrent, non-concurrent & Free Body Diagram.

2.2 Lamia's Theorem – Statement, Application for solving various engineering problems.

3. FRICTION

3.1 Definition of friction, Frictional forces, Limiting frictional force, Coefficient of Friction.
Angle of Friction & Repose, Laws of Friction, Advantages & Disadvantages of Friction.

3.2 Equilibrium of bodies on level plane – Force applied on horizontal & inclined plane (up &down).

3.3 Ladder, Wedge Friction.

4. CENTROID & MOMENT OF INERTIA

4.1 Centroid – Definition, Moment of an area about an axis, centroid of geometrical figures such as squares, rectangles, triangles, circles, semicircles & quarter circles, centroid of composite figures.

4.2 Moment of Inertia – Definition, Parallel axis & Perpendicular axis Theorems. M.I. of plane lamina & different engineering sections.

5. SIMPLE MACHINES

5.1 Definition of simple machine, velocity ratio of simple and compound gear train, explain simple & compound lifting machine, define M.A, V.R. & Efficiency & State the relation between them, State Law of Machine, Reversibility of Machine, Self Locking Machine.

5.2 Study of simple machines – simple axle & wheel, single purchase crab winch & double purchase crab winch, Worm & Worm Wheel, Screw Jack.

5.3 Types of hoisting machine like derricks etc, Their use and working principle. No problems.

6. DYNAMICS

6.1 Kinematics & Kinetics, Principles of Dynamics, Newton's Laws of Motion, Motion of Particle acted upon by a constant force, Equations of motion, De-Alembert's Principle.

6.2 Work, Power, Energy & its Engineering Applications, Kinetic & Potential energy & its application.

6.3 Momentum & impulse, conservation of energy & linear momentum, collision of elastic bodies, and Coefficient of Restitution.

Syllabus coverage upto I.A

Chapter 1, 2 and 3.1

Books Recommended

1. Engineering Mechanics – by A.R. Basu (TMH Publication Delhi)
2. Engineering Machines – Basudev Bhattacharya (Oxford University Press).
3. Text Book of Engineering Mechanics – R.S Khurmi (S. Chand).
4. Applied Mechanics & Strength of Material – By I.B. Prasad.
5. Engineering Mechanics – By Timosheenko, Young & Rao.
6. Engineering Mechanics – Beer & Johnson (TMH Publication).

Th.4(a). BASIC ELECTRICAL ENGINEERING

(1st sem Common)

Theory: 2 Periods per Week — I.A : 10 Marks
Total Periods: 30 Periods — End Sem Exam : 40 Marks
Examination: 1.5 Hours — TOTAL MARKS : 50 Marks

Topic wise Distribution of Periods and Marks

Sl.No.	Topics	Periods
1	Fundamentals	05
2	A C Theory	08
3	Generation of Elect. Power	03
4	Conversion of Electrical Energy	07
5	Wiring and Power Billing	04
6	Measuring Instrument	03
	Total	**30**

Objective

1. To be familiar with A.C Fundamental and circuits
2. To be familiar with basic principle and application of energy conversion devices
3. To be familiar with generation of Electrical power
4. To be familiar with wiring and protective device
5. To be familiar with calculation and commercial Billing of electrical power & energy
6. To have basic knowledge of various electrical measuring instruments & conservation of electrical energy

1. FUNDAMENTALS

1.1 Concept of current flow.
1.2 Concept of source and load.
1.3 State Ohm's law and concept of resistance.
1.4 Relation of V, I & R in series circuit.
1.5 Relation of V, I & R in parallel circuit.
1.6 Division of current in parallel circuit.
1.7 Effect of power in series & parallel circuit.
1.8 Kirchhoff's Law.
1.9 Simple problems on Kirchhoff's law.

2. A.C. THEORY

2.1 Generation of alternating emf.
2.2 Difference between D.C. & A.C.
2.3 Define Amplitude, instantaneous value, cycle, Time period, frequency, phase angle, phase difference.
2.4 State & Explain RMS value, Average value, Amplitude factor & Form factor with Simple problems.
2.5 Represent AC values in phasor diagrams.
2.6 AC through pure resistance, inductance & capacitance
2.7 AC though RL, RC, RLC series circuits.
2.8 Simple problems on RL, RC & RLC series circuits.
2.9 Concept of Power and Power factor
2.10 Impedance triangle and power triangle.

3. GENERATION OF ELECTRICAL POWER

3.1 Give elementary idea on generation of electricity from thermal , hydro & nuclear power station with block diagram

4. CONVERSION OF ELECTRICAL ENERGY

(No operation, Derivation, numerical problems)

4.1 Introduction of DC machines.

4.2 Main parts of DC machines.

4.3 Classification of DC generator

4.4 Classification of DC motor.

4.5 Uses of different types of DC generators & motors.

4.6 Types and uses of single phase induction motors.

4.7 Concept of Lumen

4.8 Different types of Lamps (Filament, Fluorescent, LED bulb) its Construction and Principle.

4.9 Star rating of home appliances (Terminology, Energy efficiency, Star rating Concept)

5. WIRING AND POWER BILLING

5.1 Types of wiring for domestic installations.

5.2 Layout of household electrical wiring (single line diagram showing all the important component in the system).

5.3 List out the basic protective devices used in house hold wiring.

5.4 Calculate energy consumed in a small electrical installation

6. MEASURING INSTRUMENTS

6.1 Introduction to measuring instruments.

6.2 Torques in instruments.

6.3 Different uses of PMMC type of instruments (Ammeter & Voltmeter).

6.4 Different uses of MI type of instruments (Ammeter & Voltmeter).

6.5 Draw the connection diagram of A.C/ D.C Ammeter, voltmeter, energy meter and wattmeter. (Single phase only).

Syllabus Coverage upto I.A

Chapter 1,2,3

BOOKS RECOMENDED:

1. ABC of Electrical Enginnering by Jain & Jain (Dhanpat Rai Publication)
2. Fundamentals of Electrical Engg and Electronics by B.L Thereja
3. Concept of Basic Electrical Enginnering ,P.K Das and A.K. Mallick by B.M Publications
4. Fundamentals of Electrical Engg by Asfaq Hussain
5. Fundamentals of Electrical Engg by JB Gupta
6. Basic Electrical Engg. By Chakraborti (Mcgraw Hill)

Th.4(b). BASIC ELECTRONIC ENGINEERING

(1st sem Common)

Theory: 2 Periods per Week — I.A : 10 Marks
Total Periods: 30 Periods — End Sem Exam : 40 Marks
Examination: 1.5 Hours — TOTAL MARKS : 50 Marks

Topic wise Distribution of Periods and Marks

Sl.No.	Topics	Periods
1	Electronic Devices	8
2	Electronic circuits	9
3	Communication System	3
4	Transducers & Measuring instruments	10
	Total	**30**

Objective

1. To be familiar with Electronic devices
2. To be familiar with Electronic circuits
3. To be familiar with communication system
4. To be familiar with Electronic measuring instruments

1. ELECTRONIC DEVICES

1.1 Basic Concept of Electronics and its application.
1.2 Basic Concept of Electron Emission & its types.
1.3 Classification of material according to electrical conductivity (Conductor, Semiconductor & Insulator) with respect to energy band diagram only.
1.4 Difference between Intrinsic & Extrinsic Semiconductor.
1.5 Difference between vacuum tube & semiconductor.
1.6 Principle of working and use of PN junction diode, Zener diode and Light Emitting Diode (LED)
1.7 Integrated circuits (I.C) & its advantages.

2. ELECTRONIC CIRCUITS

2.1 Rectifier & its uses.
2.2 Principles of working of different types of Rectifiers with their merits and demerits
2.3 Functions of filters and classification of simple Filter circuit (Capacitor, choke input and π)
2.4 Working of D.C power supply system (unregulated) with help of block diagrams only
2.5 Transistor, Different types of Transistor Configuration and state output and input current gain relationship in CE,CB and CC configuration(No mathematical derivation)
2.6 Need of biasing and explain different types of biasing with circuit diagram.(only CE configuration)
2.7 Amplifiers(concept) , working principles of single phase CE amplifier
2.8 Electronic Oscillator and its classification
2.9 Working of Basic Oscillator with different elements through simple Block Diagram
.

3. COMMUNICATION SYSTEM

3.1 Basic communication system (concept & explanation with help of Block diagram)
3.2 Concept of Modulation and Demodulation, Difference between them
3.3 Different types of Modulation (AM, FM & PM) based on signal, carrier wave and modulated wave (only concept, No mathematical Derivation)

4. TRANSDUCERS AND MEASURING INSTRUMENTS

4.1 Concept of Transducer and sensor with their differences.
4.2 Different type of Transducers & concept of active and passive transducer.
4.3 Working principle of photo emissive, photoconductive, photovoltaic transducer and its application
4.4 Multimeter and its applications
4.5 Analog and Digital Multimeter and their differences
4.6 Working principle of Multimeter with Basic Block diagram
4.7 CRO, working principle of CRO with simple Block diagram

Syllabus Coverage upto I.A

Chapter 1,2(upto 2.6)

BOOKS RECOMENDED:

1. Principles of Electronics by V.K Mehta and Rohit Mehta,S Chand Publication
2. Principles of Electronics by S.K. SAHADEV (Dhanpatrai Publication)

Th.3. ENGINEERING MATHEMATICS – II
(2nd Sem Common)

Theory: 5 Periods per Week — I.A : 20 Marks
Total Periods: 75 Periods — End Sem Exam : 80 Marks
Examination: 3 Hours — TOTAL MARKS : 100 Marks

Objective:
Principles and application in Engineering are firmly ground on abstract mathematical structures. Students passing from secondary level need familiarization with such structure with a view to develop their knowledge, skill and perceptions about the applied science. Calculus is the most important mathematical tool in forming engineering application into mathematical models. Wide application of calculus makes it imperative to develop methods of solving differential equations. The knowledge of limit, derivative and derivative needs to be exhaustively practiced. To help a systematic growth of skill in solving equation by calculus method will be the endeavor of this course content. Understanding the concept of co-ordinate system in 3D in case of lines, planes and sphere and it's use to solve Engineering problems. After completion of the course the student will be equipped with basic knowledge to form equations and solve them competently.

Topic wise distribution of periods

Sl. No.	Topics	Periods	Marks
1	Vector Algebra	15	12
2	Limits and Continuity	12	12
3	Derivatives	21	20
4	Integration	15	24
5	Differential Equation	12	12
TOTAL		**75**	**80**

1) VECTOR ALGEBRA

a) Introduction
b) Types of vectors (null vector, parallel vector , collinear vectors) (in component form)
c) Representation of vector
d) Magnitude and direction of vectors
e) Addition and subtraction of vectors
f) Position vector
g) Scalar product of two vectors
h) Geometrical meaning of dot product
i) Angle between two vectors
j) Scalar and vector projection of two vectors
k) Vector product and geometrical meaning (Area of triangle and parallelogram)

2) LIMITS AND CONTINUITY

a) Definition of function, based on set theory
b) Types of functions
i) Constant function
ii) Identity function
iii) Absolute value function
iv)The Greatest integer function
v) Trigonometric function
vi) Exponential function
vii) Logarithmic function
c) Introduction of limit
d) Existence of limit
e) Methods of evaluation of limit

i) $\lim_{x\to 0} \frac{x^n - a^n}{x-a} = na^{n-1}$

ii) $\lim_{x\to 0} \frac{a^x - 1}{x} = \log_e a$

iii) $\lim_{x\to 0} \frac{e^x - 1}{x} = 1$

iv) $\lim_{x\to 0} (1+x)^{1/x} = e$

v) $\lim_{x\to \infty} \left(1+\frac{1}{x}\right)^x = e$

vi) $\lim_{x\to 0} \frac{\log(1+x)}{x} = 1$

vii) $\lim_{x\to 0} \frac{\sin x}{x} = 1$

viii) $\lim_{x\to 0} \frac{\tan x}{x} = 1$

e) Definition of continuity of a function at a point and problems based on it

3) DERIVATIVES

a) Derivative of a function at a point

b) Algebra of derivative

c) Derivative of standard functions

$x^n, a^x, \log_a x\ , e^x, \sin x\ , \cos x\ , \tan x\ , \cot x\ , \sec x\ , \csc x\ , \sin^{-1} x\ , \cos^{-1} x,$
$\tan^{-1} x\ , \cot^{-1} x\ , \sec^{-1} x\ , \csc^{-1} x$

d) Derivative of composite function (Chain Rule)

e) Methods of differentiation of

i) Parametric function

ii) Implicit function

iii) Logarithmic function

iv) a function with respect to another function

f) Applications of Derivative

i) Successive Differentiation (up to second order)

ii) Partial Differentiation (function of two variables up to second order)

g) Problems based on above

4) INTEGRATION

a) Definition of integration as inverse of differentiation

b) Integrals of standard functions

c) Methods of integration

i) Integration by substitution

ii) Integration by parts

d) Integration of the following forms

i) $\int \frac{dx}{x^2+a^2}$ ii) $\int \frac{dx}{x^2-a^2}$ iii) $\int \frac{dx}{a^2-x^2}$ iv) $\int \frac{dx}{\sqrt{x^2+a^2}}$ v) $\int \frac{dx}{\sqrt{x^2-a^2}}$ vi) $\int \frac{dx}{\sqrt{a^2-x^2}}$

vii) $\int \frac{dx}{x\sqrt{x^2-a^2}}$ $viii) \int \sqrt{a^2 - x^2}\, dx$ ix) $\int \sqrt{a^2 + x^2}\, dx$ x) $\int \sqrt{x^2 - a^2}\, dx$

e) Definite integral, properties of definite integrals

i) $\int_0^a f(x)\, dx = \int_0^a f(a-x) dx$

ii) $\int_a^b f(x)\, dx = -\int_b^a f(x)\, dx$

iii) $\int_a^c f(x)\, dx = \int_a^b f(x) dx + \int_b^c f(x)\, dx\ ,\ a < b < c$

iv) $\int_{-a}^a f(x)\, dx = 0, if\ f(x)$ = odd

$= 2\int_0^a f(x)\, dx, if\ f(x) = even$

f) Application of integration

i) Area enclosed by a curve and X – axis

ii) Area of a circle with centre at origin

5) DIFFERENTIAL EQUATION

a) Order and degree of a differential equation

b) Solution of differential equation

i) 1st order and 1st degree equation by the method of separation of variables

ii) Linear equation $\frac{dy}{dx} + Py = Q$, where P,Q are functions of x

<u>Syllabus to be covered up to IA</u>
Ch. 2 and Ch. 3

Books Recommended:

1. Elements of Mathematics _ Vol. _ 1 & 2 (Odisha State Bureau of Text Book preparation & Production)

Reference Books:

Mathematics Part- I & Part- II- Textbook for Class XII, NCERT Publication

Pr.1a. Communicative English Lab

(1st & 2nd sem Common)

Theory: 4 Periods per Week — Sessional : 50 Marks
Total Periods: 60 Periods — TOTAL MARKS : 50 Marks

Sl No.	Topic	Periods
1	Listening Skill	10
2	Speaking Skill	20
3	Personality Development	10
4	Interpersonal Skills	10
5	Presenting in G D , Seminar and Conferences	10
	Total	60

PRACTICAL

1. LISTENING SKILLS

- The student should be able to listen to a text read aloud in normal speed with focus on intonation
- After listening the student can fill-in-blanks, choose a suitable title, make a summary, supply required information and be able to answer comprehension questions from the passage read aloud.

2. SPEAKING SKILL

- Reading aloud of dialogues, texts, poems, speeches focusing on intonation.
- Self-introduction
- Role-plays on any two- situations
- Telephonic conversation

3. PERSONALITY DEVELOPMENT

- Initiation
- Physical appearance
- Audience purpose

4. INTERPERSONAL SKILLS

Appropriate use of non-verbal skills in face-to-face communication
[I.e. viva- voice, group-interviews, GDs and seminars]

5. PRESENTING IN GD, SEMINARS AND CONFERENCES

- Leadership quality
- Time management
- Achieving the target

Pr.1b. COMPUTER APPLICATION Lab
(1st / 2nd sem Common)

Theory: 4 Periods per Week — Sessional : 50 Marks
Total Periods: 60 Periods — TOTAL MARKS : 50 Marks

1. BASICCOMPUTER OPERATION **2 periods**

Identification of different components of Computer
Switch on and Booting Process
Shut down, Restart of computer

2. OPERATINGSYSTEM **13 periods**

Basic DOS commands (CLS, DIR, DATE, TIME, VERSION, MD, CD, RD, DEL, COPY, REN, USE OF WILD CARDS, PATH)
Basic Windows OS operations (DESKTOP, ICONS,, START BUTTON, TASK BAR)
MOUSE OPERATIONS- SINGLE CLICK, DOUBLE CLICK, DRAG
MAXIMIZE, MINIMIZE, RESTORE Windows Explorer, My Computer Files and Folders, Copy, Cut, Paste
Utilities: Word, notepad, paint, calculator etc

3. WORKING WITH MS-OFFICE **20 periods**

Basic operations of Word Processing Package. (MS-Word)
Basic operations of Electronic Spread Sheet Package. (MS-Excel)
Basic operations of Presentation Package (MS- Power point)
(Create, Edit, Format, Save, Print/View in the above three packages)

4. WORKING WITH INTERNET **10 periods**

Getting acquainted with Internet connection, Browser, website
URL, webpage, http, WWW, net browsing
Creating E-Mail Id, sending and receiving E-mail Chatting

5. C PROGRAMMING **15 periods**

1. Write a Program in C to find the greatest number among three integers.
2. Write a Program in C to find the average of n numbers by using for loop.
3. Write a Program in C to compute $(a + b)^3$
4. Write a Program in C to convert time in seconds to time in hours, minutes and seconds.
5. Write a program in C to find the sum of the following series. $1+1/x+1/x^2+.....+1/x^n$
6. Write a program in C to determine whether a number is prime or not?
7. Write a program in C to compute simple interest and compound interest of a given principal, rate of interest and time period.
8. Write a program in C to check whether a given number is palindrome or not?
9. Write a program in C to compute the sine series.
10. Write a program in C to accept row wise and column wise element in a two dimensional array and print them.
11. Write a program in C to find the number of times an element occurs in an array.
12. Write a program in C to find the vowels in a given string.
13. Write a program in C to find the factorial of a number, by using recursion.
14. Write a program in C to find the sum of Fibonacci series, by using function.
15. Write a program in C to accept a number from keyboard and print it in reverse order of entry, by using function.

Pr.2a. Engineering Physics Lab

(1st / 2nd sem Common)

Theory: 4 Periods per Week
Total Periods: 60 Periods
Examinatio: 3 Hours

Sessional : 50 Marks
End Sem Exams : 50 Marks
TOTAL MARKS :100 Marks

(Any 10 Experiments)

SL.NO	NAME OF THE EXPERIMENTS
1	To find the cross sectional area of a wire using a screw gauge.
2	To find the thickness and volume of a glass piece using a screw gauge.
3	To find volume of a solid cylinder using a Vernier Calipers.
4	To find volume of a hollow cylinder using a Vernier Calipers.
5	To determine the radius of curvature of convex surface using a Spherometer.
6	To determine the radius of curvature of concave surface using a Spherometer.
7	To find the time period of a simple pendulum and determine acceleration due to gravity.
8	To determine the angle of Prism.
9	To determine the angle of Minimum Deviation by I ~ D curve method.
10	To trace lines of force due to a bar magnet with North pole pointing North and locate the neutral points.
11	To trace lines of force due to a bar magnet with North pole pointing South and locate the neutral points.
12	To verify Ohm's Law by Ammeter – Voltmeter method.

Pr.2b. Engineering Chemistry Lab
(1st / 2nd sem Common)

Theory: 4 Periods per Week
Total Periods: 60 Periods
Examinatio: 3 Hours

Sessional : 50 Marks
End Sem Exams : 50 Marks
TOTAL MARKS :100 Marks

Sl No.	Experiment
1	Preparation and study of physical and chemical properties CO_2 gas.
2	Preparation and study of physical and chemical properties NH_3 gas.
3	Crystallization of Copper sulphate from copper carbonate.
4	Simple acid-base titrations (i) Acidimetry (ii) Alkalimetry
5	Tests for acid radicals (Known): (i) Carbonate, (ii) Sulphide, (iii) Chloride, (iv) Nitrate and (v) Sulphate.
6	Test for Basic radicals (Known): (i) Ammonium, (ii) Zinc, (iii) Magnesium, (iv) Aluminium, (v) Calcium, (vi) Sodium and (vii) potassium.
7	Test for unknown Acid radicals
8	Test for unknown basic radicals
9	Test for unknown salt (composed of one basic radical and one acid radical)

Recommended Books:

(i) Practical Intermediate Chemistry By Dr. Bichitrananda Nanda
(ii) Elemental Experimental chemistry by Dr. Y R Sharma, A K Das, Kalyani Publisher

Pr.3a. Engineering Drawing
(1st / 2nd sem Common)

Theory: 6 Periods per Week
Total Periods: 90 Periods
Examination: 3 Hours

Sessional : 50 Marks
End Sem Exams : 100 Marks
TOTAL MARKS : 150 Marks

Objective
After completion of the study of Engg. Drawing the student should be able to

1. Understand the importance of Engineering Drawing.
2. Demonstrate the use of different drawing instrument.
3. Make free hand lettering and numbering.
4. Practice of dimensioning of drawing.
5. Undertake different geometric constructions, projections of straight line, planes and solids.
6. Take up different orthographic projections.
7. Draw sectional views, development of surface of different solids.
8. Develop the concept of building drawing.
9. Prepare 2D engineering drawing using Auto CAD software.

Topic wise distribution of periods.

Sl. No.	Topics	Periods
1	Introduction and Demonstration	03
2	Types of Lines, Lettering & Dimensioning	03
3	Scales	03
4	Curves	06
5	Orthographic Projections	21
6	Section and Developments	21
7	Isometric Projections	06
8	Building Drawing	12
9	Practices on Auto CAD	15
	TOTAL	**90**

(All drawings are to be made in First Angle Projection)

1. INTRODUCTION & DEMONSTRATION

1.1 Identify various sizes of drawing boards, drawing sheets as pr BIS.
1.2 List the types of pencils, instruments, and scales (RF).
1.3 Demonstrate lying of drawing sheet, margin, standard layout and title block as per BIS, folding principle of drawings (blue prints, print outs etc).

2. TYPES OF LINES, LETTERING & DIMENSIONING

2.1 Demonstrate and explain the use of various types of lines.
2.2 Demonstrate the principle of single stroke, gothic lettering & numerals as per BIS.

3. SCALES

3.1 Significance of scales in drawing; different scales.
3.2 Define and draw plain sale and diagonal sale.

4. CURVES

4.1 Explain Conic sections with illustration, Explain terms like focus, vertex, directrix and eccentricity.

4.2 Draw conics sections by eccentricity method – Ellipse, Parabola and Hyperbola.

4.3 Draw Ellipse by concentric circle method sand arc of cicle method.

4.4 Draw parabola by Rectangle Method and Tangent Method.

5. OTHOGRAPHIC PROJECTIONS

5.1 Demonstrate the principles of 1^{st} angle and 3^{rd} angle projections with the help of models and draw symbols.

5.2 Draw projection of points.

5.3 Draw projection of straight line (parallel to both planes, parallel to one and perpendicular to other, parallel to one and inclined to other and inclined to both reference planes).

5.4 Draw plane figure such as squares, rectangles, triangles, circle, Pentagon and hexagon
(perpendicular to one plane and inclined to other).

5.5 Draw projections of solids such as prism, cylinder, cone, tetrahedron and pyramid in simple position (with axis parallel to one reference plane and perpendicular to other reference plane).

6. SECTION & DEVELOPMENTS

6.1 Draw the sectional projection & development of prism, cylinder, cone and pyramid in simple position by a cutting plane perpendicular to one reference plane and inclined to other reference plane.

6.2 Draw true shape of the cutting sections.

7. ISOMETRIC PROJECTIONS

Draw isometric view & Isometric projection of prism, pyramid, cone & cylinder with axis horizontal and vertical with construction of isometric scales.

8. BUILDING DRAWING

8.1 Explain terms related to building drawing.

8.2 Draw plan, elevation of single room building with verandah (Flat roof according to given line plan and specification).

9. PRACTICES ON AUTO CAD

9.1 Introduction-Settings, Limits etc.

9.2 Auto CAD commands-
Draw commands (Line, circle, are polygon, ellipse, rectangle).
Edit command, Dimension commands and Modify Commands for two dimensional drafting only.

9.3 Exercise for practice using Auto CAD.

9.3.1 Orthographic projections of lines, planes sand solids as per chapter 5.0.

9.3.2 Isometric projection as per Chapter 7.0.

Note: Focus should be on Hands on Practice of student using AutoCAD software

Books Recommended

1. Machine Drawing by Basudeb Bhattacharya, Oxford University Press.
2. A Text Book of Engineering Drawing by Dr. R.K. Dhawan.
3. A Text Book of Engineering Graphics & Auto CAD by K Venugopal.
4. A Text book of Engineering Drawing by N.D. Bhatt.
5. Engineering Drawing by P.S. Gill.
6. A Introduction to Auto CAD – 2012 by George Omura, Willey India Publishers.

Pr.3b. Workshop Practice
(1st / 2nd sem Common)

Theory: 6 Periods per Week — Sessional : 50 Marks
Total Periods: 90 Periods — End Sem Exams : 100 Marks
Examination: 4 Hours — TOTAL MARKS : 150 Marks

Objective:

1. To demonstrate safely practice in various shops of the workshop.
2. To select suitable tools & equipment in the following shops. (a) Fitting.
   (b) Sheet Metal.
   (c) Welding (Gas & Electrical). (d) Turning.
3. To select suitable materials for different process in the above shops.
4. To demonstrate the different processes adopted in the above shops.
5. To finish the jobs within stipulated time and with accuracy as per specifications.

Topic Wise distribution of periods

Sl. No.	Topics	Periods
1	Fitting Shop	24
2	Sheet Metal	18
3	Welding Shop	24
4	Turning Shop	21
5	Exposure to CNC Milling / Lathe Machine	03
	TOTAL	**90**

1. **FITTING SHOP**

1.1 Demonstrate safety practices in the fitting shop.
1.2 Select suitable holding & clamping devices for fitting jobs.
1.3 Select suitable tools like- files, vice, chisels, punch, scriber, hammers, surface plate, V-block, try square, caliper etc.
1.4 Demonstrate the following operations:
Sawing, Chipping, Fitting, Craping, Grinding, Marking, Reaming, Tapping, Drilling & Angular cutting.
1.5 Introduction of chipping, demonstration on chipping and its applications.
1.6 Description, demonstration and practice of simple operation of hack saw straight and angular cutting.
1.7 Introduction and use of measuring tools used in fitting shop like steel rule, measuring tape, outside micrometer, vernier caliper and vernier height gauge.
1.8 Description and Demonstration and practice of thread cutting using taps and dies.
Job: Cutting & fitting practice on a square of 50mm X 50mm X 8mm MS Flat. Job: Angular cutting practice of 45 degree (on the above job).
Job: Preparation of stud (to cut external threads) with the help of dies (mm or BSW). Job: H-fitting in the mild steel (ms) square.
Job: Prepare one job on male female fitting.

2. SHEET METAL

2.1 Demonstrate safety practices in sheet metal shop.

2.2 Prepare surface development for the jobs according to the drawing.

2.3 Cut M.S and G.P. sheets according to the surface development / drawing using standard sheet metal cutting tools.

2.4 Select hand tools for sheet metal work.

2.5 Demonstrate the process of metal clamp joining and reveted joining of sheet metals.

Job: Making of sheet metal joints.

Job: Prepare a sheet metal tray or a funnel.

Job: Prepare a sheet metal job involving rolling, shearing, creasing, bending & cornering. Job: Prepare a lap riveting joint.

3. WELDING SHOP

3.1 Introduction.

3.2 Safety precautions in welding, safety equipments & its application in welding shop.

3.3 Introduction to welding, type of welding, common materials that can be welded, introduction to gas welding equipment, types of flame, adjustment of flame, applications of gas welding, Welding tools & safety precautions.

3.4 Introduction to electric arc welding (AC & DC), practice in setting current & voltage for striking proper arc, precautions while using electric arc welding. Applications of arc welding. Introduction to polarity & their use.

3.5 Demonstrate & use of the different tools used in the welding shop with sketches, Hand shield, helmet, clipping hammer, gloves, welding lead, connectors, aprons, goggles, etc.

3.6 Demonstrate of welding defects & various types of joints & end preparation.

Job: Preparation of lap joint by arc welding rod. Job: Preparation of Tee joint by arc welding.

Job: Preparation of single V or double V butt joint by electric arc welding. Job: Brazing practice. Use of Spelt or (on MS sheet pieces).

Job: Gas welding practice on worn-out & broken parts.

4. TURNING SHOP

4.1 Introduction.

4.2 Safety precaution & safety equipments.

4.3 Various marking, measuring, cutting & holding tools.

4.4 Demonstration of different parts of a lathe, demonstration on centering & turning operation in a group of 06 students.

Job: plain turning, taper turning & grooving practices on round bar.

5. EXPOSURE TO C.N.C MILLING / LATHE MACHINE

Reference Books

1. Workshop Technology by S.K.Hajara Choudhray, Media Promoters Publishers, New Delhi.
2. Workshop Technology by B.S. Raghubanshi, Dhanpat Rai and Sons, New Delhi.
3. Workshop Technology by H.S. Bawa – TMH.
4. Workshop Familiarization by E Wilkinson.
5. Sheet metal shop practice by Bruce & Meyer.
6. Workshop Technology by R.S. Khurmi & J.K. Gupta, S.Chand.

Notes

1. *Work, Progress book should be maintained continuously.*
2. *The roll numbers of the students must be punched on each job.*
3. *The turning shop job should be done by students' maximum 06 students in a group*

Pr.4 Seminar
(1st / 2nd sem Common)

Theory: 4 Periods per Week — Sessional : 50 Marks
Total Periods: 60 Periods — TOTAL MARKS : 50 Marks

The students shall present seminar on different topics on latest science and Technology in the entire class. There shall not be any grouping of students. The students shall present the seminar topic to the whole class/section. All other students should be allowed and encouraged to put questions to the presenter student, who shall answer the questions. A student has to present seminar on at least 2 topics in a semester. He/she has to submit seminar report for each topic separately, to the teacher concerned, which shall be preserved for verification by the authorities. The students should be encouraged to refer to the magazines, journals ,e-materials etc. for preparing for seminar topic. Attendance of all students other than the presenters should be ensured, so that seminar shall be more participative and knowledge of students shall improve by listening to many topics presented.

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 3rd Semester Civil Engineering (wef 2019-20)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Structural Mechanics	5		-	20	80	3	100
Th.2		Geotechnical Engineering	4		-	20	80	3	100
Th.3		Building materials & Construction Technology	5		-	20	80	3	100
Th.4		Estimation &Cost Evaluation- I	4			20	80	3	100
Th.5		Environmental studies	4			20	80	3	100
		Total	22			100	400	-	500
		Practical							
Pr.1		Civil Engg. Lab-I	-	-	6	50	100		
Pr.2		Civil Engg. Drawing-I	-	-	5	25	50		
Pr.3		Estimation Practice-I (Computer-Aided)	-	-	3	25			
		Student Centered Activities(SCA)		-	3	-	-	-	-
		Total	-	-	*17*	*100*	*150*	-	*250*
		Grand Total	**22**	**-**	**17**	**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.

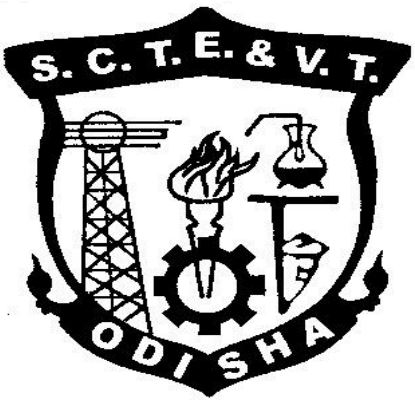
There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

CURRICULLUM OF 3RD SEMESTER

For

DIPLOMA IN CIVIL ENGINEERING

(Effective From 2019-20 Session)



STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

Th1. STRUCTURAL MECHANICS

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	3rd
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

The course aims to prepare the students to comprehend the design principles associated with the structural members. The students will develop competency in calculating necessary dimensions and material properties so that the members can withstand the loading conditions.

B. COURSE OBJCTIVES

On completion of the course, students will be able to -

1. Comprehend, define, compute and interpret major mechanical properties demonstrated by solid materials.
2. Analyze solid states under uniaxial loading and plane stress conditions.
3. Draw shear force and bending moment diagrams of simple statically determinate and statically indeterminate structural members subject to transverse loading.
4. Obtain slope and deflection profiles of statically determinate simple structural members.
5. Comprehend buckling as a failure mode in column and determine crippling loads for columns using Euler's theory.
6. Compute forces in members of a truss

C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Periods
1	Review of Basic Concepts	04
2	Simple and Complex Stress, Strain	15
3	Stresses in Beams	10
4	Columns and Struts	04
5	Shear Force and Bending Moment	12
6	Slope and Deflection	10
7	Indeterminate Beams	10
8	Trusses and Frames	10

D. Course Contents:

1 Review Of Basic Concepts

1.1 Basic Principle of Mechanics: Force, Moment, support conditions, Conditions of equilibrium, C.G & MI, Free body diagram

1.2 Review of CG and MI of different sections

2 Simple And Complex Stress, Strain

2.1 Simple Stresses and Strains

Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability, Types of stresses -Tensile, Compressive and Shear stresses, Types of strains - Tensile, Compressive and Shear strains, Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear, Elongation and Contraction, Longitudinal and Lateral strains, Poisson's Ratio, Volumetric strain, computation of stress, strain, Poisson's ratio, change in dimensions and volume etc, Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants.

2.2 Application of simple stress and strain in engineering field:

Behaviour of ductile and brittle materials under direct loads, Stress Strain curve of a ductile material, Limit of proportionality, Elastic limit, Yield stress, Ultimate stress, Breaking stress, Percentage elongation, Percentage reduction in area, Significance of percentage elongation and reduction in area of cross section, Deformation of prismatic bars due to uniaxial load, Deformation of prismatic bars due to its self weight.

2.3 Complex stress and strain

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, Mohr's Circle and its application to solve problems of complex stresses

3 Stresses In Beams and Shafts

3.1 Stresses in beams due to bending: Bending stress in beams – Theory of simple bending – Assumptions – Moment of resistance – Equation for Flexure– Flexural stress distribution – Curvature of beam – Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus

3.2 Shear stresses in beams: Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis.

3.3 Stresses in shafts due to torsion: Concept of torsion, basic assumptions of pure torsion, torsion of solid and hollow circular sections, polar moment of inertia, torsional shearing stresses, angle of twist, torsional rigidity, equation of torsion

3.4 Combined bending and direct stresses: Combination of stresses, Combined direct and bending stresses, Maximum and Minimum stresses in Sections, Conditions for no tension, Limit of eccentricity, Middle third/fourth rule, Core or Kern for square, rectangular and circular sections, chimneys, dams and retaining walls

4 Columns and Struts

4.1 Columns and Struts, Definition, Short and Long columns, End conditions, Equivalent length / Effective length, Slenderness ratio, Axially loaded short and long column, Euler's theory of long columns, Critical load for Columns with different end conditions

5 Shear Force and Bending Moment

5.1 Types of loads and beams:

Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL), Types of Supports: Simple support, Roller support, Hinged support, Fixed support, Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction, Types of Beams based on support conditions: Calculation of support reactions using equations of static equilibrium.

5.2 Shear force and bending moment in beams:

Shear Force and Bending Moment: Signs Convention for S.F. and B.M, S.F and B.M of general cases of determinate beams with concentrated loads and udl only, S.F and B.M diagrams for Cantilevers, Simply supported beams and Over hanging beams, Position of maximum BM, Point of contra flexure, Relation between intensity of load, S.F and B.M.

6 Slope and Deflection

6.1 Introduction: Shape and nature of elastic curve (deflection curve); Relationship between slope, deflection and curvature (No derivation), Importance of slope and deflection.

6.2 Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method).

7 Indeterminate Beams

7.1 Indeterminacy in beams, Principle of consistent deformation/compatibility, Analysis of propped cantilever, fixed and two span continuous beams by principle of superposition, SF and BM diagrams (point load and udl covering full span)

8 Trusses

8.1 Introduction: Types of trusses, statically determinate and indeterminate trusses, degree of indeterminacy, stable and unstable trusses, advantages of trusses.

8.2 Analysis of trusses: Analytical method (Method of joints, method of Section)

E. Course Coverage Upto Internal Assessment: Chapters 1,2,3,4

F. Recommended Books

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	R.Subramanian	Strength of Materials	Oxford Publication
2	S.Rammrutham,	Theory of structure	Dhanpat Rai Publications
3	V.N.Vazirani&M.M. Rathwani	Analysis of Structures-Vol.I&II	Khanna Publication

Th2. GEOTECHNICAL ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	3rd
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 the students to comprehend the design principles associated with the civil foundations and other geotechnical structures. The students will develop competency in estimating and predicting soil strength and slope based on properties and design requirements.

B. Course Objectives

On completion of the course, students will be able to -

1. comprehend the scope of soil mechanics and define the associated terminology and inter-relation among various soil properties.
2. classify and indentify soil types under different standards
3. comprehend significance of permeability and seepage and compute those.
4. describe requirement and methodology of compaction and consolidation.
5. realize the methods towards shear strength estimation and obtain strength envelop for different types of soils.
6. define terms of foundation engineering and estimate bearing capacity.

C. Topic Wise Distribution

Chapter	**Name of topics**	**Hours**
1	Introduction	02
2	Preliminary Definitions and Relationship.	06
3	Index Properties of soil	04
4	Classification of Soil	06
5	Permeability and Seepage	07
6	Compaction and Consolidation.	08
7	Shear Strength.	06
8	Earth Pressure on Retaining Structures.	07

9	Foundation Engineering.	14

D. **Course Contents**:

1 Introduction

1.1 Soil and Soil Engineering

1.2 Scope of Soil Mechanics

1.3 Origin and formation of soil

2 Preliminary Definitions and Relationship

2.1 Soil as a three Phase system.

2.2 Water Content, Density, Specific gravity, Voids ratio, Porosity, Percentage of air voids, air content, degree of saturation, density Index, Bulk/Saturated/dry/submerged density, Interrelationship of various soil parameters

3 Index Properties of Soil

3.1 Water Content

3.2 Specific Gravity

3.3 Particle size distribution: Sieve analysis, wet mechanical analysis, particle size distribution curve and its uses

3.4 Consistency of Soils, Atterberg's Limits, Plasticity Index, Consistency Index, Liquidity Index

4 Classification of Soil

4.1 General

4.2 I.S. Classification, Plasticity chart

5 Permeability and Seepage

5.1 Concept of Permeability, Darcy's Law, Co-efficient of Permeability,

5.2 Factors affecting Permeability.

5.3 Constant head permeability and falling head permeability Test.

5.4 Seepage pressure, effective stress, phenomenon of quick sand

6 Compaction and Consolidation

6.1 Compaction: Compaction, Light and heavy compaction Test, Optimum Moisture

Content of Soil, Maximum dry density, Zero air void line, Factors affecting Compaction, Field compaction methods and their suitability

6.2 Consolidation: Consolidation, distinction between compaction and consolidation.

Terzaghi's model analogy of compression/ springs showing the process of consolidation – field implications

7 Shear Strength

7.1 Concept of shear strength, Mohr- Coulomb failure theory, Cohesion, Angle of internal friction, strength envelope for different type of soil, Measurement of shear strength;- Direct shear test, triaxial shear test, unconfined compression test and vane-shear test

8 Earth Pressure on Retaining Structures

8.1 Active earth pressure, Passive earth pressure, Earth pressure at rest.

8.2 Use of Rankine's formula for the following cases (cohesion-less soil only)

(i) Backfill with no surcharge, (ii) backfill with uniform surcharge

9 Foundation Engineering

9.1 Functions of foundations, shallow and deep foundation, different type of shallow and deep foundations with sketches. Types of failure (General shear, Local shear & punching shear)

9.2 Bearing capacity of soil, bearing capacity of soils using Terzaghi's formulae & IS Code formulae for strip, Circular and square footings, Effect water table on bearing capacity of soil

9.3 Plate load test and standard penetration test

E. COURSE COVERAGE UPTO INTERNAL EXAMINATION

Chapters 1, 2, 3, 4, 5, 6

F. RECOMMENDED BOOKS

Learning Resources			
Text Books			
Sl. No	**Name of Authors**	**Titles of Book**	**Name of Publisher**
1	Dr. B.C.Punmia	Soil Mechanics & Foundation Engineering	Laxmi publications (P) LTD
2	Dr. K.R.Arora	Soil Mechanics& Foundation Engineering	Standard Publishers Distributors Ltd.
3	Dr. V.N.S. Murthy	Soil Mechanics& Foundation Engineering,Vol-I	UBS Publishers Distributors Ltd.

Th3.BUILDING MATERIALS AND CONSTRUCTIONS TECHNOLOGY

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	3rd
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

The course has two parts namely the materials and construction task. The first part offers insight to the common materials used in construction. This enables students to understand the application and processing requirement in the common construction materials. The second part of the course offers idea on construction activities based on components of a building. Another objective of the course is to develop concept of eco-friendly construction practices.

B. COURSE OBJCTIVES

On completion of the course, students will be able to –

1. Realize the role of rock, bricks, cement, concrete, timber and steel in construction and comprehend the classification and processing tasks involved.
2. Understand the composition and mechanism of the protective paints and prescribe as necessary.
3. Classify buildings on occupancy and comprehend different components and their requirement in a building.
4. Understand the glossary of terms involved in foundation, masonry, wood works and other activities involved in building construction.
5. Grasp the construction details involved in a building.
6. Realize the significance of protecting environment and adopt necessary practices towards green construction.

C. TOPIC WISE DISTRIBUTION

D.

Chapter	Name of topics	Hours
PART A: BUILDING MATERIALS		
1	Stone	05
2	Bricks	06
3	Cement, Mortar and Concrete	07

4	Other Construction Materials	07
5	Surface Protective Materials:	05
PART B: CONSTRUCTIONS TECHNOLOGY		
1	Introduction	02
2	Foundations	04
3	Walls & Masonry Works	06
4	Doors, Windows and Lintels:	04
5	Floors, Roofs and Stairs	05
7	Protective, Decorative Finishes and Termite Proofing	05
8	Green Buildings, Energy Management and Energy Audit of Buildings & Project:	04

E. COURSE CONTENTS:

PART :A (BUILDING MATERIALS)

1 Stone

1.1 Classification of rock, uses of stone, natural bed of stone,
1.2 Qualities of good building stone,
1.3 Dressing of stone
1.4 Characteristics of different types of stone and their uses

2 Bricks

2.1 Brick earth – its composition
2.2 Brick making – Preparation of brick earth, Moulding, Drying, Burning in kilns (continuous Process)
2.3 Classification of bricks, size of traditional and modular bricks, qualities of good building bricks

3 Cement, Mortar and Concrete

3.1 Cement: Types of cements, Properties of cements, Manufacturing of cement
3.2 Importance and application of blended cement with fly ash and blast furnace slag.
3.3 Mortar: Definition and types of mortar
3.4 Sources and classification of sand, Bulking of sand
3.5 Use of gravel, morrum and fly ash as different building material
3.6 Concrete: Definition and composition- Water cement ratio- Workability, mechanical properties and grading of aggregates, mixing, placing, compacting and curing of concrete.

4 Other Construction Materials

4.1 Timber: Classification and Structure of timber.

4.2 Seasoning of timber – Importance.

4.3 Characteristics of good timber.

4.3 Clay products and refractory materials – Definition and Classification.

4.4 Properties and uses of refractory materials- tiles, terracotta, porcelain glazing.

4.5 Iron and Steel: Uses of cast iron, wrought iron, mild steel and tor steel

5 Surface Protective Materials

5.1 Composition of Paints, enamels, varnishes.

5.2 Types and uses of surface protective materials like Paints, Enamels, Varnishes, Distempers, Emulsion, French polish and Wax Polish.

PART: B (CONSTRUCTIONS TECHNOLOGY)

1 Introduction

1.1 Buildings and classification of buildings based on occupancy

1.2 Different components of a building.

1.3 Site investigation – objectives, site reconnaissance and explorations.

2 Foundations

2.1 Concept of foundation and its purpose

2.2 Types of foundations – shallow and deep

2.3 Shallow foundation-constructional details of : Spread foundations for walls, thumb rules for depth and width of foundation and thickness of concrete block

2.4 Deep foundations: Pile foundations-their suitability, classification of piles based on materials, function and method of installation.

3 Walls & Masonry Works :

3.1 Purpose of walls

3.2 Classification of walls – load bearing, non-load bearing walls, retaining walls.

3.3 Classification of walls as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls (Concept Only).

3.4 Partition Walls : Suitability and uses of brick and wooden partition walls

3.5 Brick masonry : Definition of different terms

3.6 Bond – meaning and necessity: English bond for 1and 1-1/2 Brick thick walls. T, X and right angled corner junctions. Thickness for 1and 1-1/2 brick square pillars in English bond

3.7 Stone Masonry :

3.8 Glossary of terms –String course, corbel, cornice, block-in-course, grouting, mouldings, templates, throating, through stones, parapet, coping, pilaster and buttress

4 Doors, Windows And Lintels

4.1 Glossary of terms used in doors and windows

4.2 Doors – different types of doors

4.3 Windows – different types of windows

4.4 Purpose of use of arches and lintels

5 Floors, Roofs and Stairs

5.1 Floors: Glossary of terms ,Types of floor finishes – cast-in-situ, concrete flooring(monolithic, bonded), terrazzo tile flooring, cast in situ Terrazzo flooring, timber flooring (Concept only)

5.2 Roofs: Glossary of terms, Types of roofs, concept and function of flat, pitched, hipped and Sloped roofs

5.3 Stairs: Glossary of terms; Stair case, winder, landing, stringer, newel, baluster, rise, tread, width of stair case, hand rail, nosing, head room, mumty room.

5.4 Various types of stair case – straight flight, dog legged, open well, quarter turn, half turn (newel and geometrical stairs), bifurcated stair, spiral stair, cantilever stair, tread riser stair.

6 Protective, Decorative Finishes, Damp and Termite Proofing

6.1 Plastering – purpose – Types of plastering, Types of plaster finishes – Grit finish, rough cast, smooth cast, sand faced, pebble dash, acoustic plastering and plain plaster etc.

6.2 Proportion of mortars used for different plasters, preparation of mortars, techniques

of plastering and curing

6.3 Pointing – purpose –Types of pointing

6.4 Painting – objectives – method of painting new and old wall surfaces, wood surface and metal surfaces – powder coating and spray painting on metal surfaces.

6.5 White washing – Colour washing – Distempering – internal and external walls.

6.6 Damp and Termite proofing – Materials and Methods.

7 Green Buildings, Energy Management and Energy Audit Of Buildings & Project

8.1 Concept of green building

8.2 Introduction to Energy Management and Energy Audit of Buildings.

8.3 Aims of energy management of buildings.

8.4 Types of energy audit, Response energy audit questionnaire

8.5 Energy surveying and audit report.

F. Course Coverage up to Internal Assessment: All of Part A and Chapters 1, 2 of Part B

G. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	N. Subramanian	Building materials & Construction	Oxford Publication
2	Rangwala	Engineering Materials	Charorar Publishing House
3	Rangwala	Building Construction	Charorar Publishing House
4	Sarkar & Saraswati	Construction Technology	Oxford Publication

Th4. ESTIMATION & COST EVALUATION – I

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

The course enables the students to be ready to act as estimator and prepare necessary plans before construction satisfying the requirements imposed by different regulatory bodies. Further, the course helps them realize the organizational hierarchy and professional roles.

B. COURSE OBJCTIVES

On completion of the course, students will be able to –

1. Understand the significance of accurate estimation practices.
2. Evaluate and generate component wise estimates for a building
3. Develop a proper cost estimate for single storeyed building.
4. Analyse and offer reason behind the costs involved in different components
5. Prepare abstract of cost estimates in line with prescription by state regulating bodies.
6. Realize the levels existing in organization and comprehend the roles and responsibilities at different levels.

C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Introduction :	02
2	Quantity Estimate of Building	30
3	Analysis of Rates and Valuation.	22
4	Administrative Set-Up of Engineering Organisations	04

D. COURSE CONTENTS:

1 Introduction

1.1 Types of estimates – Plinth area, floor area / carpet area

1.2 Units and modes of measurements as per IS 1200

1.3 Accuracy of measurement for different item of work

2 Quantity Estimate of Building

2.1 Short wall long wall method and centre line method, deductions in masonry, plastering, white washing, painting etc., multiplying factor (paint coefficients) for painting of doors and windows (paneled/glazed), grills etc.

2.2 Detailed estimate of single storied flat roof building with shallow foundation and RCC roof slab with leak proof treatment over it including staircase and mumty room.

3 Analysis of Rates and Valuation

3.1 Analysis of rates for cement concrete, brick masonry in Cement Mortar, laterite stone masonry in Cement Mortar, cement plaster, white washing, Artificial Stone flooring, Tile flooring, concrete flooring, R.C.C. with centering and shuttering, reinforcing steel, Painting of doors and windows etc. as per OPWD.

3.2 Calculation of lead, lift, conveyance charges, royalty of materials, etc. as per Orissa P.W.D. system (Concept of C.P.W.D./Railways provisions)

3.3 Abstract of cost of estimate.

3.4 Valuation- Value and cost, scrap value, salvage value, assessed value, sinking fund, depreciation and obsolesce, methods of valuation.

4 Administrative Set-Up of Engineering Organisations:

4.1 Administrative set-up and hierarchy of Engineering department in State Govt./Central Govt./PSUs/Private Sectors etc. Duties and responsibilities of Engineers at different positions /levels.

E. Course Coverage up to Internal Assessment: Chapters 1, 2

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
3	B.N.Dutta	Estimating &Costing	UBSPD
4	A. Panigrahi	Accounts & contracts	Vikas Publication
5	Govt. of Odisha	Latest Orissa PWD Schedule of Rates & Analysis of rates	Govt. of Odisha

B: The use of schedule and analysis of rates of Govt. of Odisha is allowed in the end examination.

Th5. ENVIRONMENTAL STUDIES
(Common to All Branches)

Name of the Course: Diploma in Civil Enginering			
Course code:		Semester	3rd
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination	80

A. Rationale:

Due to various aspects of human developments including the demand of different kinds of technological innovations, most people have been forgetting that, the Environment in which they are living is to be maintained under various living standards for the preservation of better health. The degradation of environment due to industrial growth is very much alarming due to environmental pollution beyond permissible limits in respect of air, water industrial waste, noise etc. Therefore, the subject of Environmental Studies to be learnt by every student in order to take care of the environmental aspect in each and every activity in the best possible manner.

B. OBJECTIVES:

After completion of study of environmental studies, the student will be able to:

1. Gather adequate knowledge of different pollutants, their sources and shall be aware of solid waste management systems and hazardous waste and their effects.
2. Develop awareness towards preservation of environment.

C. TOPIC WISE DISTRIBUTION OF PERIODS

SL.NO.	TOPIC	PERIODS
1	The Multidisciplinary nature of environmental studies	04
2	Natural Resources	10
3	Systems	08
4	Biodiversity and it's Conservation	08
5	Environmental Pollution.	12
6	Social issues and the Environment	10
7	Human population and the environment	08
	TOTAL	60

Unit 1: The Multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness.

Unit 2: Natural Resources

Renewable and non renewable resources:

a) Natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction mining, dams and their effects on forests and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.
- Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity, .
- Energy Resources: Growing energy need, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
- Land Resources: Land as a resource, land degradation, man induces landslides, soil erosion, and desertification.

b) Role of individual in conservation of natural resources.
c) Equitable use of resources for sustainable life styles.

Unit 3: Systems

- Concept of an eco system.
- Structure and function of an eco system.
- Producers, consumers, decomposers.
- Energy flow in the eco systems.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following eco system:
- Forest ecosystem:
- Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit 4: Biodiversity and it's Conservation

- Introduction-Definition: genetics, species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social ethical, aesthetic and optin values.
- Biodiversity at global, national and local level.
- Threats to biodiversity: Habitats loss, poaching of wild life, man wildlife conflicts.

Unit 5: Environmental Pollution.

Definition Causes, effects and control measures of:

a) Air pollution.
b) Water pollution.
c) Soil pollution
d) Marine pollution
e) Noise pollution.
f) Thermal pollution
g) Nuclear hazards.

Solid waste Management: Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution.

Disaster management: Floods, earth quake, cyclone and landslides.

Unit 6: Social issues and the Environment

- Form unsustainable to sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, water shed management.
- Resettlement and rehabilitation of people; its problems and concern.
- Environmental ethics: issue and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.
- Air (prevention and control of pollution) Act.
- Water (prevention and control of pollution) Act.
- Public awareness.

Unit 7: Human population and the environment

- Population growth and variation among nations.
- Population explosion- family welfare program.
- Environment and human health.
- Human rights.
- Value education
- Role of information technology in environment and human health.

Syllabus coverage upto I.A

Units 1, 2, 3

Learning Resources:			
Sl.No	**Title of the Book**	**Name of Authors**	**Name of Publisher**
1.	Textbook of Environmental studies	Erach Bharucha	# UGC
2.	Fundamental concepts in Environmental Studies	D.D. Mishra	S.Chand & Co-Ltd
3.	Text book of Environmental Studies	K.Raghavan Nambiar	SCITECH Publication Pvt. Ltd
4.	Environmental Engineering	V.M.Domkundwar	Dhanpat Rai & Co

Pr1. CIVIL ENGINEERING LABORATORY-I

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	3rd
Total Period:	90	Examination	3 hrs
Lab. periods:	6P/week	Term Work	50
Maximum marks:	150	End Semester Examination:	100

A. RATIONALE

The course exposes the students to different test facilities and their usage methods to determine characteristics of Civil Engineering materials.

B. COURSE OBJCTIVES

C. On completion of the course, students will be able to –

1. Use Universal testing machine to determine the stress-strain relation in steel.
2. Carry out tests to determine cement characteristics and strength.
3. Investigate properties of aggregates
4. Conduct tests to determine concrete workability and compressive strength
5. To perform non-destructive tests on concrete
6. To conduct strength tests on different types of bricks

D. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	MATERIAL TESTING LABORATORY	60
2	CONCRETE LABORATORY	30

E. COURSE CONTENTS

I. Material Testing Laboratory:

1. Test on Steel

Determination of Young's Modulus of steel in a tensile testing machine.

2. Tests on Cement, Sands, Bricks, Blocks & Aggregates

2.1 Determination of fineness of Cement by sieving.

2.2 Determination of normal Consistency, initial and final setting time of Cement

2.3 Determination of soundness of Cement by Le-Chatelier apparatus.

2.4 Determination of Compressive Strength of cement.

2.5 Determination of Compressive Strength of Burnt clay, Fly Ash Bricks and Blocks.

2.6 Grading of Fine & Coarse aggregate by sieving for concrete .

2.7 Determination of Specific Gravity and Bulking of sand.

2.8 Determination of Specific Gravity and Bulk density of coarse aggregate.

2.9 Grading of Road Aggregates.

2.10 Determination of Flakiness, Elongation of Road aggregates.

2.11 Determination of Crushing Value Test of aggregates.

2.12 Los-Angeles Abrasion Test of aggregate.

2.13 Impact test of aggregate.

2.14 Determination of soundness test of road aggregates.

II. Concrete Laboratory

3.1 Determination of Compressive Strength of concrete cubes.

3.2 Determination of Workability of concrete by:

a) Slump Cone method,
b) Compaction Factor method.

3.3 Non Destructive tests on Concrete:

a) Demonstration on Rebound hammer
b) Ultrasonic Pulse Velocity measuring Instrument.

F. RECOMMENDED BOOKS

Learning Resources			
Text Books			
Sl. No	**Name of Authors**	**Titles of Book**	**Name of Publisher**
1	M. L. Gambhir	Concrete Manual-A Laboratory Manual For Quality of Concrete	Dhanpat Rai & Co. Pvt. Ltd.
2	Dr. M.Chakraborty	Cement,Aggregate and concrete Laboratory Manual	
3	S.K.Khanna & C.E.G.Justo	Highway material testing Laboratory manual	Nem Chand & Bros,Roorkee,India
4	Ajay K. Duggal & Vijay P Puri	Laboratory manual in Highway Engg.	New Age Int.Publishers
5	Dr.M.R.Samal	Civil Engineering Laboratory Practice-I	Kalyani Publishers

Pr2. CIVIL ENGINEERING DRAWING-I

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	3rd
Total Period:	75	Examination	2 hrs
Theory periods:	5P/week	Term Work	25
Maximum marks:	75	End Semester Examination:	50

A. RATIONALE

The course aims to prepare the students to use modern engineering tools to prepare building drawings.

B. COURSE OBJCTIVES

After completion of the course, students will be able to

CO1- Use AutoCAD modules to prepare engineering drawings
CO2- Comprehend various drawing commands available in CAD software
CO3- Prepare plan, elevation and section views of flat roof buildings
CO4- Prepare plan, elevation and section views of inclined roof buildings
CO5- Generate drawings of building citing material differences
CO6- Generate building plans following prescribed regulations in established codes.

C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	AutoCAD software	25
2	Plan, elevation and sectional elevation of flat roof building from line diagram and given specifications using AutoCAD software	25
3	Plan, elevation and section of inclined roof building with a/c sheet/gci/tiles on wooden structure using AutoCAD software	10
4	Building planning	15

D. COURSE CONTENTS

1. AutoCAD SOFTWARE.

- **1.1** Recap of the Draw, Format, Edit, Dimension, Modify commands
- **1.2** Draw 2D drawings of the following Building Components - Doors, Windows, Cross section through wall, Spread footing, Column footing, Stairs case, R.C.C. T-beam and slab
- **1.3** Develop Isometric drawings of simple objects
- **1.4** Develop 3D drawings of simple objects.

2 PLAN, ELEVATION AND SECTIONAL ELEVATION OF FLAT ROOF BUILDING FROM LINE DIAGRAM AND GIVEN SPECIFICATIONS with use of AutoCAD software.

- **2.1** Plan at window sill level of a single storeyed R.C. roof slab building with elevation and sectional views form given line diagram and specification.
- **2.2** Detail drawing of Double storeyed pucca building with R.C.C. stair case from line diagram and given specification.

2.3 Preparation of approval drawing of a residential building as per the norms of local approving authority with site plan, index plan etc.

3 PLAN, ELEVATION AND SECTION OF INCLINED ROOF BUILDING WITH AC SHEET/GCI/TILES ON WOODEN STRUCTURE with use of AutoCAD Commands

Detail drawing of inclined roof building from given line diagram and specification. (gabbled / hipped)

4. **BUILDING PLANNING**

4.1 Planning of buildings for specific cost based on approximate plinth area rate.

4.2 Orientation of buildings, location of openings and living areas.

4.3 Line plan of School, hostel, market complex and dispensary building.

E. RECOMMENDED BOOKS

Learning Resources			
Text Books			
Sl. No	**Name of Authors**	**Titles of Book**	**Name of Publisher**
1	M.Chakrobarty	Civil Engg. Drawing	M.Chakrobarty
2	B.P.Verma	Civil Engineering drawing &House Planning	Khanna Publishers
3	Govt Of India	IS12556, 10713&I.S-696	BIS Publication
4	V.Thanikachalama & K.V Natarajan	Civil Engineering drawing Manual	S Chand & Co Pvt Ltd
5	G.V.Krishnan & Thomas A. Stellman	Harnessing AutoCAD	Delmar Cengage Learning
	George Omura	Mastering AutoCAD	Sybex
	William G. Wyatt	AutoCAD (Architecture) –latest edition	Delmar Cengage Learning

Pr3. ESTIMATING PRACTICE

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4th
Total Period:	45	Examination	
Lab. periods:	3 P/week	Term Work	25
Maximum marks:	25	End Semester Examination:	00

A. RATIONALE

The course will enable the students to develop detailed estimate and prepare bill of materials essential for buildings in accordance with prescribed codes.

B. COURSE OBJCTIVES

After completion of the course, students will be able to

CO1- Prepare estimates fir 2 room single storey building

CO2- Prepare estimate for 2 storeyed buildings

CO3- Comprehend the schedule and analysis of rates offered by State Works Department

CO4- Use MX Excel to prepare analysis of rates

CO5- Evaluate dry material list and cost associated using MS Excel

CO6- Prepare abstract of costs and bill of materials for single storey and double storey buildings

C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Estimate for plinth area	21
2	Analysis of rates	09
3	Dry material calculation	09
4	Cost estimate and bill of quantities	06

D. COURSE CONTENTS

1.0 Preparation of plinth area estimate & detailed estimate for the following ;

- 1.1 Single storeyed two roomed building with specification as per Orissa P.W.D. schedule of rates and analysis of rates
- 1.2 A two storeyed pucca Building with specification as per Orissa P.W.D. schedule of rates and analysis of rates

2.0 Analysis of rates in detail for the above items of works basing on Orissa Govt. analysis of rate with help of **MS Excel software.**

3.0 Calculation of dry materials for different items of building basing on Orissa Govt. analysis of rate with help of **MS Excel software**

4.0 Preparation of abstract of cost and bill of quantities of the estimates as per item no. 1.0 above with help of **MS Excel software**

E. RECOMMENDED BOOKS

Learning Resources			
Text Books			
Sl. No	**Name of Authors**	**Titles of Book**	**Name of Publisher**
1	M.Chakrobarty	Estimating,Costing,specification &Valuation in Civil Engineering	Chakrobarty
2	B.N.Dutta	Estimating &Costing in Civil Engg.	UBS Publishers' Distributors Pvt. Ltd
3	G.S.Birdie	Text Book of Estimating &Costing	Dhanpat Rai Publishing Company Pvt. Ltd
4	Govt. of Odisha	Latest Orissa PWD Schedule of Rates & Analysis of rates	Govt. of Odisha

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA									
TEACHING AND EVALUATION SCHEME FOR 3rd Semester Electrical Engg.(wef 2019-20)									
Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional:	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Engineering Mathematics-III	4		-	20	80	3	100
Th.2		Circuit and Network Theory	4	1	-	20	80	3	100
Th.3		Element of Mechanical Engineering	4		-	20	80	3	100
Th.4		Electrical Engineering Material	4			20	80	3	100
Th.5		Environmental studies	4			20	80	3	100
		Total	20	01		100	400	-	500
		Practical							
Pr.1		Mechanical Engineering Lab	-	-	3	25	50	3	75
Pr.2		Circuit and Simulation Lab	-	-	6	50	50	3	100
Pr.3		Mechanical Workshop	-	-	6	25	50	3	75
		Student Centred Activities(SCA)		-	3	-	-	-	-
		Total	-	-	*18*	*100*	*150*	-	*250*
		Grand Total	**20**	**01**	**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 3RD SEMESTER

For

DIPLOMA IN ENGINEERING

(Effective FROM 2019-20 Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

Th1. ENGINEERING MATHEMATICS – III

(COMMON TO ELECT,ETC, AE & I and other Allied branches of Electrical and ETC)

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	3rd
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination ::	80

A. RATIONALE:

The subject engineering mathematics-III is a common paper for engineering branches. This subject includes complex numbers, Matrices, Laplace Transforms, Fourier series, Differential equations and Numerical Methods etc for solution of engineering problems.

B. OBJECTIVE:

On completion of study of Engineering Mathematics-III, the students will be able to:

1. Apply complex number concept in electricity , Quadratic equation , Imaginary numbers in signal processing, Radar & even biology (Brain Waves)
2. Apply Matrices in Engineering fields such as Electrical Circuits and Linear programming.
3. Transform Engineering problems to mathematical models with the help of differential equations and familiarize with the methods of solving by Analytical methods, Transform method and operator method and Numerical methods.
4. Solve algebraic equations by iterative Methods easily programmable in computers.
5. Analysis data and develop interpolating polynomials through method of differences

C. Topic wise distribution of periods:

Sl. No.	Topics	Period
1	Complex Numbers	06
2	Matrices	04
3	Differential Equations	10
4	Laplace transforms	12
5	Fourier Series	12
6	Numerical Methods	04
7	Finite difference & interpolation	12
	Total:	**60**

D. COURSE CONTENTS

1. Complex Numbers

1.1 Real and Imaginary numbers.
1.2 Complex numbers, conjugate complex numbers, Modulus and Amplitude of a complex number.
1.3 Geometrical Representation of Complex Numbers.
1.4 Properties of Complex Numbers.
1.5 Determination of three cube roots of unity and their properties.

1.6 De Moivre's theorem
1.7 Solve problems on 1·1 - 1·6

2. Matrices

2.1. Define rank of a matrix.
2.2. Perform elementary row transformations to determine the rank of a matrix.
2.3. State Rouche's theorem for consistency of a system of linear equations in n unknowns.
2.4. Solve equations in three unknowns testing consistency.
2.5. Solve problems on 2.1 – 2.4

3. Linear Differential Equations

3.1. Define Homogeneous and Non – Homogeneous Linear Differential Equations with constant coefficients with examples.
3.2. Find general solution of linear Differential Equations in terms of C.F. and P.I.
3.3. Derive rules for finding C.F. And P.I. in terms of operator D, excluding $\frac{1}{f(D)}x^n$.
3.4. Define partial differential equation (P.D.E) .
3.5. Form partial differential equations by eliminating arbitrary constants and arbitrary functions.
3.6. Solve partial differential equations of the form Pp + Qq = R
3.7. Solve problems on 3.1- 3.6

4. Laplace Transforms

4.1. Define Gamma function and $\Gamma(n+1) = n!$ and find $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$.
4.2. Define Laplace Transform of a function $f(t)$ and Inverse Laplace Transform .
4.3. Derive L.T. of standard functions and explain existence conditions of L.T.
4.4. Explain linear, shifting property of L.T.
4.5. Formulate L.T. of derivatives, integrals, multiplication by t^n and division by t.
4.6. Derive formulae of inverse L.T. and explain method of partial fractions .
4.7. solve problem on 4.1- 4.6

5. Fourier Series

5.1. Define periodic functions.
5.2. State Dirichlet's condition for the Fourier expansion of a function and it's convergence
5.3. Express periodic function $f(x)$ satisfying Dirichlet's conditions as a Fourier series.
5.4. State Euler's formulae.
5.5. Define Even and Odd functions and find Fourier Series in ($0 \le x \le 2\pi$ *and* $-\pi \le x \le \pi$).
5.6. Obtain F.S of continuous functions and functions having points of discontinuity in ($0 \le x \le 2\pi$ *and* $-\pi \le x \le \pi$)
5.7. Solve problems on 5.1 – 5.6

6. Numerical Methods

6.1. Appraise limitation of analytical methods of solution of Algebraic Equations.
6.2. Derive Iterative formula for finding the solutions of Algebraic Equations by :

6.2.1. Bisection method
6.2.2. Newton- Raphson method

6.3. solve problems on 6.2

7. Finite difference and interpolation

7.1. Explain finite difference and form table of forward and backward difference.
7.2. Define shift Operator (E) and establish relation between E & difference operator(Δ).
7.3. Derive Newton's forward and backward interpolation formula for equal intervals.
7.4. State Lagrange's interpretation formula for unequal intervals.
7.5. Explain numerical integration and state:
7.5.1. Newton's Cote's formula.
7.5.2. Trapezoidal rule.
7.5.3. Simpson's 1/3rd rule
7.6. Solve problems on 7.1- 7.5

Syllabus to be covered up to I.A.
Chapter: 1,2,3 and 4

Learning Resources:			
Sl.No	**Title of the Book**	**Name of Authors**	**Name of Publisher**
1.	Higher engineering mathematics	Dr B.S. Grewal	khanna publishers
2.	Elements of mathematics Vol-1	Odisha state bureau of text book preparation and production	
3.	Text Book of Engineering Mathematics-I	C.R Mallick	Kalayani publication
4.	Text Book of engineering mathematics-III	C.R Mallick	Kalayani publication

Th2. Circuit and Network Theory

(Common to Electrical /EEE/E&M/EIC)

Name of the Course: Diploma in Electrical Engineering			
Course code:			
Total Period:	75(60L+15T)	Semester	3rd
Theory periods:	4P/week	Examination :	3 hrs
Tutorial:	1P/week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination ::	80

A. Rationale:

Study of Magnetic and Electric Circuits are essential in study of Electrical Engineering. Study of Circuits, Network and Filters constitutes the basic and fundamental aspect of deriving insight into the functioning and analysis of Electrical network, instruments and machineries.

B. Objectives:

After completion of this subject the student will be able to:

1. To develop the concept on Electrical circuit parameters
2. To develop problem solving ability on magnetic Circuit.
3. To develop knowledge on network analysis
4. Use of theorems in problem solving.
5. To develop knowledge on R-L, R-C and R-L-C circuit analysis in A.C
6. To understand the behavior of circuit in transient condition.
7. To develop knowledge of filters and their circuit characteristics

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Name of the Topic	Period
1	Magnetic Circuits	07
2	Coupled Circuits	05
3	Circuit Elements And Analysis	06
4	Network Theorems	08
5	Ac Circuit And Resonance	08
6	Poly-phase Circuit	06
7	Transients	06
8	Two-Port Network	08
9	Filters	06
	TOTAL	**60**

D. COURSE CONTENT:

1. MAGNETIC CIRCUITS

1 . 1 Introduction
1 . 2 Magnetizing force, Intensity, MMF, flux and their relations
1 . 3 Permeability, reluctance and permeance
1 . 4 Analogy between electric and Magnetic Circuits
1 . 5 B-H Curve
1 . 6 Series & parallel magnetic circuit.
1 . 7 Hysteresis loop

2. COUPLED CIRCUITS:

2 . 1 Self Inductance and Mutual Inductance
2 . 2 Conductively coupled circuit and mutual impedance
2 . 3 Dot convention
2 . 4 Coefficient of coupling
2 . 5 Series and parallel connection of coupled inductors.
2 . 6 Solve numerical problems

3. CIRCUIT ELEMENTS AND ANALYSIS:

3 . 1 Active, Passive, Unilateral & bilateral, Linear & Non linear elements
3 . 2 Mesh Analysis, Mesh Equations by inspection
3 . 3 Super mesh Analysis
3 . 4 Nodal Analysis, Nodal Equations by inspection
3 . 5 Super node Analysis.
3 . 6 Source Transformation Technique
3 . 7 Solve numerical problems (With Independent Sources Only)

4. NETWORK THEOREMS:

4.1 Star to delta and delta to star transformation
4.2 Super position Theorem
4.3 Thevenin's Theorem
4.4 Norton's Theorem
4.5 Maximum power Transfer Theorem.
4.6 Solve numerical problems (With Independent Sources Only)

5. AC CIRCUIT AND RESONANCE:

5.1 A.C. through R-L, R-C & R-L-C Circuit
5.2 Solution of problems of A.C. through R-L, R-C & R-L-C series Circuit by complex algebra method.
5.3 Solution of problems of A.C. through R-L, R-C & R-L-C parallel & Composite Circuits

5.4 Power factor & power triangle.
5.5 Deduce expression for active, reactive, apparent power.
5.6 Derive the resonant frequency of series resonance and parallel resonance circuit
5.7 Define Bandwidth, Selectivity & Q-factor in series circuit.
5.8 Solve numerical problems

6. **POLYPHASE CIRCUIT**
6.1 Concept of poly-phase system and phase sequence
6.2 Relation between phase and line quantities in star & delta connection
6.3 Power equation in 3-phase balanced circuit.
6.4 Solve numerical problems
6.5 Measurement of 3-phase power by two wattmeter method.
6.6 Solve numerical problems.

7. **TRANSIENTS:**
7.1 Steady state & transient state response.
7.2 Response to R-L, R-C & RLC circuit under DC condition.
7.3 Solve numerical problems

8. **TWO-PORT NETWORK:**
8.1 Open circuit impedance (z) parameters
8.2 Short circuit admittance (y) parameters
8.3 Transmission (ABCD) parameters
8.4 Hybrid (h) parameters.
8.5 Inter relationships of different parameters.
8.6 T and π representation.
8.7 Solve numerical problems

9. **FILTERS:**
9.1 Define filter
9.2 Classification of pass Band, stop Band and cut-off frequency.
9.3 Classification of filters.
9.4 Constant – K low pass filter.
9.5 Constant – K high pass filter.
9.6 Constant – K Band pass filter.
9.7 Constant – K Band elimination filter.
9.8 Solve Numerical problems

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 the publisher**
1	Electrical Technology Volume – I [for module: 2 only]	B. L. Thereja	S. Chand
2	Introduction to CIRCUIT ANDNETWORK	Gargi Basu	Platinum

3	Network Analysis and Synthesis	B.R.Gupta	S.CHAND
4	Circuit and Networks	Sakhija & Nagsarkar	OXFORD
5	CIRCUIT & NETWORKS for modules:- 1,3,4,5,6,7,8,9	A. Sudhakar & Shyam Mohan S Palli	Tata McGraw Hill
6	Introduction to Circuit and Network	Gargi Basu	Platinum Publishers

Th3. Elements of Mechanical Engineering

(Common to Electrical and EEE)

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	3rd
Total Period:	60	Examination :	3 hrs
Theory periods:	4P/week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination ::	80

A. Rationale:

This subject has been introduced with a view to provide adequate understanding of properties of steam, thermodynamic laws, Boilers, Turbines, Condensers to the students of electrical engineering since these form the basic and fundamental aspect for drive mechanisms used in generation of electricity

B. Objectives:

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

1. Explain the principle of working of Boilers, Turbines and condensers.
2. State the different types of boilers and Turbines and their uses.
3. Explain the properties of steam.
4. State and explain thermodynamic laws.

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl No.	Topic	Periods
1.	THERMODYNAICS	06
2.	PROPERTIES OF STEAM	05
3.	BOILERS	10
4.	STEAM ENGINES	10
5.	STEAM TURBINES	06
6.	CONDENSER	04
7.	I.C. ENGINE	04
8.	HYDROSTATICS	05
9.	HYDROKINETICS	05
10.	HYDRAULIC DEVICES AND PNEUMATICS	05
	TOTAL	**60**

D. **Course Content :**

1. THERMODYNAICS:
   - 1 . 1 State Unit of Heat and work, 1st law of thermodynamics.
   - 1 . 2 State Laws of perfect gases
   - 1 . 3 Determine relationship of specific heat of gases at constant volume and constant pressure.
2. PROPERTIES OF STEAM:
   - 2.1 Use steam table for solution of simple problem
   - 2.2 Explain total heat of wet, dry and super heated steam
3. BOILERS:
   - 3 . 1 State types of Boilers

3 . 2 Describe Cochran, Babcock Wilcox boiler
3 . 3 Describe Mountings and accessories

4. STEAM ENGINES:
   4.1 Explain the principle of Simple steam engine
   4.2 Draw Indicator diagram
   4.3 Calculate Mean effective pressure, IHP and BHP and mechanical efficiency.
   4.4 Solve Simple problem.
5. STEAM TURBINES:
   5.1 State Types
   5.2 Differentiate between impulse and reaction Turbine
6. CONDENSER:
   6.1 Explain the function of condenser
   6.2 State their types
7. I.C. ENGINE:
   7.1 Explain working of two stroke and 4 stroke petrol and Diesel engines.
   7.2 Differentiate between them
8. HYDROSTATICS:
   8.1 Describe properties of fluid
   8.2 Determine pressure at a point, pressure measuring Instruments
9. HYDROKINETICS:
   9.1 Deduce equation of continuity of flow
   9.2 Explain energy of flowing liquid
   9.3 State and explain Bernoulli's theorem
10. HYDRAULIC DEVICES AND PNEUMATICS:
   10.1 Intensifier
   10.2 Hydraulic lift
   10.3 Accumulator
   10.4 Hydraulic ram

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	Thermal Engineering	R. S. Khurmi	S Chand
2	Hydraulics & Hydraulic M/Cs	A. R. Basu	Dhanpat Rai & Co.
3	Thermal Engineering	A. S. Sarad	Satyaprakashan
4	Hydraulics & Hydraulic M/Cs	R. K. Bansal	Laxmi Publishers

Th4. ELECTRICAL ENGINEERING MATERIAL

(Common to Electrical /E&M)

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	3rd
Total Period:	60	Examination :	3 hrs
Theory periods:	4P/week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination ::	80

A. Rationale:

Electrical Engg. Materials hold prime importance for Electrical Engineers in design, installation & maintenance of electrical equipments. With the advent of latest metallurgical processes the materials used in the design processes brings safer and hazard free electrical installations. Hence basic knowledge on electrical Engineering materials is essential.

B. Objectives:

1. To clarify the students on insulating, conducting & magnetic materials.
2. To impart knowledge on the Physical, Electrical & Mechanical properties
3. To impart knowledge on practical uses of various materials in different areas.

C.TOPIC WISE DISTRIBUTION OF PERIODS

Sl No.	Topic	Periods
1.	Conducting materials	16
2.	Semiconducting materials	10
3.	Insulating materials	09
4.	Dielectric materials	08
5.	Magnetic materials	08
6.	Material for special purposes	09
	Total:	**60**

D. COURSE CONTENT:

1. **Conducting Materials:**
   - 1 . 1 Introduction
   - 1 . 2 Resistivity, factors affecting resistivity
   - 1 . 3 Classification of conducting materials into low-resistivity and high resistivity materials
   - 1 . 4 Low Resistivity Materials and their Applications. (Copper, Silver, Gold, Aluminum, Steel)

1.5 Stranded conductors
1.6 Bundled conductors
1.7 Low resistivity copper alloys
1.8 High Resistivity Materials and their Applications(Tungsten, Carbon, Platinum, Mercury)
1.9 Superconductivity
1.10 Superconducting materials
1.11 Application of superconductor materials

2. **Semiconducting Materials:**

2.1 Introduction
2.2 Semiconductors
2.3 Electron Energy and Energy Band Theory
2.4 Excitation of Atoms
2.5 Insulators, Semiconductors and Conductors
2.6 Semiconductor Materials
2.7 Covalent Bonds
2.8 Intrinsic Semiconductors
2.9 Extrinsic Semiconductors
2.10 N-Type Materials
2.11 P-Type Materials
2.12 Minority and Majority Carriers
2.13 Semi-Conductor Materials
2.14 Applications of Semiconductor materials
2.14.1 Rectifiers
2.14.2 Temperature-sensitive resisters or thermistors
2.14.3 Photoconductive cells
2.14.4 Photovoltaic cells
2.14.5 Varisters
2.14.6 Transistors
2.14.7 Hall effect generators
2.14.8 Solar power

3. **Insulating Materials:**

3.1 Introduction
3.2 General properties of Insulating Materials
3.2.1 Electrical properties
3.2.2 Visual properties
3.2.3 Mechanical properties
3.2.4 Thermal properties
3.2.5 Chemical properties
3.2.6 Ageing
3.3 Insulating Materials – Classification, properties, applications
3.3.1 Introduction
3.3.2 Classification of insulating materials on the basis physical and

chemical structure

3.4 Insulating Gases

3.4.1 Introduction.

3.4.2 Commonly used insulating gases

4. **Dielectric Materials:**

4.1 Introduction

4.2 Dielectric Constant of Permittivity

4.3 Polarization

4.4 Dielectric Loss

4.5 Electric Conductivity of Dielectrics and their Break Down

4.6 Properties of Dielectrics.

4.7 Applications of Dielectrics.

5. **Magnetic Materials:**

5.1 Introduction

5.2 Classification

5.2.1 Diamagnetism

5.2.2 Para magnetism

5.2.3 Ferromagnetism

5.3 Magnetization Curve

5.4 Hysteresis

5.5 Eddy Currents

5.6 Curie Point

5.7 Magneto-striction

5.8 Soft and Hard magnetic Materials

5.8.1 Soft magnetic materials

5.8.2 Hard magnetic materials

6. **Materials for Special Purposes**

6.1 Introduction

6.2 Structural Materials

6.3 Protective Materials

6.3.1 Lead

6.3.2 Steel tapes, wires and strips

6.4 Other Materials

6.4.1 Thermocouple materials

6.4.2 Bimetals

6.4.3 Soldering Materials

6.4.4 Fuse and Fuse materials.

6.4.5 Dehydrating material.

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	Electrical Engineering Material & Electronic components	K.B.Raina, S.K. Bhattacharya, T. Joneja	S. K. Kataria & Sons
2	An Introduction to Electrical Engineering Materials	C.S.Indulkar, S.Thiruvengadam	S. Chand
3	Electrical Engineering Materials	R.K.Shukla, Archana Singh	Mc Graw Hill

Th5. ENVIRONMENTAL STUDIES

(Common to all Branches)

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	3rd
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination ::	80

A. RATIONALE:

Due to various aspects of human developments including the demand of different kinds of technological innovations, most people have been forgetting that, the Environment in which they are living is to be maintained under various living standards for the preservation of better health. The degradation of environment due to industrial growth is very much alarming due to environmental pollution beyond permissible limits in respect of air, water industrial waste, noise etc. Therefore, the subject of Environmental Studies to be learnt by every student in order to take care of the environmental aspect in each and every activity in the best possible manner.

B. OBJECTIVE:

After completion of study of environmental studies, the student will be able to:

1. Gather adequate knowledge of different pollutants, their sources and shall be aware of solid waste management systems and hazardous waste and their effects.
2. Develop awareness towards preservation of environment.

C. Topic wise distribution of periods:

Sl. No.	Topics	Period
1	The Multidisciplinary nature of environmental studies	04
2	Natural Resources	10
3	Systems	08
4	Biodiversity and it's Conservation	08
5	Environmental Pollution	12
6	Social issues and the Environment	10
7	Human population and the environment	08
	Total:	**60**

D. COURSE CONTENTS

1. The Multidisciplinary nature of environmental studies:

1.1 Definition, scope and importance.

1.2 Need for public awareness.

2. Natural Resources:

Renewable and non renewable resources:

2.1 Natural resources and associated problems.

2.1.1. Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction mining, dams and their effects on forests and tribal people.

2.1.2. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.

2.1.3. Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources.

2.1.4. Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity, .

2.1.5. Energy Resources: Growing energy need, renewable and non-renewable energy sources, use of alternate energy sources, case studies.

2.1.6. Land Resources: Land as a resource, land degradation, man induces landslides, soil erosion, and desertification.

2.2 Role of individual in conservation of natural resources.

2.3 Equitable use of resources for sustainable life styles.

3. **Systems:**

3.1. Concept of an eco system.

3.2. Structure and function of an eco system.

3.3. Producers, consumers, decomposers.

3.4. Energy flow in the eco systems.

3.5. Ecological succession.

3.6. Food chains, food webs and ecological pyramids.

3.7. Introduction, types, characteristic features, structure and function of the following eco system:

3.8. Forest ecosystem:

3.9. Aquatic eco systems (ponds, streams, lakes, rivers, oceans,

estuaries).

4. **Biodiversity and it's Conservation:**

4.1. Introduction-Definition: genetics, species and ecosystem diversity.
4.2. Biogeographically classification of India.
4.3. Value of biodiversity: consumptive use, productive use, social ethical, aesthetic and optin values.
4.4. Biodiversity at global, national and local level.
4.5. Threats to biodiversity: Habitats loss, poaching of wild life, man wildlife conflicts.

5. **Environmental Pollution:**

5.1. Definition Causes, effects and control measures of:

5.1.1 Air pollution.
5.1.2 Water pollution.
5.1.3 Soil pollution
5.1.4 Marine pollution
5.1.5 Noise pollution.
5.1.6 Thermal pollution
5.1.7 Nuclear hazards.

5.2. Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
5.3. Role of an individual in prevention of pollution.
5.4. Disaster management: Floods, earth quake, cyclone and landslides.

6. **Social issues and the Environment:**

6.1. Form unsustainable to sustainable development.
6.2. Urban problems related to energy.
6.3. Water conservation, rain water harvesting, water shed management.
6.4. Resettlement and rehabilitation of people; its problems and concern.
6.5. Environmental ethics: issue and possible solutions.
6.6. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.
6.7. Air (prevention and control of pollution) Act.
6.8. Water (prevention and control of pollution) Act.
6.9. Public awareness.

7. **Human population and the environment:**

7.1. Population growth and variation among nations.
7.2. Population explosion- family welfare program.
7.3. Environment and humanhealth.
7.4. Human rights.
7.5. Value education

7.6. Role of information technology in environment and human health.

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.	Textbook of Environmental studies	Erach Bharucha	#UGC
2.	Fundamental concepts in Environmental Studies	D.D. Mishra	S.Chand & Co-Ltd
3.	Text book of Environmental Studies	K.Raghavan Nambiar	SCITECH Publication Pvt. Ltd.
4.	Environmental Engineering	V.M.Domkundwar	Dhanpat Rai & Co

Pr1. MECHANICAL ENGINEERING LABORATORY

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	3rd
Total Period:	45	Examination :	3 hrs
Lab. periods:	3 P / week	Sessional:	25
Maximum marks:	75	End Semester Examination ::	50

1. APPLIED MECHANICS & MATERIAL TESTING

1.1 Determination of M.A.,V.R. and efficiency of Screw Jack

1.2 Determination of friction co-efficient of bearing

1.3 Determination of Young's modulus by Searle's Apparatus

1.4 Determination of M.A.,V.R. and efficiency of wheel train

1.5 Determination of Bending stress in beam using strain gauge

1.6 Study of Universal Testing Machine and determination of tensile stress and Young's module of M.S specification.

2. HYDRAULICS & HYDRAULIC MACHINE LAB

2.1 Study of pressure measuring devices such as (a) Piezo-meter (b) Simple manometer

2.2 Study of venturi-meter

2.3 Verification of Bernouli's Theorem

2.4 Model study of Centrifugal pumps, Francis, Turbine, Kaplan turbine and Pelton wheel.

3. HEAT ENGINE LAB

3.1 Study of Cochran Boiler

3.2 Study and demonstration of Stream Engine

3.3 Study and demonstration of Diesel Engine

3.4 Study and demonstration of Petrol Engine

Pr2. CIRCUIT AND SIMULATION LAB

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	3rd
Total Period:	90	Examination :	3hrs
Lab. periods:	6 P / week	Sessional:	50
Maximum marks:	100	End Semester Examination ::	50

A. Rationale:

The response of Electrical Circuit can be verified practically by applying different theorems and fundamental techniques. The students will become sure that the theoretical tricks which they have learned from books are true. The students will become competent in the field of circuit analysis

B. Objective:

On completion of the lab course the student will be able to:

1. Verify the theorems using different components.
2. Know the various types of filters.
3. Simulate different circuits using P-Spice/MATLAB software.

C. Course content in terms of specific objectives:

1. Measurement of equivalent resistance in series and parallel circuit
2. Measurement of power and power factor using series R-L-C Load.
3. Verification of KCL and KVL.
4. Verification of Super position theorem
5. Verification of Thevenin's Theorem
6. Verification of Norton's Theorem
7. Verification of Maximum power transfer Theorem
8. Determine resonant frequency of series R-L-C circuit.
9. Study of Low pass filter & determination of cut-off frequency
10. Study of High pass filter & determination of cut-off frequency
11. Analyze the charging and discharging of an R-C & R-L circuit with oscilloscope and Compute the time constant from the tabulated data and determine the rise time graphically.
12. Construct the following circuits using P-Spice/MATLAB software and compare the measurements and waveforms.
    i. Superposition theorem
    ii. Series Resonant Circuit
    iii. Transient Response in R-L-C series circuit

Note: P-Spice/MATLAB software might be loaded in 10 systems.

Pr3. MECHANICAL WORKSHOP PRACTICE

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	3rd
Total Period:	90	Examination:	3 hrs
Lab. periods:	6 P / week	Sessional:	25
Maximum marks:	75	End Semester Examination ::	50

1. Carpentry:

1 . 1 Name of carpentry tools and uses

1 . 2 Different operations

a. Sawing
b. Planning
c. Chiseling

1 . 3 Measuring & Marking

1 . 4 Different types of timbers used by carpenters, substitutions of timbers.

1 . 5 Jobs :

a. Slot. Notch
b. Mortise and tenon joint
c. Single dovetail joint

2. Turning

Study of S. C. Lathes and their accessories, practice in lathe work involving various operations such as plane turning, step turning, tapper turning, knuckling and external V. Threading. (One job only.)

List of Equipments for a batch size thirty (Electrical Laboratory)

Sl. No.	Equipment	Quantity
1	DC SHUNT MOTOR coupled with a DC SHUNT GENERATOR (MG SET)	
2	DC SERIES MOTOR	
3	DC SHUNT MOTOR	
4	DC COMPOUND MOTOR	
5	1- PHASE TRANSFORMER	
6	MULTIMETER	
7	MEGGER	
8	VOLTMETER [MI type 0-30, 0-300, 0-150-300-600 V], [MC type 0-50, 0-100, 0-150, 0-300, 0-600, 0-75-150 V]	
9	AMMETER [MI type 0-100mA, 0-2.5, 0-5, 0-5-10A] [MC type 0-100ma, 0-500 ma,0-1, 0-2.5, 0-3, 0-5A]	
10	WATTMETER [LPF-150W, 300W, 600W], [UPF 700W, 1400W]	
11	TACHOMETER [ANALOG & DIGITAL 0-10,000 rpm]	
12	P.F METER [5A,250V,0.5P.F]	
13	VARIABLE RESISTANCE (50Ω,5Amp)	
14	VARIABLE RESISTANCE (100Ω,5Amp)	
15	VARIABLE RESISTANCE (150Ω,5Amp)	
17	VARIABLE RESISTANCE (600Ω,1.2 Amp)	
18	VARIABLE RESISTANCE (20Ω,5Amp)	
19	RESISTIVE LOAD BOX (1.2KW)	
20	LAMP LOAD BOX (1.2 KW)	
21	STARTER (3 point)	
22	STARTER (4 point)	
23	BALL PIN HAMMER	
24	MALLET HAMMER	
25	COMBINATION PLIER	
26	NOSE PLIER	
27	WIRE GAUGE	
28	WIRE STRIPPER	
29	NEON TESTER(240V)	
30	MEASURINGTAPE(30M)	
31	SCREW DRIVER(10 INCH)	
32	SCREW DRIVER(5 INCH)	
33	ELECTRICIAN KNIFE	
34	WIRE CUTTER	
35	PVC TAPE	
36	Fuse(240v,5 amp)	
37	Fuse(240v,15 amp)	
38	One way switch(240v,5Amp)	
39	One way switch(240v,15Amp)	
40	Combination plier	
41	Nose plier	

42	Wire gauge	
43	Wire stripper	
44	Incandsecent lamp(180w,230v)	
45	Flourescent tube(40w,230v)	
46	Choke(230v)	
47	Starter	
48	Tubelight stand	
49	Lamp holder	
50	Sodium vapour lamp set	
51	Mercury vapour lamp	
52	Icdp switch(230v,5 amp)	
53	Ictp switch(400v,15 amp)	
54	Pcv board(2×2)	
55	Pcv board(2×4)	
56	Pcv board(4×6)	
57	Pcv board(6×6)	
58	Pcv board(4×10)	
59	Pcv board(6×8)	
60	Junction box	
61	PVC CONDUIT PIPE(20m)	
62	BATTENT(1.5 inch,10 m)	
63	CASING CAPPING(20m)	
64	5Pin Socket(230v,5Amp)	
65	5Pin Socket(230v,15Amp)	
66	Extention Chord(30m)	
67	FAN REGULATOR	
68	BEARING PULLER	
69	CAPACITOR(2.5µf,230V)	
70	CAPACITOR(3µf,230V)	
71	CEILING FAN	
72	PEDESTAL FAN	
73	BATTERY CHARGER [0-12-24 V]	
74	BANDPASS FILTER	
75	LOW PASS FILTER	
76	HIGH PASS FILTER	
77	BAND ELIMINATION FILTER	
78	CONSTANT K TYPE BANDPASS FILTER	
79	CRO	
80	FUNCTION GENERATOR	
81	NETWORK THEOREM KIT	
82	PARALLEL RESONANCE TRAINER KIT	
83	RC CIRCUIT AND TIME CONSTANT KIT	
84	SERIES RESONANCE TRAINER KIT	

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA									
TEACHING AND EVALUATION SCHEME FOR 3rd Semester Mechanical Engg.(wef 2019-20)									
Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Production Technology	4		-	20	80	3	100
Th.2		Strength of Material	4		-	20	80	3	100
Th.3		Engineering. Material	4		-	20	80	3	100
Th.4		Thermal Engineering-I	4			20	80	3	100
Th.5		Environmental studies	4			20	80	3	100
		Total	20			100	400	-	500
		Practical							
Pr.1		Mechanical Engg. Drawing	-	-	6	25	50	3	75
Pr.2		Mechanical Engg. Lab-I	-	-	4	25	50	3	75
Pr.3		Workshop-II	-	-	6	50	50	4	100
		Student Centred 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									

CURRICULLUM OF 3RDSEMESTER

For

DIPLOMA IN MECHANICAL ENGINEERING

(Effective FROM 2019-20 Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

TH-1 PRODUCTION TECHNOLOGY

Name of the Course: Diploma in **Mech/Auto/Aero & Other Mechanical Allied Branches**

Course code:		Semester	3rd
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	I.A	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE :

Production Technology involves a working knowledge in the field of product design, product development and rapid part production. It deals with the production methodology and its management to make a complete analysis on the products.

B. COURSE OBJECTIVES

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

1. Understand the different components and processes involved in press tool operation.
2. Understand how to minimize the job setting and tool setting times in mass production.
3. Understand the industrial requirements of fabrication systems.
4. Understand the manufacturing processes like casting and powder metallurgy.

C. CHAPTER WISE DISTRIBUTION OF PERIODS

Sl. No.	Topic	Periods
01	Metal Forming Processes	07
02	Welding	16
03	Casting	16
04	Powder Metallurgy	07
05	Press Work	07
06	Jigs and fixtures	07
	Total Period:	60

D. COURSE CONTENTS

1.0 Metal Forming Processes

- 1.1 Extrusion: Definition & Classification
- 1.2 Explain direct, indirect and impact extrusion process.
- 1.3 Define rolling. Classify it.
- 1.4 Differentiate between cold rolling and hot rolling process.
- 1.5 List the different types of rolling mills used in Rolling process.

2.0 Welding

- 2.1 Define welding and classify various welding processes.
- 2.2 Explain fluxes used in welding.
- 2.3 Explain Oxy-acetylene welding process.
- 2.4 Explain various types of flames used in Oxy-acetylene welding process.
- 2.5 Explain Arc welding process.
- 2.6 Specify arc welding electrodes.
- 2.7 Define resistance welding and classify it.
- 2.8 Describe various resistance welding processes such as butt welding, spot welding, flash welding, projection welding and seam welding.

2.9 Explain TIG and MIG welding process
2.10 State different welding defects with causes and remedies.

3.0 Casting

3.1 Define Casting and Classify the various Casting processes.
3.2 Explain the procedure of Sand mould casting.
3.3 Explain different types of molding sands with their composition and properties.
3.4 Classify different pattern and state various pattern allowances.
3.5 Classify core.
3.6 Describe construction and working of cupola and crucible furnace.
3.7 Explain die casting method.
3.8 Explain centrifugal casting such as true centrifugal casting, centrifuging with advantages, limitation and area of application.
3.9 Explain various casting defects with their causes and remedies.

4.0 Powder Metallurgy

4.1 Define powder metallurgy process.
4.2 State advantages of powder metallurgy technology technique
4.3 Describe the methods of producing components by powder metallurgy technique.
4.4 Explain sintering.
4.5 Economics of powder metallurgy.

5.0 Press Work

5.1 Describe Press Works: blanking, piercing and trimming.
5.2 List various types of die and punch 7
5.3 Explain simple, Compound & Progressive dies
5.4 Describe the various advantages & disadvantages of above dies

6.0 Jigs and fixtures

6.1 Define jigs and fixtures
6.2 State advantages of using jigs and fixtures
6.3 State the principle of locations
6.4 Describe the methods of location with respect to 3-2-1 point location of rectangular jig
6.5 List various types of jig and fixtures.

Syllabus to be covered up to IA- Chapters 1, 2&3

LEARNING RESOURCES

Sl. No.	Author	Title of the book	Publisher
01	O.P. Khanna	Production Technology, Vol- I& II	Dhanpat Rai Publication
02	B.S Raghuwanshi	Workshop technology, Vol- I& II	Dhanpat Rai & Co
03	P.N. Rao	Manufacturing technology, Vol- I&II	TMH
04	P.C.Sharma	Manufacturing technology, Vol- I	S. Chand

TH-2 STRENGTH OF MATERIAL

Name of the Course: Diploma in **Mech/Auto/Aero & Other Mechanical Allied Branches**			
Course code:		Semester	3rd
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	I.A TEST	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE :

Strength of material deals with the internal behaviors of solid bodies under the action of external force. The subject focuses on mechanical properties of material analysis of stress, strain and deformations. Therefore it is an important basic subject of students for Mechanical and Automobile Engg.

B. COURSE OBJECTIVES:

Students will develop ability towards

- Determination of stress, strain under uniaxial loading (due to static or impact load and temperature) in simple and single core composite bars.
- Determination of stress, strain and change in geometrical parameters of cylindrical and spherical shells due to pressure
- Realization of shear stress besides normal stress and computation of resultant stress in two dimensional objects.
- Drawing bending moment and shear force diagram and locating points in a beam where the effect is maximum or minimum.
- Determination of bending stress and torsional shear stress in simple cases
- Understanding of critical load in slender columns thus realizing combined effect of axial and bending load.

C. CHAPTER WISE DISTRIBUTION OF PERIODS

Sl. No.	Topic	Periods
01	Simple Stress & Strain	10
02	Thin cylindrical and spherical shell under internal pressure	08
03	Two dimensional stress systems	10
04	Bending moment& shear force	10
05	Theory of simple bending	10
06	Combined direct & Bending stresses	06
07	Torsion	06
	Total Period:	60

D. COURSE CONTENTS

1.0 Simple stress& strain

1.1 Types of load, stresses & strains,(Axial and tangential) Hooke's law, Young's modulus, bulk modulus, modulus of rigidity, Poisson's ratio, derive the relation between three elastic constants,

1.2 Principle of super position, stresses in composite section

1.3 Temperature stress, determine the temperature stress in composite bar (single core)

1.4 Strain energy and resilience, Stress due to gradually applied, suddenly applied and impact load

1.5 Simple problems on above.

2.0 Thin cylinder and spherical shell under internal pressure

2.1 Definition of hoop and longitudinal stress, strain

2.2 Derivation of hoop stress, longitudinal stress, hoop strain, longitudinal strain and volumetric strain

2.3 Computation of the change in length, diameter and volume

2.4 Simple problems on above

3.0 Two dimensional stress systems

3.1 Determination of normal stress, shear stress and resultant stress on oblique plane

3.2 Location of principal plane and computation of principal stress

3.3 Location of principal plane and computation of principal stress and Maximum shear stress using Mohr's circle

4.0 Bending moment& shear force

4.1 Types of beam and load

4.2 Concepts of Shear force and bending moment

4.3 Shear Force and Bending moment diagram and its salient features illustration in cantilever beam, simply supported beam and over hanging beam under point load and uniformly distributed load

5.0 Theory of simple bending

5.1 Assumptions in the theory of bending,

5.2 Bending equation, Moment of resistance, Section modulus& neutral axis.

5.3 Solve simple problems.

6.0 Combined direct & bending stresses

6.1 Define column

6.2 Axial load, Eccentric load on column,

6.3 Direct stresses, Bending stresses, Maximum& Minimum stresses. Numerical problems on above.

6.4 Buckling load computation using Euler's formula (no derivation) in Columns with various end conditions

7.0 Torsion

7.0 Assumption of pure torsion

7.1 The torsion equation for solid and hollow circular shaft

7.2 Comparison between solid and hollow shaft subjected to pure torsion

Syllabus to be covered up to I.A - Chapters 1, 2, 3&4

Learning resources:

Sl. No.	Author	Title of the book	Publisher
01	S Ramamrutham	Strength of Materials	Dhanpat Rai
02	R K Rajput	Strength of Materials	S.Chand
03	R.S khurmi	Strength of Materials	S.Chand
04	G H Ryder	Strength of Materials	Mc millon and co. lmtd
05	S Timoshenko and D H Young	Strength of Materials	TMH

TH-3 ENGINEERING MATERIAL

Name of the Course: Diploma in **Mech/Auto/Aero & Other Mechanical Allied Branches**			
Course code:		Semester	3rd
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/week	IA	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE:

Entire field of engineering deals with use of host of materials for making objects for human need. These materials include wide spectrum of element, metals, alloys and compounds with diverse properties. It is imperative that an engineer from any field should have a good knowledge of such materials and their properties.

B. COURSE OBJECTIVES:

After completion of the course students will have the ability of

- Realizing material requirements
- Realizing application area of ferrous, non ferrous and alloys
- Comprehending micro-structural changes during iron-carbon phase transformation process
- Comprehending effect of heat treatment and its effect towards change in material properties
- Comprehending continuity during evolution in engineering materials and development of modern engineering materials.

C. CHAPTER WISE DISTRIBUTION OF PERIODS

Sl. No.	Topic	Periods
01	Engineering materials and their properties	05
02	Ferrous Materials and alloy	05
03	Iron – Carbon system	08
04	Crystal imperfections	10
05	Heat Treatment	10
06	Non-ferrous alloys	10
07	Bearing Material	03
08	Spring materials	03
09	Polymers	03
10	Composites and Ceramics	03
	Total Period:	60

D. COURSE CONTENT:

1.0 Engineering materials and their properties

1.1 Material classification into ferrous and non ferrous category and alloys
1.2 Properties of Materials: Physical , Chemical and Mechanical
1.3 Performance requirements
1.4 Material reliability and safety

2.0 Ferrous Materials and alloys

2.1 Characteristics and application of ferrous materials
2.2 Classification, composition and application of low carbon steel, medium carbon steel and High carbon steel
2.3 Alloy steel: Low alloy steel, high alloy steel, tool steel and stainless steel
2.4 Tool steel: Effect of various alloying elements such as Cr, Mn, Ni, V, Mo,

3.0 Iron – Carbon system

3.1 Concept of phase diagram and cooling curves
3.2 Features of Iron-Carbon diagram with salient micro-constituents of Iron and Steel

4.0 Crystal imperfections

4.1 Crystal defines, classification of crystals, ideal crystal and crystal imperfections
4.2 Classification of imperfection: Point defects, line defects, surface defects and volume defects
4.3 Types and causes of point defects: Vacancies, Interstitials and impurities
4.4 Types and causes of line defects: Edge dislocation and screw dislocation
4.5 Effect of imperfection on material properties
4.6 Deformation by slip and twinning
4.7 Effect of deformation on material properties

5.0 Heat Treatment

5.1 Purpose of Heat treatment
5.2 Process of heat treatment: Annealing, normalizing, hardening, tampering, stress relieving measures
5.3 Surface hardening: Carburizing and Nitriding
5.4 Effect of heat treatment on properties of steel
5.5 Hardenability of steel

6.0 Non-ferrous alloys

6.1 Aluminum alloys: Composition, property and usage of Duralmin, y- alloy.
6.2 Copper alloys: Composition, property and usage of Copper-Aluminum, Copper-Tin, Babbit , Phosperous bronze, brass, Copper- Nickel
6.3 Predominating elements of lead alloys, Zinc alloys and Nickel alloys
6.4 Low alloy materials like P-91, P-22 for power plants and other

high temperature services. High alloy materials like stainless steel grades of duplex, super duplex materials etc.

7.0 Bearing Material

7.1 Classification, composition, properties and uses of Copper base, Tin Base, Lead base, Cadmium base bearing materials

8.0 Spring materials

8.1 Classification, composition, properties and uses of Iron-base and Copper base spring material

9.0 Polymers

9.1 Properties and application of thermosetting and thermoplastic polymers

9.2 Properties of elastomers

10.0 Composites and Ceramics

10.1 Classification, composition, properties and uses of particulate based and fiber reinforced composites

10.2 Classification and uses of ceramics

Syllabus to be covered up to I.A - Chapters 1, 2, 3, 4&5

Learning resources:

Sl. No.	Author	Title of the book	Publisher
01	O P Khanna	A Textbook of Material Science and Metallurgy	Dhantpat Rai
02	R K Rajput	Engineering materials and Metallurgy	S.Chand
03	S K Hazra choudhry	Material science & process	Imdian Book Distrubuting

TH - 4 THERMAL ENGINEERING-I

Name of the Course: Diploma in **Mech/Auto/Aero & Other Mechanical Allied Branches/E&M**			
Course code:		Semester	3rd
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE:

Thermal Engineering is the field of applied science which deals with energy possessed by heated gases and the laws which give the conversion of this energy into mechanical energy and vice versa

B. COURSE OBJECTIVES:

After the completion of the course the students will develop ability towards.

- Comprehending significance of thermodynamics properties in order to analyze a Thermodynamic system.
- Comprehending & applying first & second law of thermodynamics in closed & open system.
- Comprehending & applying gas laws applicable to perfect gas in order to determine Thermodynamic properties.
- Comprehending the concept of I.C engine and gas power cycle & computing work done & efficiency thereof.

C. CHAPTER WISE DISTRIBUTION OF PERIODS

Sl. No.	Topic	Periods
01	Thermodynamic concept & Terminology	12
02	Laws of Thermodynamics	12
03	Properties Processes of perfect gas	10
04	Internal combustion engine	08
05	Air Standard Cycle	10
06	Fuels and Combustion	08
	Total Period:	60

D. COURSE CONTENT:

1. Thermodynamic concept & Terminology

1.1 Thermodynamic Systems (closed, open, isolated)
1.2 Thermodynamic properties of a system (pressure, volume, temperature, entropy, enthalpy, Internal energy and units of measurement).
1.3 Intensive and extensive properties
1.4 Define thermodynamic processes, path, cycle , state, path function, point function.
1.5 Thermodynamic Equilibrium.
1.6 Quasi-static Process.
1.7 Conceptual explanation of energy and its sources
1.8 Work , heat and comparison between the two.
1.9 Mechanical Equivalent of Heat.
1.10Work transfer, Displacement work

2. Laws of Thermodynamics

2.1 State & explain Zeroth law of thermodynamics.

2.2 State & explain First law of thermodynamics.
2.3 Limitations of First law of thermodynamics
2.4Application of First law of Thermodynamics (steady flow energy equation and its application to turbine and compressor)
2.4 Second law of thermodynamics (Claucius & Kelvin Plank statements).
2.5 Application of second law in heat engine, heat pump, refrigerator & determination of efficiencies & C.O.P (solve simple numerical)

3. Properties Processes of perfect gas

3.1 Laws of perfect gas:
Boyle's law, Charle's law, Avogadro's law, Dalton's law of partial pressure, Guy lussac law, General gas equation, characteristic gas constant, Universal gas constant.
3.2 Explain specific heat of gas (Cp and Cv)
3.3 Relation between Cp & Cv.
3.4 Enthalpy of a gas.
3.5 Work done during a non- flow process.
3.6 Application of first law of thermodynamics to various non flow process (Isothermal, Isobaric, Isentropic and polytrophic process)
3.6 Solve simple problems on above.
3.7 Free expansion & throttling process.

4. Internal combustion engine

4.1 Explain & classify I.C engine.
4.2 Terminology of I.C Engine such as bore, dead centers, stroke volume, piston speed &RPM.
4.3 Explain the working principle of 2-stroke & 4- stroke engine C.I & S.I engine.
4.4 Differentiate between 2-stroke & 4- stroke engine C.I & S.I engine.

5. Gas Power Cycle

5.1 Carnot cycle
5.2 Otto cycle.
5.3 Diesel cycle.
5.4 Dual cycle.
5.5 Solve simple numerical.

6. **Fuels and Combustion**

6.1 Define Fuel.
6.2 Types of fuel.
6.3 Application of different types of fuel.
6.4 Heating values of fuel.
6.5 Quality of I.C engine fuels Octane number, Cetane number.

Syllabus to be covered up to I.A - Chapters 1, 2&3

Learning resources:

Sl. No.	Author	Title of the book	Publisher
01	R.S. Khurmi	Thermal Engineering	S.Chand
02	A.R.Basu	Thermal Engineering	Dhanpat Rai
03	A.S. Sarao	Thermal Engineering	Satya Prakash
04	P.K.Nag	Engineering Thermodynamics	TMH
05	Mahesh M Rathore	Thermal Engineering	TMH

TH.5 ENVIRONMENTAL STUDIES

(Common to All Branches)

Theory: 4 Periods per Week — I.A: 20 Marks
Total Periods: 60 Periods — End Exam : 80 Marks
Examination: 3 Hours — TOTAL MARKS : 100 Marks

A. RATIONALE:

Due to various aspects of human developments including the demand of different kinds of technological innovations, most people have been forgetting that, the Environment in which they are living is to be maintained under various living standards for the preservation of better health. The degradation of environment due to industrial growth is very much alarming due to environmental pollution beyond permissible limits in respect of air, water industrial waste, noise etc. Therefore, the subject of Environmental Studies to be learnt by every student in order to take care of the environmental aspect in each and every activity in the best possible manner.

B. OBJECTIVES:

After completion of study of environmental studies, the student will be able to:

1. Gather adequate knowledge of different pollutants, their sources and shall be aware of solid waste management systems and hazardous waste and their effects.
2. Develop awareness towards preservation of environment.

C. Topic wise distribution of periods:

Sl. No.	Topics	Period
1	The Multidisciplinary nature of environmental studies	04
2	Natural Resources	10
3	Systems	08
4	Biodiversity and it's Conservation	08
5	Environmental Pollution.	12
6	Social issues and the Environment	10
7	Human population and the environment	08
	Total:	**60**

D.COURSE CONTENT:

Unit 1: The Multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness.

Unit 2: Natural Resources

Renewable and non renewable resources:

a) Natural resources and associated problems.
   - Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction mining, dams and their effects on forests and tribal people.
   - Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.
   - Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources.
   - Food Resources: World food problems ,changes caused by agriculture and overgrazing,effectsofmodernagriculture,fertilizers-pesticidesproblems, water logging, salinity,.
   - Energy Resources: Growing energy need, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
   - Land Resources: Land as a resource ,land degradation ,man induces landslides, soil erosion, and desertification.

b) Role of individual in conservation of natural resources.
c) Equitable use of resources for sustainable lifestyles.

Unit 3: Systems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers, decomposers.
- Energy flow in the ecosystems.
- Ecological succession.
- Food chains, food web sand ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem:
- Forest ecosystem:
- Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit 4: Biodiversity and it's Conservation

- Introduction-Definition: genetics, species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social ethical, aesthetic and opt in values.
- Biodiversity at global, national and local level.
- Threats to biodiversity: Habitats loss, poaching of wild life, man wildlife conflicts.

Unit 5: Environmental Pollution.

Definition Causes, effects and control measures of:

a) Air pollution.
b) Water pollution.
c) Soil pollution
d) Marine pollution

e) Noise pollution.
f) Thermal pollution
g) Nuclear hazards.

Solid waste Management: Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution.

Disaster management: Floods, earth quake, cyclone and landslides.

Unit 6: Social issues and the Environment

From unsustainable to sustainable development**.**

- Urban problems related to energy.
- Water conservation, rain water harvesting, water shed management.
- Resettlement and rehabilitation of people; its problems and concern.
- Environmental ethics: issue and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.
- Air (prevention and control of pollution) Act.
- Water (prevention and control of pollution) Act.
- Public awareness.

Unit 7: Human population and the environment

- Population growth and variation among nations.
- Population explosion-family welfare program.
- Environment and human health.
- Human rights.
- Value education
- Role of information technology in environment and human health.

Syllabus to be covered up to I.A **Units 1, 2, 3**

Learning Resources:			
Sl.No	Title of the Book	Name of Authors	Name of Publisher
1	Text book of Environmental studies	Erach Bharucha	#UGC
2	Fundamental concepts in Environmental Studies	,D.D .Mishra	S. Chand&Co-Ltd
3	Textbook of Environmental Studies	K.Raghavan Nambiar	SCITECH Publication Pvt. Ltd.
4	Environmental Engineering	V.M.Domkundwar	- DhanpatRai&Co

MECHANICAL ENGINEERING DRAWING (PR-1)

Name of the Course: Diploma in **Mech/Auto/Aero & Other Mechanical Allied Branches**			
Course code:		Semester	3rd
Total Period:	90	Examination	3 hrs
Lab Periods:	6 P/week	Sessional:	25
Maximum marks:	75	End Semester Examination:	50

COURSE OBJECTIVES:-

Students will develop ability towards

- Recognizing significance of standardized representations
- Comprehending role of various fastening elements and offer engineering drawing thereof in manual mode
- Comprehending geometrical constraints and function of components in assemblies such as bearings and screw jack
- Comprehending functional requirement of major components and offer engineering drawing in manual mode thereof.

Chapter **Contents**

1.0 Revision of Engineering Drawing of 1st Year

2.0 Draw plan, elevation and side view of different machine elements from their isometric view using AutoCAD & mini drafter (Minimum 5 Drawings).

3.0 Engineering drawing of fastening elements in first angle orthographic Projection

3.1 Bolt, nut and threads

3.2 Cotter joint

3.3 Knuckle joint

4.0 Details to assembly

4.1 Rigid pedestal bearing

4.2 Foot step bearing

4.3 Simple Screw jack

5.0 Assembly to details

5.1 Connecting rod of IC Engine

5.2 Boiler safety valve

5.3 Spring loaded valve

5.4 Hydraulic non return valve

5.5 Flat belt pulley

Learning Resources:

Sl No.	Author Name	Name of the Book	Publisher Name
1	N D Bhatt	Machine Drawing	Charotar
2	T Jones	Machine Drawing	Kalyani
3	R K Dhawan	Machine Drawing	S.Chand
4	T. Jeypooven	Emgg. Graphics using Autocad	CBS

MECHANICAL ENGINEERING LABORATORY (PRACTICAL-2)

Name of the Course: Diploma in **Mech/Auto/Aero & Other Mechanical Allied Branches**			
Course code:		Semester	3rd
Total Period:	60	Examination	3 hrs
Lab. periods:	4 P/week	Sessional	25
Maximum marks:	75	End Semester Examination:	50

COURSE OBJECTIVES

Students will develop ability towards

- Conducting experimentations to determine properties of a solid material subject to uniaxial loading and impact
- Conducting experimentations towards determining characteristics of a fuel
- Study of equipment employing using fuels.

1. Strength of Materials and thermal Laboratory

1.1 Determine end reactions in a simply supported beam using parallel force apparatus.

1.2 Determination of Young's modulus using Searle's apparatus

1.3 Determination of torsional rigidity of the shaft using torsion testing machine

1.4 Determination of salient points (Young's modulus, yield point, fracture point) from stress- strain curve using Universal Testing Machine

1.5 Determination of hardness number by Rockwell/Vickers hardness testing machine

1.6 Determination of toughness using Impact testing machine (Charpy/Izod)

1.7 Determination of Flash point and fire point

1.8 Joule's experiment

WORKSHOP PRACTICE-II (PRACTICAL-3)

Name of the Course: Diploma in **Mech/Auto/Aero & Other Mechanical Allied Branches**			
Course code:		Semester	3rd
Total Period:	90	Examination	4 hrs
Lab. periods:	6 P/week	Sessional	50
Maximum marks:	100	End Semester Examination:	50

COURSE OBJECTIVES:-

Students will develop ability towards

- Practicing fitting, carpentry, smithy and machining
- Understanding the tools and equipment used in the practices
- Realize the time and resource utilization in the practices

1. Fitting practices

1.1 Preparation of caliper
1.2 Preparation of try square
1.3 Preparation of hammer, square , Hexagonal

2. Smithy Practices

2.1 Preparation of door ring with hook
2.2 Preparation of hexagonal head bolt
2.3 Preparation of octagonal flat chisel

3 Carpentry Practices

3.1 Cutting of slot, botch, mortise and Tenon Joint
3.2 Preparation of single dove tail joint

4 Welding Practice

4.1 Lap & Butt Joint using Arc Welding
4.2 Lap Joint using Gas Welding
4.3 Joining Two non-ferrous parts through

LIST OF EQUIPMENTS OF MECHANICAL ENGG. LABORATORY

Sl No	NAME OF THE EQUIPMENT	Quantity
1	PARALLEL FORCE APPARATUS	2 Nos.
2	SEARLE'S APPARATUS	2 Nos.
3	TORSION TESTING MACHINE	1 Nos.
4	DIGITAL UNIVERSAL TESTING MACHINE	1 Nos.
5	HARDNESS TESTING MACHINE	1 Nos.
6	IMPACT TESTING MACHINE	1 Nos.
7	FLASH POINT AND FIRE POINT APPARATUS	1 Nos.
8	JOULES APPARATUS	1 Nos.

LIST OF EQUIPMENTS OF WORKSHOP PRACTICE

WELDING SHOP

SL. NO.	NAME OF ITEM	QUANTITY
01	OXYGEN CYLINDER	01 No.
02	ACETYLENE CYLINDER	01 No.
03	PRESSURE GAUSES	02 Nos
04	PRESSURE REGULATOR	02 Nos.
05	WELDING TORCH	01 No.
06	GOGGLES	10 Nos.
07	HOSE PIPES	10 Meters
08	AC WELDING TRANSFORMER SET	01 No.
09	CHIPPING BRUSH	02 Nos.
10	WIRE BRUSH	02 Nos.
11	ARC SHIELD (EYE PROTECTOR)	05 Nos.
12	MIG / TIG WELDING MACHINE	01 Nos.

CARPENTRY SHOP

SL. NO.	NAME OF ITEM	QUANTITY
01	STEEL RULE (SCALE) 1 Meter	10 Nos.
02	SCRIBER	10 Nos.
03	MARKING GAUGE	05 Nos.
04	MORTISE GAUGE	05 Nos.
05	TRY SQURE	10 Nos.
06	DIVIDERS	10 Nos.
07	RIP SAW	10 Nos.
08	COPING SAW	10 Nos.
09	FIRMAR CHIESEL	10 Nos.
10	GAUGE CHIESEL	02 Nos.
11	IRON JACK PLANE	02 Nos.
12	TRYING PLANE	05 Nos.
13	RASP	05 Nos.
14	HAND DRILL	05 Nos.
15	GIMLET DRILL	02 Nos.
16	CLAMPING VICE	10 Nos.
17	C-CLAMP	05 Nos.
18	CROSS PEAN HAMMER	05 Nos.
19	CLAW HAMMER	10 Nos.
20	MALLET	05 Nos.
21	WOOD WORKING LATHE	01 No.
22	CIRCULAR SAW	01 No.

FITTING SHOP

SL. NO.	NAME OF ITEM	QUANTITY
01	BENCH VICE	20 Nos.
02	PIPE VICE	04 Nos.
03	TRY SQURE	10 Nos.
04	SCRIBER & SUEFACE GAUGE	10 Nos.
05	DOT PUNCH	10 Nos.
06	CENTRE PUNCH	10 Nos.
07	SURFACE PLATE	01 No.
08	ANGLE PLATE	01 No.
09	STEEL RULE	10 Nos.
10	VERNIER CALLIPERS	05 Nos.
11	MICROMETRE	05 Nos.
12	DIVIDERS	10 Nos.
13	OUTSIDE CALLIPERS	10 Nos.
14	INSIDE CALLIPERS	05 Nos.
15	FEELER GAUGE	01 No.
16	VERNIER HEIGHT GAUGE	01 No.
17	HACKSAW (FIXED FRAME)	10 Nos.
18	ROUND FILE	10 Nos.
19	SINGLE CUT FILE	10 Nos.
20	DOUBLE CUT FILE	10 Nos.
21	BALL PEAN HAMMER	05 Nos.
22	TAP WRENCH	01 No.
23	HAND DRILLING M/C	01 No.
24	PORTABLE GRINDER	01 o.

BLACKSMITHY SHOP

SL. NO.	NAME OF ITEM	QUANTITY
01	FURNACE OF HEARTH (WITH CENTRE BLOWER)	05 Nos.
02	SHOWEL	05 Nos.
03	POKER	05 Nos.
04	ANVIL	05 Nos.
05	SCEDGE HAMMER	05 Nos.
06	PICK UP TONG	10 Nos.
07	CHIESEL TONG	05 Nos.
08	CLOSE FLAT TONG	05 Nos.
09	PINUR TONG	05 Nos.
10	HOT CHIESEL	05 Nos.
11	COLD CHIESEL	05 Nos.
12	DRIFT	02 Nos.
13	SWAGE BLOCK	01 No.
14	BALL PEAN HAMMER	05 Nos.
15	CROSS PEAN HAMMER	05 Nos.

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 4th Semester (Civil Engineering)(wef 2019-20)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Structural Design - I	5		-	20	80	3	100
Th.2		Hydraulic and Irrigation Engineering	5		-	20	80	3	100
Th.3		Surveying – I	5		-	20	80	3	100
Th.4		Highway Engineering	5			20	80	3	100
		Total	*20*			*80*	*320*	-	*400*
		Practical							
Pr.1		Survey Practice-I	-	-	7	50	100	3	
Pr.2		Civil Engg. Drawing-II	-	-	6	50	100	3	
Pr.3		Technical Seminar			3	50			
		Student Centered Activities(SCA)		-	3				
		Total	-	-	*19*	*150*	*200*	-	*350*
		Grand Total	**20**	**-**	**19**	**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 etc. ,Seminar and SCA shall be conducted in a section.

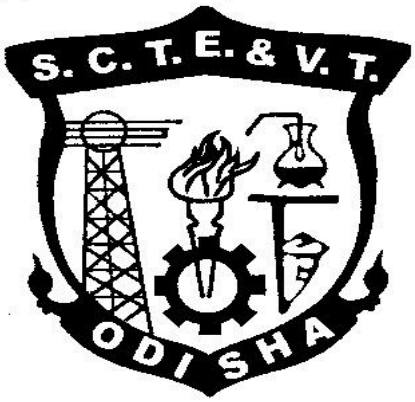
There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

CURRICULLUM OF 4TH SEMESTER

For

DIPLOMA IN CIVIL ENGINEERING

(Effective FROM 2019-20 Session)



STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

Th1. STRUCTURAL DESIGN – I

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4th
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

(*Use of only IS 456 code is allowed in the written examination*)

A. RATIONALE

The course will enable the students to undertake activities relating to the Design of simple Civil structural elements in view of load conditions and regulations imposed by standard or codes.

B. COURSE OBJECTIVES

On completion of the subject a student will be able to –

1. Comprehend design philosophies and compare those
2. Refer the design codes
3. Design simple R.C. structural elements
4. Draw structural details for construction
5. Analyze and design structural elements such as beams, columns, staircase etc
6. Design formwork and scaffolding.

C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name of topics	Periods
1	Working stress method (WSM)	05
2	Philosophy of Limit state method (LSM)	03
3	Analysis and design of singly and double reinforced sections (LSM)	15
4	Shear, Bond and Development Length (LSM)	04
6	Analysis and Design of T-Beam (LSM)	15
7	Analysis and Design of Slab and Stair case (LSM)	15
8	Design of Axially loaded columns and Footings (LSM)	18

D. COURSE CONTENTS:

(The codal provision for I.S.456 – 2000 along with other codes are to be followed**)**

1 Working stress method (WSM)

1.1 Objectives of design and detailing. State the different methods of design of concrete structures.

1.2 Introduction to reinforced concrete, R.C. sections their behavior, grades of concrete and steel. Permissible stresses, assumption in W.S.M.

1.3 Flexural design and analysis of single reinforced sections from first principles.

1.4 Concept of under reinforced, over reinforced and balanced sections.

1.5 Advantages and disadvantages of WSM, reasons for its obsolescence.

2 Philosophy Of Limit State Method (LSM)

2.1 Definition, Advantages of LSM over WSM, IS code suggestions regarding design philosophy.

2.2 Types of limit states, partial safety factors for materials strength, characteristic strength, characteristic load, design load, loading on structure as per I.S. 875

2.3 Study of I.S specification regarding spacing of reinforcement in slab, cover to reinforcement in slab, beam column & footing, minimum reinforcement in slab, beam & column, lapping, anchorage, effective span for beam & slab.

3 Analysis and Design of Single and Double Reinforced Sections (LSM)

3.1 Limit state of collapse (flexure), Assumptions, Stress-Strain relationship for concrete and steel, neutral axis, stress block diagram and strain diagram for singly reinforced section.

3.2 Concept of under- reinforced, over-reinforced and limiting section, neutral axis co-efficient, limiting value of moment of resistance and limiting percentage of steel required for limiting singly R.C. section.

3.3 Analysis and design: determination of design constants, moment of resistance and area of steel for rectangular sections

3.4 Necessity of doubly reinforced section, design of doubly reinforced rectangular section

4 Shear, Bond and Development Length (LSM)

4.1 Nominal shear stress in R.C. section, design shear strength of concrete, maximum shear stress, design of shear reinforcement, minimum shear reinforcement, forms of shear reinforcement.

4.2 Bond and types of bond, bond stress, check for bond stress, development length in tension and compression, anchorage value for hooks 900 bend and 450 bend standards lapping of bars, check for development length.

4.3 Numerical problems on deciding whether shear reinforcement is required or not, check for adequacy of the section in shear. Design of shear reinforcement; Minimum shear reinforcement in beams (Explain through examples only).

5 Analysis and Design of T-Beam (LSM)

5.1 General features, advantages, effective width of flange as per IS: 456-2000 code provisions.

5.2 Analysis of singly reinforced T-Beam, strain diagram & stress diagram, depth of neutral axis, moment of resistance of T-beam section with neutral axis lying within the flange.

5.3 Simple numerical problems on deciding effective flange width. (Problems only on finding moment of resistance of T-beam section when N.A. lies within or up to the bottom of flange shall be asked in written examination)..

6 Analysis and Design of Slab and Stair case (LSM)

6.1 Design of simply supported one-way slabs for flexure check for deflection control and shear.

6.2 Design of one-way cantilever slabs and cantilevers chajjas for flexure check for deflection control and check for development length and shear.

6.3 Design of two-way simply supported slabs for flexure with corner free to lift.

6.4 Design of dog-legged staircase

6.5 Detailing of reinforcement in stairs spanning longitudinally.

7 Design of Axially loaded columns and Footings (LSM)

7.1 Assumptions in limit state of collapse- compression.

7.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.

7.3 Analysis and design of axially loaded short square, rectangular and circular columns (with lateral ties only).

7.4 Types of footing, Design of isolated square column footing of uniform thickness for flexure and shear.

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	N.Subramanian	Design of Reinforced Concrete Structures	Oxford Pbln
2	N.C.Sinha,S.K.Roy	Fundamentals of Reinforced Concrete	S.Chand
3	H.J Saha.	Reinforced Concrete	Charotar Publishing house
4	Pillai & Menon.	Reinforced Concrete Structures	Tata McGraw Hill Education Private Limited
5	A.K. Jain.	Limit State Method (RCC Design)	Nem Chand & Bros
6	IS:456-2000		BIS Publication
7	SP-16		BIS Publication

Th2. HYDRAULICS & IRRIGATION ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4th
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

The course will be imparted in two parts. Primarily it aims to explain students the need of irrigation and components of the irrigation system which is covered in the second part of the course. The course aims to explain students the intricacies of irrigation engineering with reference to basic sciences relating to fluid mechanics and hydraulic machines. The essential components of fluid mechanics and hydraulic machines will be addressed in the first part of the course.

B. COURSE OBJECTIVES

On completion of the course students will be able to -

1. Define common fluid properties and interpret results from pressure measuring instruments.
2. Realize the science behind fluid flow and compute fluid flow characteristics through notches, weirs, channels and pipes.
3. Realize the working principle of hydraulic pumps and evaluate their performance in general cases.
4. Comprehend the need of irrigation
5. Determine cause and effect of water logging
6. Comprehend the purpose of irrigation system components and elaborate on these

C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name Of Topics	Periods
PART: A (Hydraulics And Machines)		
1	Hydrostatics	12
2	Kinematics Of Fluid Flow	18
3	Pumps	05
Part: B (Irrigation Engineering)		
1	Hydrology	04
2	Water Requirement Of Crops	04
3	Flow Irrigation	07
4	Water Logging And Drainage :	02
5	Diversion Head Works And Regulatory Structures	08
6	Cross Drainage Works :	07
7	Dams	08

D. COURSE CONTENTS:

PART: A (Hydraulics)

1 HYDROSTATICS:

1.1 **Properties of fluid:** density, specific gravity, surface tension, capillarity, viscosity and their uses

1.2 **Pressure and its measurements:** intensity of pressure, atmospheric pressure, gauge pressure, absolute pressure and vacuum pressure; relationship between atmospheric pressure, absolute pressure and gauge pressure; pressure head; pressure gauges.

1.3 Pressure exerted on an immersed surface: Total pressure, resultant pressure, expression for total pressure exerted on horizontal & vertical surface.

2 KINEMATICS OF FLUID FLOW:

2.1 Basic equation of fluid flow and their application: Rate of discharge, equation of continuity of liquid flow, total energy of a liquid in motion- potential, kinetic & pressure, Bernoulli's theorem and its limitations. Practical applications of Bernoulli's equation.

2.2 Flow over Notches and Weirs: Notches, Weirs, types of notches and weirs, Discharge through different types of notches and weirs-their application (No Derivation)

2.3 Types of flow through the pipes: uniform and non uniform; laminar and turbulent; steady and unsteady; Reynold's number and its application

2.4 Losses of head of a liquid flowing through pipes: Different types of major and minor losses. Simple numerical problems on losses due to friction using Darcy's equation, Total energy lines & hydraulic gradient lines (Concept Only).

2.5 Flow through the Open Channels: Types of channel sections-rectangular, trapezoidal and circular, discharge formulae- Chezy's and Manning's equation, Best economical section.

3 PUMPS:

3.1 Type of pumps

3.2 Centrifugal pump: basic principles, operation, discharge, horse power & efficiency.

3.3 Reciprocating pumps: types, operation, discharge, horse power & efficiency

PART: B (Irrigation Engineering)

1 Hydrology

1.1 Hydrology Cycle

1.2 Rainfall: types, intensity, hyetograph

1.3 Estimation of rainfall, rain gauges, Its types(concept only),

1.4 Concept of catchment area, types, run-off, estimation of flood discharge by Dicken's and Ryve's formulae

2 Water Requirement of Crops

2.1 Definition of irrigation, necessity, benefits of irrigation, types of irrigation

2.2 Crop season

2.3 Duty, Delta and base period their relationship, overlap allowance, kharif and rabi crops

2.4 Gross command area, culturable command area, Intensity of Irrigation, irrigable area, time factor, crop ratio

3 FLOW IRRIGATION

3.1 Canal irrigation, types of canals, loss of water in canals
3.2 Perennial irrigation
3.3 Different components of irrigation canals and their functions
3.4 Sketches of different canal cross-sections
3.5 Classification of canals according to their alignment, Various types of canal lining – Advantages and disadvantages

4 WATER LOGGING AND DRAINAGE :

4.1 Causes and effects of water logging, detection, prevention and remedies

5 DIVERSION HEAD WORKS AND REGULATORY STRUCTURES

5.1 Necessity and objectives of diversion head works, weirs and barrages
5.2 General layout, functions of different parts of barrage
5.3 Silting and scouring
5.4 Functions of regulatory structures

6 CROSS DRAINAGE WORKS :

6.1 Functions and necessity of Cross drainage works - aqueduct, siphon, super-passage, level crossing
6.2 Concept of each with help of neat sketch

7 DAMS

7.1 Necessity of storage reservoirs, types of dams
7.2 Earthen dams: types, description, causes of failure and protection measures.
7.3 Gravity dam- types, description, Causes of failure and protection measures.
7.4 Spillways- Types (With Sketch) and necessity.

E. Syllabus Coverage up to Internal Assessment: Part A: Chapters 1, 2 & Part B: 1, 2

F. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	Modi & Seth	Fluid Mechanics & Hydraulic machines	Standard Book House
2	D.R. Biswal	Hydraulics & Fluid Mechanics	Kalyani Pbln
3	R.K.Rajput	A Text Book of Fluid Mechanics & Hydraulic machines	S.Chand

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	S.K.Garg	Irrigation Engineering & Hydraulics Structures	Khanna Publishers
2	N. N. Basak	Irrigation Engineering	TMH Publishing
3	S.K. Sharma	Irrigation Engineering & Hydraulic structures.	S. Chand Pbln

Th3. SURVEY – I

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4th
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

Survey is an essential prerequisite for all types of civil construction activities. This course aims to provide knowledge in area of plane survey and the survey instruments. Besides, the course aims to provide students in map reading and area computations from survey data.

B. COURSE OBJECTIVES

On completion of the course students will be able to

1. Define various survey terminology and carryout necessary corrections for errors
2. Comprehend the principle, purpose, equipment and error corrections in chain and compass surveying
3. Comprehend the principle, purpose, equipment and error corrections in plane table and theodolite surveying
4. Comprehend the map nomenclature and apply skills in map interpretation
5. Gather skill towards leveling and contouring with knowledge of purpose and different methods thereof
6. Compute area and volume using different numerical algebraic methods

C. Topic Wise Distribution of Periods

Chapter	Name of topics	Periods
1	Introduction To Surveying, Linear Measurements	07
2	Chaining and Chain Surveying	07
3	Angular Measurement and Compas Surveying	12
4	Map Reading Cadastral Maps & Nomenclature	07
5	Plane Table Surveying	07
6	Theodolite Surveying and Traversing:	15
7	Levelling and Contouring	15
8	Computation of Area & Volume	05

D. Course Contents

1 INTRODUCTION TO SURVEYING, LINEAR MEASUREMENTS:

1.1 Surveying: Definition, Aims and objectives

1.2 Principles of survey-Plane surveying- Geodetic Surveying- Instrumental surveying.

1.3 Precision and accuracy of measurements, instruments used for measurement of distance, Types of tapes and chains.

1.4 Errors and mistakes in linear measurement – classification, Sources of errors and remedies.

1.5 Corrections to measured lengths due to-incorrect length, temperature variation, pull, sag, numerical problem applying corrections.

2 CHAINING AND CHAIN SURVEYING :

2.1 Equipment and accessories for chaining
2.2 Ranging – Purpose, signaling, direct and indirect ranging, Line ranger – features and use, error due to incorrect ranging.
2.3 Methods of chaining –Chaining on flat ground, Chaining on sloping ground – stepping method, Clinometer-features and use, slope correction.
2.4 Setting perpendicular with chain & tape, Chaining across different types of obstacles –Numerical problems on chaining across obstacles.
2.5 Purpose of chain surveying, Its Principles, concept of field book.
Selection of survey stations, base line, tie lines, Check lines.
2.7 Offsets – Necessity, Perpendicular and Oblique offsets, Instruments for setting offset – Cross Staff, Optical Square.
2.8 Errors in chain surveying – compensating and accumulative errors causes & remedies, Precautions to be taken during chain surveying.

3 ANGULAR MEASUREMENT AND COMPAS SURVEYING :

3.1 Measurement of angles with chain, tape & compass
3.2 Compass – Types, features, parts, merits & demerits, testing & adjustment of compass
3.3 Designation of angles- concept of meridians – Magnetic, True, arbitrary; Concept of bearings – Whole circle bearing, Quadrantal bearing, Reduced bearing, suitability of application, numerical problems on conversion of bearings
3.4 Use of compasses – setting in field-centering, leveling, taking readings, concepts of Fore bearing, Back Bearing, Numerical problems on computation of interior & exterior angles from bearings.
3.5 Effects of earth's magnetism – dip of needle, magnetic declination, variation in declination, numerical problems on application of correction for declination.
3.6 Errors in angle measurement with compass – sources & remedies.
3.7 Principles of traversing – open & closed traverse, Methods of traversing.
3.8 Local attraction – causes, detection, errors, corrections, Numerical problems of application of correction due to local attraction.
3.9 Errors in compass surveying – sources & remedies.
Plotting of traverse – check of closing error in closed & open traverse, Bowditch's correction, Gales table

4 MAP READING CADASTRAL MAPS & NOMENCLATURE:

4.1 Study of direction, Scale, Grid Reference and Grid Square
Study of Signs and Symbols
4.2 Cadastral Map Preparation Methodology
4.3 Unique identification number of parcel
4.4 Positions of existing Control Points and its types
4.5 Adjacent Boundaries and Features, Topology Creation and verification.

5 PLANE TABLE SURVEYING :

5.1 Objectives, principles and use of plane table surveying.
5.2 Instruments & accessories used in plane table surveying.
5.3 Methods of plane table surveying – (1) Radiation, (2) Intersection, (3) Traversing, (4) Resection.
5.4 Statements of TWO POINT and THREE POINT PROBLEM.
Errors in plane table surveying and their corrections, precautions in plane table surveying.

6 THEODOLITE SURVEYING AND TRAVERSING:

6.1 Purpose and definition of theodolite surveying

6.2 Transit theodolite- Description of features, component parts, Fundamental axes of a theodolite, concept of vernier, reading a vernier, Temporary adjustment of theodolite

6.3 Concept of transiting –Measurement of horizontal and vertical angles.

6.4 Measurement of magnetic bearings, deflection angle, direct angle, setting out angles, prolonging a straight line with theodolite, Errors in Theodolite observations.

6.5 Methods of theodolite traversing with – inclined angle method, deflection angle method, bearing method, Plotting the traverse by coordinate method, Checks for open and closed traverse.

6.6 Traverse computation – consecutive coordinates, latitude and departure, Gale's traverse table, Numerical problems on omitted measurement of lengths & bearings

6.7 Closing error – adjustment of angular errors, adjustment of bearings, numerical problems

6.8 Balancing of traverse – Bowditch's method, transit method, graphical method, axis method, calculation of area of closed traverse.

7 LEVELLING AND CONTOURING :

7.1 Definition and Purpose and types of leveling– concepts of level surface, Horizontal surface, vertical surface, datum, R. L., B.M.

7.2 Instruments used for leveling, concepts of line of collimation, axis of bubble tube, axis of telescope, Vertical axis.

7.3 Levelling staff – Temporary adjustments of level, taking reading with level, concept of bench mark, BS, IS, FS, CP, HI.

7.4 Field data entry – level Book – height of collimation method and Rise & Fall method, comparison, Numerical problems on reduction of levels applying both methods, Arithmetic checks.

7.5 Effects of curvature and refraction, numerical problems on application of correction.

7.6 Reciprocal leveling – principles, methods, numerical problems, precise leveling.

7.7 Errors in leveling and precautions, Permanent and temporary adjustments of different types of levels.

7.8 Definitions, concepts and characteristics of contours.

7.9 Methods of contouring, plotting contour maps, Interpretation of contour maps, toposheets.

7.10 Use of contour maps on civil engineering projects – drawing cross-sections from contour maps, locating proposal routes of roads / railway / canal on a contour map, computation of volume of earthwork from contour map for simple structure.

7.11 Map Interpretation: Interpret Human and Economic Activities (i.e.: Settlement, Communication, Land use etc.), Interpret Physical landform (i.e.: Relief, Drainage Pattern etc.), Problem Solving and Decision Making

8 COMPUTATION OF AREA & VOLUME:

8.1 Determination of areas, computation of areas from plans.

8.2 Calculation of area by using ordinate rule, trapezoidal rule, Simpson's rule.

8.3 Calculation of volumes by prismoidal formula and trapezoidal formula, Prismoidal corrections, curvature correction for volumes.

E. SYLLABUS COVERAGE UPTO INTERNAL ASSESSMENT

Chapters 1, 2, 3, 4, 5

G. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	R.Subramanian	Surveying and Levelling	Oxford
2	Dr.B.C.Punmia.	Surveying,Vol.-I&II	Laxmi Publication
3	R. Agor	A text Book of Surveying & Levelling	Khanna Publishers
4	N.N Basak.	Surveying & Levelling	TMH Publishing

Th4. HIGHWAY ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4th
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

One of the major tasks carried out by civil engineering professionals is highway construction. Knowledge is essential on necessary geometric, materials, equipment essential for highway construction. The course aims to impart knowledge in this segment.

B. COURSE OBJECTIVES

On completion of the course students will be able to -

1. Realize significance of the highway transportation and professional bodies associated with this,
2. Acquaint themselves with road geometric terms and understand the purpose of providing necessary features including angles and curvature during road construction.
3. Select proper road construction materials based on required properties and test data.
4. Comprehend the pavements and their types and know the step wise construction processes.
5. Acquire knowledge on common construction equipment
6. Realize essence of drainage and maintenance on the highways and prescribe related practices.

C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Periods
1	Introduction	05
2	Road Geometrics	20
3	Road Materials	09
4	Road Pavements	13
5	Hill Roads	07
6	Road Drainage	07
7	Road Maintenance :	07
8	Construction equipments:	07

D. COURSE CONTENTS:

1 Introduction

1.1 Importance of Highway transportation: importance organizations like Indian roads congress, Ministry of Surface Transport, Central Road Research Institute.
1.2 Functions of Indian Roads Congress
1.3 IRC classification of roads
1.4 Organisation of state highway department

2 Road Geometrics

2.1 Glossary of terms used in geometric and their importance, right of way, formation width, road margin, road shoulder, carriage way, side slopes, kerbs, formation level, camber and gradient

2.2 Design and average running speed, stopping and passing sight distance

2.3 Necessity of curves, horizontal and vertical curves including transition curves and super elevation, Methods o f providing super – elevation

3 Road Materials

3.1 Difference types of road materials in use: soil, aggregates, and binders

3.2 Function of soil as highway Subgrade

3.3 California Bearing Ratio: methods of finding CBR valued in the laboratory and at site and their significance

3.4 Testing aggregates: Abrasion test, impact test, crushing strength test, water absorption test & soundness test

4 **Road Pavements**

4.1 Road Pavement: Flexible and rigid pavement, their merits and demerits, typical cross-sections, functions of various components

Flexible pavements:

4.2 Sub-grade preparation:

Setting out alignment of road, setting out bench marks, control pegs for embankment and cutting, borrow pits, making profile of embankment, construction of embankment, compaction, stabilization, preparation of subgrade, methods of checking camber, gradient and alignment as per recommendations of IRC, equipment used for subgrade preparation

4.3 Sub base Course:

Necessity of sub base, stabilized sub base, purpose of stabilization (no designs) Types of stabilization

- Mechanical stabilization
- Lime stabilization
- Cement stabilization
- Fly ash stabilization

4.4 Base Course:

Preparation of base course, Brick soling, stone soling and metalling, Water Bound Macadam and wet-mix Macadam, Bituminous constructions: Different types

4.5 Surfacing:

- Surface dressing
  (i) Premix carpet and (ii) Semi dense carpet
- Bituminous concrete
- Grouting

4.6 Rigid Pavements:

Concept of concrete roads as per IRC specifications

5 Hill Roads:

5.1 Introduction: Typical cross-sections showing all details of a typical hill road in cut, partly in cutting and partly in filling

5.2 Breast Walls, Retaining walls, different types of bends

6 Road Drainage:

6.1 Necessity of road drainage work, cross drainage works

6.2 Surface and sub-surface drains and storm water drains. Location, spacing and typical details of side drains, side ditches for surface drainage, intercepting drains, pipe drains in hill roads, details of drains in cutting embankment, typical cross sections.

7 Road Maintenance :

7.1 Common types of road failures – their causes and remedies
7.2 Maintenance of bituminous road such as patch work and resurfacing
7.3 Maintenance of concrete roads – filling cracks, repairing joints, maintenance of shoulders (berm), maintenance of traffic control devices
7.4 Basic concept of traffic study, Traffic safety and traffic control signal

8 Construction equipments:

Preliminary ideas of the following plant and equipment:
8.1 Hot mixing plant
8.2 Tipper, tractors (wheel and crawler) scraper, bulldozer, dumpers, shovels, graders, roller dragline
8.3 Asphalt mixer and tar boilers
8.4 Road pavers
8.5 Modern construction equipments for roads.

E. SYLLABUS COVERAGE UPTO INTERNAL ASSESSMENT: Chapters 1, 2, 3, 4

F. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	S.K.Khanna & C.E.G. Justo	Highway Engineering	Nem Chand & Bros
2	S.P.Chandola	A Text Book Of Transportation Engineering	S. Chand
3	S.P.Bindra	A course on Highway engineering	Dhanpat Rai Publications
4	S.K. Sharma	Principles, practices & design of Highway Enginnering.	S. Chand

Pr1. SURVEY PRACTICE-I

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4th
Total Period:	105	Examination	3hrs
Lab. periods:	7P/week	Term Work/Sessional	50
Maximum marks:	150	End Semester Examination:	100

A. RATIONALE

The course prepares the students in use of survey instruments to conduct survey, present and interpret the generated data. This course, further, aims to enable students in map reading and computation of area from survey generated data. In addition, It introduces modern practice of survey that is photogrammetry which is applied in topographic mapping and site planning activities, along with the foundation for GIS information generation.

B. COURSE OBJECTIVES

On completion of the course students will be able to

1. Undertake linear measurement activities using chains in absence or presence of obstacles
2. Conduct compass surveying and record data in necessary format
3. Read, interpret and verify a map
4. Setup plane table and conduct survey using different methods
5. Use of theodolite and plot the traverse and contour maps
6. Realize significance of photogrammetry as pictorial, accurate and permanent record and understand the basics of aerial photography
7. Acquire image through aerial and satellite platform and scanning thereof along with stereoscopic measurement
8. Generate DTM/DEM and ortho-image

C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name of topics	Hours
1	Linear Mesurements, Chaining and Chain Surveying	05
2	Angular Measurement and Compass Surveying	12
3	Map Reading Cadastral Maps & Nomenclature	08
4	Plane Table Surveying	13
5	Theodolite Traversing	10
6	Levelling and Contouring	12
7	Basics of Aerial Photography	09
8	Basics of Photogrammetry, DEM and Ortho Image Generation	36

D. **COURSE CONTENTS:**

1.0 Linear Measurements, Chaining and Chain Surveying:

1.1 Testing and adjusting of a metric chain.
1.2 Measurement of distance between two points (more than 2 chain lengths apart) with chain including direct ranging.
1.3 Setting out different types of triangles, given the lengths of sides with chain and tape.
1.4 Measurement of distance between two points by chaining across a sloped ground using stepping method and a clinometer.
1.5 Measurement of distance by chaining across a obstacles on the chain line i) a pond ii)a building iii) a stream/ river (in the event of non-availability of stream / river, a pond or lake may be taken, considering that chaining around the same is not possible.
1.6 Setting perpendicular offsets to various objects (at least 3) from a chain line using-(1) tape, (2) cross-staff, (3) optical square and comparing the accuracy of the 3 methods
1.7 Setting oblique offsets to objects (at least 3) from a chain using tape

2.0 Angular Measurement and Compass Surveying:

2.1 Testing and adjustment of Prismatic compass and Surveyor's compass.
2.2 Measurement of bearings of lines (at least 3 lines) and determination of included angles using Prismatic compass and Surveyor's compass.
2.3 Setting out triangles (at least 2) with compass, given the length and bearing of one side and included angles.
2.4 Setting out a closed traverse of 5 sides, using prismatic compass, given bearing of one line and included angles and lengths of sides.
2.5 Conducting chain and compass traverse surveying in a given plot of area (2plots) and recording data in the field book. (5 to 6 students/groups)

3.0 Map Reading Cadastral Maps & Nomenclature:

3.1 Study of direction, Scale, Grid Reference and Grid Square
3.2 Study of Signs and Symbols
3.3 Cadastral Map Preparation Methodology
3.4 Unique identification number of parcel
3.5 Positions of existing Control Points and its types
3.6 Adjacent Boundaries and Features, Topology Creation and verification.

4.0 Plane Table Surveying:

4.1 Setting up of Plane Table and Plotting five points by radiation method and five inaccessible points by intersection method.
4.2 Conducting Plane Table surveying in a given plot of area by traversing (Atleast a 5-sided traverse and locating the objects)
4.3 Plane table surveying by Resection method (two point &three point problem method)

5.0 Theodolite Traversing:

5.1 Measurement of horizontal angles (3nos.) by repetition and reiteration method and compare two methods
5.2 Prolonging a given straight line with the help of a theodolite
5.3 Determination of magnetic bearing of 3 given straight lines

Setting out a closed traverse with 6 sides and entering the field data
5.4 Plotting the traverse from exercise 4.1 and checking the error of closure
5.5 Setting out an open traverse with 5 sides and entering the field data
5.6 Plotting the traverse from exercise 4.3 and checking the error of closure

6.0 Leveling and Contouring:

6.1 Making temporary adjustments of Levels
6.2 Determining Reduced Levels of five given points taking staff readings with Levels.
6.3 Determining the difference of levels between two points (3 pairs of points / group) by taking staff readings form single set up of level, recording the readings in level book and application of Arithmetic check. (At least 3 change points must be covered)
6.4 Conduct Fly Leveling (Compound) between two distant points with respect to R.L. of a given B.M. and reduction of levels by both height of collimation and rise & fall method and applying Arithmetic check. (At least 3 change points must be covered)
6.5 Conduct profile leveling along the given alignment for a road / canal for 150m length, taking L. S. at every 15m and C. S. at 1m & 3m apart on both sides at every 30m interval and recording the data in level book and applying arithmetical check.
6.6 Locating contour points in the given area by direct method / indirect method
6.7 Conducting block level survey in the given area
6.8 Plotting and drawing contour map of a given area by radial method
6.9 Map Interpretation: Interpret Human and Economic Activities (i.e.: Settlement, Communication, Land use etc.), Interpret Physical landform (i.e.: Relief, Drainage Pattern etc.), Problem Solving and Decision Making

7.0 Basics of Aerial Photography:

7.1 Film
7.2. Focal Length
7.3. Scale
7.4. Types of Aerial Photographs (Oblique, Straight)

8.0 Basics of Photogrammetry, DEM and Ortho Image generation:

Photogrammetry:

8.1 Classification of Photogrammetry
8.2 Aerial Photogrammetry
8.3 Terrestrial Photogrammetry

Photogrammetry Process:
8.4 Acquisition of Imagery using aerial and satellite platform
8.5 Control Survey
8.6 Geometric Distortion in Imagery
8.7 Application of Imagery and its support data
8.8 Orientation and Triangulation
8.9 Stereoscopic Measurement: X-parallax and Y-parallax
8.10 DTM/DEM Generation
8.11 Ortho Image Generation

E. RECOMMENDED BOOKS:

- Surveying and Leveling - R.Subramanian
- Surveying, Vol.-I&II -Dr.B.C.Punmia
- A text Book of Surveying & Leveling -R.Agor.
- Surveying Part-III - Dr.B.C.Punmia
- Advanced Surveying - D. Gaikwad, S. Chand

Pr2. CIVIL ENGINEERING DRAWING – II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4th
Total Period:	90	Examination	3 hrs
Lab. periods:	6 P/week	Term Work/Sessional	50
Maximum marks:	150	End Semester Examination:	100

A. RATIONALE

The course aims to prepare the students to use modern engineering tools to prepare drawings of essential structures that include culverts, irrigation structures, sanitation components.

B. COURSE OBJECTIVES

After completion of the course, students will be able to use AutoCAD or CAD softwares to

- Prepare RCC slab culvert drawings
- Prepare Hume pipe culvert drawings
- Prepare detailed drawings including plan, elevation and section views of irrigation structures
- Prepare detailed drawings of drainage siphons
- Generate drawings of plumbing and sanitary connections in two room buildings
- Generate detailed drawing of septic tanks

C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name of topics	Hours
1	Detailed drawing of culvert	25
2	Irrigation Structures	35
3	Plumbing and Sanitary connections	10
4	septic tank up to 50 users with soak pit	20

D. COURSE CONTENT:

(ALL THE DRAWINGS TO BE DONE USING AUTO CAD SOFTWARE ONLY)

1.0 Detailed drawing of culvert

Half foundation plan and half top plan, cross sectional elevation and longitudinal section of

i) RCC Slab culvert with right angled wing wall
ii) Hume pipe culvert with splayed wing wall

2.0 Irrigation Structures

2.1 Detail drawing of a vertical drop type fall (Sarada Type) from given specifications
2.2 Drawing of a Drainage siphon from given specifications

3 Plumbing and Sanitary connections and fittings of a two roomed building

4 Detailed drawing of septic tank up to 50 users with soak pit and necessary connection from the water closet.

E. RECOMMENDED BOOKS:

1. Civil Engg. Drawing -M.Chakrobarty.
2. Civil Engineering Drawing & House Planning -B.P.Verma.
3. A Course in Civil Engg Drawing -VB Sikka
3. Engineering graphics and design - K. Kumar, A.K. Ray & C. Ranjan- Vikas Pbln.
4. Auto Cad -Omura
5. AutoCAD (Architecture) 2011 -William G. Wyatt

Pr.3 -TECHNICAL SEMINAR

Total Periods	03	Maximum Marks	50 Marks
Lab. Periods:	03 Periods /week	Term Work/Sessional	50Marks
Examination	3hours	End Semester Examination	--

Each student has to select a recent topic of latest technology in the area of Civil Engineering and present a seminar in front of all students of the class. He/She has to prepare a PowerPoint presentation of the selected topic and the total presentation will be approximately 10 minutes duration .There will be interactive session between the presenter and rest of the students including the faculty members of the dept at the end of presentation .A student has to present at least 2 nos.of seminar during a semester and to submit the report for evaluation.

CIVIL ENGG. CAD LABORATORY

(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 No.
1	STAAD-Pro -V8i(Latest Educational Version – 15 user) software	1
2	AutoCAD-2016 or lates Educational version for minimum15 users	1
3	Desk Top Computer with following latest version configuration : Processor: Intel Core i7 or higher version, CPU@2.3GHz or higher, Ram: 4GB or higher,MS Windows 64 bit operating system with 64 based processor etc.	30
4	Laptop Computer with following latest version configuration : Processor: Intel Core i7 or higher version, CPU@2.3GHz or higher, Ram: 4GB or higher,MS Windows 64 bit operating system with 64 based processor etc.	1
5	Online UPS: 5KVA	5
6	Laser Printer- Resolution in dpi: Mono 600x600, Paper size:A4, Print speed in ppm(A4 size):14, port:1 or higher configuration	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

SURVEY PRACTICE I (For Gr,. Size-30 students)

Sl No.	Name of Equipments	Quantity required
1	Metallic Tape(15m,30m) in leather/fiber case and winding device as per BIS1492:1970	10
2	Steel Tape(3m,5m,15m & 30m) made of steel ribbon in leather/fiber case and winding device as per BIS1492:1970	02
3	Invar Tape(15m,30m) made of invar steel in leather/ fiber case and winding device as per BIS1492:1970	01
4	Cross Staff(Open type metallic)100X100X150 mm iron leg painted at bottom,1.5m length	10
5	Arrows(MS)	30
6	Ranging Rods(Iron) 2 & 3m length made of conduits of 30mm dia painted with white and black/red with iron shoes as per BIS2283:1983	30
7	Hammer	10
8	Prismatic Compass(150mm dia.) made of brass or gun metal Circles: Aluminum graduated every 30 minutes, Reading Agate stone bearing with help of prism glasses & reflecting mirror packed in fiber case with sighting vane and rigid stand and ball socket arrangement	06
9	Plane Table Surveying Plane Table consisting of Drawing Board 75cmX60cmX2cm made of seasoned pine wood/fire wood and braced with teak wood battens fitted with brass screws and washers in slots complete with metallic disc of 160 mm dia at base and confirming to BIS2539:1963;accessories comprising of magnetic trough compass confirming to BIS1764:1961,spirit level 15 cm long, plumb bob , 28cm long brass Ufork, alidade 45 cm long made of brass, one sided beveled edged wooden stand with metallic head and shoes.	10 sets
10	Telescopic Alidade size 175mm Internal focusing vertical circle graduated to read 30min with vernier, extendable base plate to 375mm and half degree divided giving angle of elevation and depression spirit level mounted on top telescope, telescope fitted with stadia diaphragm, vertical circle, to be supplied in teak wood box fully protected from dust	06
11	Automatic Level (as per BIS:4590) Telescope: Apperature of objective 45mm Field view1020' Magnification 32X Stadia Ratio 1:100 Addition Constant 0(zero) Minimum Focusing Distance1.5mm Range250meters Circular level with sensitivity per 2mm run10' mounted on sides of the telescope Accessories: Maintenance tools Leveling : Speedy Leveling by ball and socket arrangement. Tilting screw for final leveling Teak wood box, Tripod stand made of seasoned timber rigid with metal shoes	06
12	Leveling Staff: Aluminium-4 meter long in telescopic accurately painted in red and black on white background as per BIS 1779 and push type automatic locking system in canvas cover. Least Count- 0.005m /.001m	06

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA									
TEACHING AND EVALUATION SCHEME FOR 4th Semester (Electrical)(wef 2019-20)									
Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Energy Conversion-I	4	1	-	20	80	3	100
Th.2		Analog Electronics & OP-Amp	4		-	20	80	3	100
Th.3		Electrical Measurement & Instrumentation	4	1	-	20	80	3	100
Th.4		Generation, Transmission and Distribution	4			20	80	3	100
		Total	*16*	*02*		*80*	*320*	-	*400*
		Practical							
Pr.1		Electrical Machine Lab-I	-	-	6	25	50	3	75
Pr.2		Analog Electronics Lab	-	-	3	25	50	3	75
Pr.3		Simulation Practice on MATLAB	-	-	3	25	50	3	75
Pr.4		Electrical Drawing			6	25	100	3	125
		Student Centered Activities(SCA)		-	3				
		Total	-	-	*21*	*100*	*250*	-	*350*
		Grand Total	**16**	**02**	**21**	**180**	**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 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 4TH SEMESTER

For

DIPLOMA IN ENGINEERING

(Effective FROM 2019-20 Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

Th1. ENERGY CONVERSION – I

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	4th
Total Period:	75 (60L + 15T)	Examination	3 hrs
Theory periods:	4P / week	Internal Assessment :	20
Tutorial:	1 P / week		
Maximum marks:	100	End Semester examination:	80

A. RATIONALE

Energy Conversion-I deals with DC machines and transformers. The application of DC generators and motors in modern industries are still in practice. The electrical technicians have to look after the installation, operation, maintenance and control of such machine. So the knowledge of these machines is felt essential. Transformers of various voltage ratios and KVA ratings are in wide use in industries as well as in distribution and transmission.

B. OBJECTIVES

After completion of this subject the student will be able to:

1. To acquire knowledge of construction, characteristic and control of the DC machines.
2. To acquire knowledge on performance of DC machines and transformers.
3. To acquire knowledge of testing and maintenance of transformers and DC machines.

C. TOPIC WISE DISTRIBUTION OF PERIODS		
Sl. No.	**Topic**	**Periods**
1.	DC GENERATORS	17
2.	DC MOTORS	15
3.	SINGLE PHASE TRANSFORMER	20
4.	AUTO TRANSFORMER	03
5.	INSTRUMENT TRANSFORMERS	05
TOTAL		60

D. COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES

1. D.C GENERATOR

1.1. Operating principle of generator
1.2. Constructional features of DC machine.
  1.2.1. Yoke, Pole & field winding, Armature, Commutator.
  1.2.2. Armature winding, back pitch, Front pitch, Resultant pitch and commutator- pitch.
  1.2.3. Simple Lap and wave winding, Dummy coils.
1.3. Different types of D.C. machines (Shunt, Series and Compound)
1.4. Derivation of EMF equation of DC generators. (Solve problems)
1.5. Losses and efficiency of DC generator. Condition for maximum efficiency and numerical problems.

1.6. Armature reaction in D.C. machine
1.7. Commutation and methods of improving commutation.
1.7.1. Role of inter poles and compensating winding in commutation.
1.8. Characteristics of D.C. Generators
1.9. Application of different types of D.C. Generators.
1.10. Concept of critical resistance and critical speed of DC shunt generator
1.11. Conditions of Build-up of emf of DC generator.
1.12. Parallel operation of D.C. Generators.
1.13. Uses of D.C generators.

2. D. C. MOTORS

2.1. Basic working principle of DC motor
2.2. Significance of back emf in D.C. Motor.
2.3. Voltage equation of D.C. Motor and condition for maximum power output(simple problems)
2.4. Derive torque equation (solve problems)
2.5. Characteristics of shunt, series and compound motors and their application.
2.6. Starting method of shunt, series and compound motors.
2.7. Speed control of D.C shunt motors by Flux control method. Armature voltage Control method. Solve problems
2.8. Speed control of D.C. series motors by Field Flux control method, Tapped field method and series-parallel method
2.9. Determination of efficiency of D.C. Machine by Brake test method(solve numerical problems)
2.10. Determination of efficiency of D.C. Machine by Swinburne's Test method(solve numerical problems)
2.11. Losses, efficiency and power stages of D.C. motor(solve numerical problems)
2.12. Uses of D.C. motors

3. SINGLE PHASE TRANSFORMER

3.1 Working principle of transformer.
3.2 Constructional feature of Transformer.
3.2.1 Arrangement of core & winding in different types of transformer.
3.2.2 Brief ideas about transformer accessories such as conservator, tank, breather, and explosion vent etc.
3.2.3 Explain types of cooling methods
3.3 State the procedures for Care and maintenance.
3.4 EMF equation of transformer.
3.5 Ideal transformer voltage transformation ratio
3.6 Operation of Transformer at no load, on load with phasor diagrams.
3.7 Equivalent Resistance, Leakage Reactance and Impedance of transformer.
3.8 To draw phasor diagram of transformer on load, with winding Resistance and Magnetic leakage with using upf, leading pf and lagging pf load.
3.9 To explain Equivalent circuit and solve numerical problems.
3.10 Approximate & exact voltage drop calculation of a Transformer.
3.11 Regulation of transformer.
3.12 Different types of losses in a Transformer. Explain Open circuit and Short Circuit test.(Solve numerical problems)
3.13 Explain Efficiency, efficiency at different loads and power factors, condition for maximum efficiency (solve problems)
3.14 Explain All Day Efficiency (solve problems)
3.15 Determination of load corresponding to Maximum efficiency.
3.16 Parallel operation of single phase transformer.

4. AUTO TRANSFORMER

4.1. Constructional features of Auto transformer.
4.2. Working principle of single phase Auto Transformer.
4.3. Comparison of Auto transformer with an two winding transformer (saving of Copper).
4.4. Uses of Auto transformer.
4.5. Explain Tap changer with transformer (on load and off load condition)

5. INSTRUMENT TRANSFORMERS

1.1 Explain Current Transformer and Potential Transformer

1.2 Define Ratio error, Phase angle error, Burden.

1.3 Uses of C.T. and P.T.

Syllabus coverage up to Internal assessment

Chapters: 1 and 2.

Learning Resources:			
Sl.No	***Title of the Book***	***Name of Author***	***Publisher***
1	*Electrical Technology – II*	*B. L. Thareja and A. K. Thareja*	*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*
7	*Electrical Machines*	*Prithwiraj purakait and Indrayudh Bandyopadhyay*	*OXFORD*

Th2. Analog Electronics and OP-AMP

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Internal Assessment :	20
Maximum marks:	100	End Semester Examination:	80

A. Rationale:

Electrical Engineers use electronic devices and circuits in various fields. The modern electrical plants need help of solid state electronic circuits for control, starting etc. So it was felt to provide a subject having electronic devices and circuits for the electrical students. Study of practical circuits and components have been dealt here with in the theoretical approach.

B. Objectives:

1. To develop knowledge on the characteristics of different types of diodes, transistors, UJT, FET and to draw a comparison in their characteristics and application.
2. To develop knowledge of their application.
3. To develop knowledge of different oscillator circuits and to identify the difference between them and their frequency relation.
4. To develop knowledge of operational amplifiers and their application in the field.

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl No.	Name of the Topic	Periods
1	P-N JUNCTION DIODE	6
2	SPECIAL SEMICONDUCTOR DEVICES	5
3	RECTIFIER CIRCUITS & FILTERS	7
4	TRANSISTORS	7
5	TRANSISTOR CIRCUITS	7
6	TRANSISTOR AMPLIFIERS & OSCILLATORS	13
7	FIELD EFFECT TRANSISTOR	6
8	OPERATIONAL AMPLIFIERS	9
	Total	**60**

D. Course Content:

1. P-N JUNCTION DIODE:

- 1 . 1 P-N Junction Diode
- 1 . 2 Working of Diode
- 1 . 3 V-I characteristic of PN junction Diode.
- 1 . 4 DC load line
- 1 . 5 Important terms such as Ideal Diode, Knee voltage
- 1 . 6 Junctions break down.
  - 1.6.1 Zener breakdown
  - 1.6.2 Avalanche breakdown
- 1 . 7 P-N Diode clipping Circuit.
- 1 . 8 P-N Diode clamping Circuit

2. **SPECIAL SEMICONDUCTOR DEVICES:**

2 . 1 Thermistors, Sensors & barretters
2 . 2 Zener Diode
2 . 3 Tunnel Diode
2 . 4 PIN Diode

3. **RECTIFIER CIRCUITS & FILTERS:**

3.1 Classification of rectifiers
3.2 Analysis of half wave, full wave centre tapped and Bridge rectifiers and calculate:
- 3.2.1 DC output current and voltage
- 3.2.2 RMS output current and voltage
- 3.2.3 Rectifier efficiency
- 3.2.4 Ripple factor
- 3.2.5 Regulation
- 3.2.6 Transformer utilization factor
- 3.2.7 Peak inverse voltage

3.3 Filters:
- 3.3.1 Shunt capacitor filter
- 3.3.2 Choke input filter
- 3.3.3 π filter

4. **TRANSISTORS:**

4.1 Principle of Bipolar junction transistor
4.2 Different modes of operation of transistor
4.3 Current components in a transistor
4.4 Transistor as an amplifier
4.5 Transistor circuit configuration & its characteristics
- 4.5.1 CB Configuration
- 4.5.2 CE Configuration
- 4.5.3 CC Configuration

5. **TRANSISTOR CIRCUITS:**

5.1 Transistor biasing
5.2 Stabilization
5.3 Stability factor
5.4 Different method of Transistors Biasing
- 5.4.1 Base resistor method
- 5.4.2 Collector to base bias
- 5.4.3 Self bias or voltage divider method

6. **TRANSISTOR AMPLIFIERS & OSCILLATORS:**

6.1 Practical circuit of transistor amplifier
6.2 DC load line and DC equivalent circuit
6.3 AC load line and AC equivalent circuit
6.4 Calculation of gain
6.5 Phase reversal
6.6 H-parameters of transistors
6.7 Simplified H-parameters of transistors

6.8 Generalised approximate model
6.9 Analysis of CB, CE, CC amplifier using generalised approximate model
6.10 Multi stage transistor amplifier
6.10.1 R.C. coupled amplifier
6.10.2 Transformer coupled amplifier
6.11 Feed back in amplifier
6.11.1 General theory of feed back
6.11.2 Negative feedback circuit
6.11.3 Advantage of negative feed back
6.12 Power amplifier and its classification
6.12.1 Difference between voltage amplifier and power amplifier
6.12.2 Transformer coupled class A power amplifier
6.12.3 Class A push – pull amplifier
6.12.4 Class B push – pull amplifier
6.13 Oscillators
6.13.1 Types of oscillators
6.13.2 Essentials of transistor oscillator
6.13.3 Principle of operation of tuned collector, Hartley, colpitt, phase shift, wein-bridge oscillator (no mathematical derivations)

7. **FIELD EFFECT TRANSISTOR:**

7.1 Classification of FET
7.2 Advantages of FET over BJT
7.3 Principle of operation of BJT
7.4 FET parameters (no mathematical derivation)
7.4.1 DC drain resistance
7.4.2 AC drain resistance
7.4.3 Trans-conductance
7.5 Biasing of FET

8. **OPERATIONAL AMPLIFIERS:**

8.1 General circuit simple of OP-AMP and IC – CA – 741 OP AMP
8.2 Operational amplifier stages
8.3 Equivalent circuit of operational amplifier
8.4 Open loop OP-AMP configuration
8.5 OPAMP with fed back
8.6 Inverting OP-AMP
8.7 Non inverting OP-AMP
8.8 Voltage follower & buffer
8.9 Differential amplifier
8.9.1 Adder or summing amplifier
8.9.2 Sub tractor
8.9.3 Integrator
8.9.4 Differentiator
8.9.5 Comparator

Syllabus coverage up to Internal assessment

Chapters: 1, 2, 3, 4 and 5.

Learning Resources:			
Sl.No	**Name of Authors**	**Title of the Book**	**Name of the publisher**
1	Sanjeev Gupta	Electronic Devices and Circuits	Dhanpat Rai Publications
2	R.S SEDHA	Electronics circuit	S.CHAND

Th3. ELECTRICAL MEASUREMENT & INSTRUMENTATION

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	4th
Total Period:	75 (60L + 15T)	Examination	3 hrs
Theory periods:	4P / week	Internal Assessment :	20
Tutorial:	1 P / week		
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE :

The subjects deal with the methods of measuring voltage, current, power, energy, frequency, power factor & line parameters, and principle of operation of the instruments used for such measurements. Also it provides the methods to extend the range of low range instruments to measure higher values. A power measurement includes measurement of DC power, AC single phase power and AC three phase power. Also accuracy, precision, resolution and errors and their correction are very important and have been fully discussed. Since the whole system is a combination of analog and digital system in Industry, the topics of both the system have been studied along with the topics of sensors, their characteristics and their interfacing with analog and digital system under this subject.

B. OBJECTIVES :

1. To acquire the knowledge of selecting various types of instruments for similar purpose like measurement of voltage, current, power factor, frequency etc.
2. To learn the connection of different types of electrical measuring instruments.
3. To learn the adjustment of different instruments.
4. To understand the working principle and construction of the electrical instruments.
5. To solve different numerical problems associated with the instruments based on their design Formula.
6. To acquire knowledge of the construction, characteristics and methods of usage of sensors and transducers.

C. **TOPIC WISE DISTRIBUTION OF PERIODS**

Sl. No.	Topic	Periods
1.	Measuring instruments	05
2.	Analog ammeters and voltmeters	10
3.	Wattmeter and measurement of power	08
4.	Energy meters and measurement of energy	08
5.	Measurement of speed, frequency and power factor	07
6.	Measurement of Resistance, Inductance& Capacitance	08
7.	Sensors And Transducer	09
8.	Oscilloscope	05
	TOTAL	**60**

D. COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES

1. MEASURING INSTRUMENTS

1.1 Define Accuracy, precision, Errors, Resolutions Sensitivity and tolerance.
1.2 Classification of measuring instruments.
1.3 Explain Deflecting, controlling and damping arrangements in indicating type of

instruments.
1.4 Calibration of instruments.

2. ANALOG AMMETERS AND VOLTMETERS

2.1. Describe Construction, principle of operation, errors, ranges merits and demerits of:
- 2.1.1 Moving iron type instruments.
- 2.1.2 Permanent Magnet Moving coil type instruments.
- 2.1.3 Dynamometer type instruments
- 2.1.4 Rectifier type instruments
- 2.1.5 Induction type instruments

2.2 Extend the range of instruments by use of shunts and Multipliers.
2.3 Solve Numerical

3. WATTMETERS AND MEASUREMENT OF POWER

3.1 Describe Construction, principle of working of Dynamometer type wattmeter. (LPF and UPF type)
3.2 The Errors in Dynamometer type wattmeter and methods of their correction.
3.3 Discuss Induction type watt meters.

4. ENERGYMETERS AND MEASUREMENT OF ENERGY

4.1 Introduction
4.2 Single Phase Induction type Energy meters – construction, working principle and their compensation & adjustments.
4.3 Testing of Energy Meters.

5. MEASUREMENT OF SPEED, FREQUENCY AND POWER FACTOR

5.1 Tachometers, types and working principles
5.2 Principle of operation and construction of Mechanical and Electrical resonance Type frequency meters.
5.3 Principle of operation and working of Dynamometer type single phase and three phase power factor meters.

6. MEASUREMENT OF RESISTANCE, INDUCTANCE& CAPACITANCE

6.1 Classification of resistance
- 6.1..1. Measurement of low resistance by potentiometer method. .
- 6.1..2. Measurement of medium resistance by wheat Stone bridge method.
- 6.1..3. Measurement of high resistance by loss of charge method.

6.2 Construction, principle of operations of Megger & Earth tester for insulation resistance and earth resistance measurement respectively.
6.3 Construction and principles of Multimeter. (Analog and Digital)
6.4 Measurement of inductance by Maxewell's Bridge method.
6.5 Measurement of capacitance by Schering Bridge method

7. SENSORS AND TRANSDUCER

7.1. Define Transducer, sensing element or detector element and transduction elements.
7.2. Classify transducer. Give examples of various class of transducer.
7.3. Resistive transducer
- 7.3.1 Linear and angular motion potentiometer.
- 7.3.2 Thermistor and Resistance thermometers.
- 7.3.3 Wire Resistance Strain Gauges

7.4. Inductive Transducer
- 7.4.1 Principle of linear variable differential Transformer (LVDT)

7.4.2 Uses of LVDT.

7.5. Capacitive Transducer.

7.5.1 General principle of capacitive transducer.

7.5.2 Variable area capacitive transducer.

7.5.3 Change in distance between plate capacitive transducer.

7.6. Piezo electric Transducer and Hall Effect Transducer with their applications.

8. OSCILLOSCOPE

8.1. Principle of operation of Cathode Ray Tube.

8.2. Principle of operation of Oscilloscope (with help of block diagram).

8.3. Measurement of DC Voltage & current.

8.4. Measurement of AC Voltage, current, phase & frequency.

Syllabus coverage up to Internal assessment

Chapters: 1, 2, 3 and 4.

Learning Resources:			
Sl.No	**Title of the Book**	**Name of Author**	**Publisher**
1.	Electrical & Electronic Measurements and Instrumentation	R.K.Rajput	S.Chand
2.	Electric Measurement and Measuring instruments	A.K. Sawhney	Dhanpat Rai & Co
3.	Electrical and Electronics Measuring instruments and Measurement	J. B. Gupta	S K Kataria & Sons
4.	Electrical Measurement and Measuring instruments	E.W. Golding & H Widdis	Wheeler Publishing
5.	Industrial Instrumentation and Control	S K Singh	TMH Ltd.
6.	Electrical and Electronic Measurement and Instrumentation.	S K Bhattacharya	Vikas

Th4. GENERATION TRANSMISSION & DISTRIBUTION

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4P / week	Internal Assessment :	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE :

Power system comprises generation, transmission and distribution. In this subject generation, transmission and distribution, types of generation schemes, transmission with transmission loss and efficiencies, different type of sub-stations, different type of distribution schemes, EHV AC and HV DC overhead transmission, underground cable transmission and economic aspects involved are dealt with. Further, types of tariff are briefly included to give brief and overall idea to the students.

B. OBJECTIVES :

After completion of this subject the student will be able to:

1. Different schemes of power generation with their block diagram.
2. Mechanical and electrical design of transmission lines and numerical problems.
3. Types of cables and their methods of laying and testing.
4. Different schemes of distribution with problem solving
5. Different types of sub-stations.
6. Economic aspects of power supply system with problem and type of tariff of electricity.

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topics	Periods
1.	Generation of electricity	07
2.	Transmission of electric power	05
3.	Over head line	07
4.	Performance of short & medium lines	07
5.	EHV transmission	07
6.	Distribution System	07
7.	Underground cable	06
8.	Economic Aspects	06
9.	Types of tariff	03
10.	Substation	05
	TOTAL	**60**

D. COURSE CONTENTS IN TERMS OF SPECIFIC OBJECTIVES.

1. GENERATION OF ELECTRICITY

1.1 Elementary idea on generation of electricity from Thermal, Hydel, Nuclear, Power station.

1.2 Introduction to Solar Power Plant (Photovoltaic cells).

1.3 Layout diagram of generating stations.

2. TRANSMISSION OF ELECTRIC POWER

2.1 Layout of transmission and distribution scheme.
2.2 Voltage Regulation & efficiency of transmission.
2.3 State and explain Kelvin's law for economical size of conductor.
2.4 Corona and corona loss on transmission lines.

3. OVER HEAD LINES

3.1 Types of supports, size and spacing of conductor.
3.2 Types of conductor materials.
3.3 State types of insulator and cross arms.
3.4 Sag in overhead line with support at same level and different level. (approximate formula effect of wind, ice and temperature on sag)
3.5 Simple problem on sag.

4. PERFORMANCE OF SHORT & MEDIUM LINES

4.1. Calculation of regulation and efficiency.

5. EHV TRANSMISSION

5.1 EHV AC transmission.
5.1..1. Reasons for adoption of EHV AC transmission.
5.1..2. Problems involved in EHV transmission.
5.2 HV DC transmission.
5.2..1. Advantages and Limitations of HVDC transmission system.

6. DISTRIBUTION SYSTEMS

6.1 Introduction to Distribution System.
6.2 Connection Schemes of Distribution System: (Radial, Ring Main and Inter connected system)
6.3 DC distributions.
6.3.1 Distributor fed at one End.
6.3.2 Distributor fed at both the ends.
6.3.3 Ring distributors.
6.4 AC distribution system.
6.4.1. Method of solving AC distribution problem.
6.4.2. Three phase four wire star connected system arrangement.

7. UNDERGROUND CABLES

7.1 Cable insulation and classification of cables.
7.2 Types of L. T. & H.T. cables with constructional features.
7.3 Methods of cable lying.
7.4 Localization of cable faults: Murray and Varley loop test for short circuit fault / Earth fault.

8. ECONOMIC ASPECTS

8.1 Causes of low power factor and methods of improvement of power factor in

power system.

8.2 Factors affecting the economics of generation: (Define and explain)

8.2.1 Load curves.

8.2.2 Demand factor.

8.2.3 Maximum demand.

8.2.4 Load factor.

8.2.5 Diversity factor.

8.2.6 Plant capacity factor.

8.3 Peak load and Base load on power station.

9. TYPES OF TARIFF

9.1. Desirable characteristic of a tariff.

9.2. Explain flat rate, block rate, two part and maximum demand tariff. (Solve Problems)

10. SUBSTATION

10.1 Layout of LT, HT and EHT substation.

10.2 Earthing of Substation, transmission and distribution lines.

Syllabus coverage up to Internal assessment

Chapters: 1, 2, 3, 4 and 5.

Learning Resources:			
Sl.No	**Title of the Book**	**Name of Author**	**Publisher**
1.	Principles of Power System	V. K. Mehta	S Chand
2	A text book of Power System Engineering	A Chakrabarti, M L Soni, P V Gupta, U S Bhatnagar	Dhanpat Rai & Co
3.	A course of electrical power system	S. L. Uppal	Khanna publisher
4.	Power System Engineering	D. P. Kothari, IJ Nagrath	TMH

Pr1. ELECTRICAL MACHINE LAB-I

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	4th
Total Period:	90	Examination	3 hrs
Lab. periods:	6 P / week	Sessional	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, terminal testing, insulation testing of DC machines, and Transformers.
2. Know methods of Starting and Speed control of DC machines.
3. To determine efficiency, regulations of different machines.
4. To draw and study performance characteristics.
5. Load sharing of transformers.

C. LIST OF EXPERIMENTS:

1. Identification of different terminals of a DC machine by test lamp method and multi-meter method & to measure insulation resistance by megger.
2. Dimensional and material study of various parts of a DC machine.
3. Plot OCC of a DC shunt generator at constant speed and determine critical resistance from the graph.
4. Plot External Characteristics of a DC shunt generator at constant speed.
5. Study of Three point starter, connect and run a DC shunt motor & measure the no load current.
6. Study of Four point starter, connect and run a DC compound motor & measure no load current.
7. Control the speed of a DC shunt motor by field flux control method & armature voltage control method.
8. Determine the armature current vs. speed characteristic of a DC motor
9. Determine the efficiency of a DC machine by brake test method.
10. Identification of terminals, determination of voltage transformation ratio of a single phase transformer.
11. Perform OC Test and SC test of a single phase transformer.
12. Determine the voltage regulation of a single phase transformer at different loads.

13. Polarity test of single phase transformer and parallel operation of two single phase transformers.

Learning Resources:

Sl. No.	Title of the Book	Name of Author	Publisher
1.	Laboratory courses in Electrical Engineering	S G Tarnekar; P K Kharbanda; S D Naik et.al	S.Chand

Pr2. ANALOG ELECTRONICS LAB

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	4th
Total Period:	45	Examination	3 hrs
Lab. periods:	3 P / week	Sessional	25
Maximum marks:	75	End Semester Examination:	50

A. RATIONALE

In this practical work the students get knowledge about the Analog Systems components.They will become capable of developing and implementing Analog Circuit.

B. OBJECTIVE

On completion of the Lab. Course the student will be able to

1. Identify the active components
2. Understand the behavior character of basic semiconductor devices
3. Understand the concept of oscillator. Amplifier, Rectifier etc.

C. COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES

1. Determine the input and output Characteristics of CE & CB transistor configuration
2. Determine Drain & Transfer Characteristics of JFET
3. Construct Bridge Rectifier using different filter circuit and to determine Ripple factor & analyze wave form with filter & without filter.
4. Construct Bridge Rectifier using different filter and to determine Ripple factor.
5. Construct & test the regulator using Zener diode
6. Construct different types of biasing circuit and analyze the wave form

   (i) Fixed bias (ii) Emitter bias (iii) Voltage divider bias
7. Study the single stage CE amplifier & find Gain
8. Study multi stage R-C coupled amplifier & to determine frequency- response & gain.
9. Construct & Find the gain

   (I) Class A. Amplifier (ii) Class B. Amplifier (iii) Class C Tuned Amplifier
10. Construct & test push pull amplifier & observer the wave form
11. Construct & calculate the frequency of

    (i) Hartly Oscillator (ii) Collpit's Oscillator (iii) Wein Bridge Oscillator (iv) R-C phase

shift oscillator and draw wave form & calculate the frequency

12. Construct & Test Differentiator and Integrator using R-C Circuit

13. Study Multivibrator (Astable, Bistable, Monstable) Circuit & Draw its Wave forms

- **Mini Project:** To collect data like base configuration. Operational Characteristics, applications and critical factor etc. On all semiconductor devices studied in theory and compile a Project report throughout and submit at the end of the semester. To assemble and test simple circuit using above components with test Points.(e.g. Series Regulator / Oscillators etc)

Learning Resources:

Sl. No.	Title of the Book	Name of Author	Publisher
1.	Basic electronic Lab. Manual :	Paul B. Zbar	S.Chand

Pr3. SIMULATION PRACTICE ON MATLAB

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	4th
Total Period:	45	Examination	3 hrs
Lab. periods:	3 P / week	Sessional	25
Maximum marks:	75	End Semester Examination:	50

A. RATIONALE:

Computer simulation is necessary for any hardware, before its fabrication. MATLAB software provides a unique platform for computer simulation. Practice on MATLAB has been opted for final semester students to be familiar with programming and simulation practice with SIMULINK to make them comfortable for designing various hardware projects and verify different experiments in absence of proto type experimental equipments.

B. OBJECTIVE:

1. To learn programming in MATLAB to perform mathematical manipulation.
2. To prepare virtual experiment setup for different electrical and power electronics experiments under MATLAB Simulink.

C. Topic wise distribution of periods:		
Sl. No.	**Topics**	**No of Periods**
1.	Introduction to MATLAB programming	20
2.	Introduction to SIMULINK	25
	Total	**45**

D. COURSE CONTENT (in terms of specific objective)

1. **Introduction to MATLAB programming:**

1.1. Functions and operation using variables and arrays.
  1.1.1. To learn algebraic, trigonometric and exponential manipulation.
  1.1.2. To learn Arithmetic, Relational and Logic operator.
1.2. Matrix formation and its manipulation.
1.3. Vector manipulation:
  1.3.1. Use of linspace to create vectors.
  1.3.2. To create, add and multiply vectors.
  1.3.3. Use of sin and sqrt functions with vector arguments.

1.4. Plotting:

1.4.1. Two dimensional Plots and sub plots

1.4.2. Label the plot and printing.

1.5. Write and execute a file to plot a circle, impulse, step, ramp, sine and cosine functions. .

2. **Introduction to SIMULINK:**

2.1. Use of Commonly used blocks, Math operation block and Display block from SIMULINK library.

2.2. Use of logical and relational operator block.

2.3. Use of Sim-Power system block to use Electrical sources, elements and Power electronics devices.

2.4. SIMULATION:

2.4.1. Verification of Network theorems.

2.4.2. Simulation of a half wave uncontrolled rectifier.

2.4.3. Simulation of 1-phase full bridge controlled rectifier.

2.4.4. Simulation of step-down chopper.

Learning Resources:			
Sl.No	**Title of the Book**	**Name of Authors**	**Name of Publisher**
1.	MATLAB and Simuilink for Engineers	Agam Kumar Tyagi	Oxford
2.	Getting started with MATLAB	Rudra Pratap	Oxford
3.	MATLAB Demystified	K K Sarma	Vikas

Pr4. ELECTRICAL DRAWING

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester:	4th
Total Period:	90	Examination:	3 hrs
Theory periods:	6 P/week	Term work:	25
Maximum marks:	125	End Semester Examination:	100

A. Rationale:

A technical person takes help of an engineering drawing to understand the constructional features of machines and accessories. Electrical drawing is introduced for the final year students to be familiar with Circuit diagrams of AC motors starters, Development of stator windings with conventional symbols.

Sketching as to BIS and REC specification and symbol of electrical earthing installations, SP and DP structures and substations of 132/33 kV and 33/11 kV type. This will enable them to follow engineering drawing in the working environment.

B. Objectives:

1. To draw wiring circuit diagram for different AC and DC motor starters.
2. To follow BIS and REC standard to draw earthing installation and SP and DP Structures and stay sets for line supports.
3. To use various symbols to draw the single line diagram of 33/11kV substations.

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	**Topics**	**Periods**
1.	Wiring Diagram of Starters	18
2.	Development of DC armature winding	18
3.	1 φ and 3 φ transformer	12
4.	Sketches of Earthing and LT and HT line	18
5.	Single line diagram sub station	09
6.	Auto CAD practice	15
	Total	**90**

D. COURSE CONTENT:

1. **WIRING DIAGRAM AND CONTROL CIRCUIT**
   - 1.1 3 point D. C. motor starter.
   - 1.2 4 point D.C. motor starter.
   - 1.3 DOL starter
   - 1.4 Star delta starter.
   - 1.5 Auto Transformer Starter.
   - 1.6 Rotor resistance starter.
2. **DRAW D.C. M/C PARTS** (Dimensional Drawing)
   - 2.1. Pole with pole shoes.
   - 2.2. Commutator
   - 2.3. Armature
   - 2.4. DC. armature winding
     - (a) Simple lap winding
     - (b) Simple wave winding.

3. **DRAW 1-PHASE & 3-PHASE TRANSFORMER** (Assembly Drawing)
   - 3.1 Stepped core type.
   - 3.2 Plane shell type.

5. **DRAW SKETCHES OF THE FOLLOWING AS PER B.I.S AND REC SPECIFICATIONS**
   - 5.1 Earthing installation.
   - 5.2 Double pole structure for LT and HT distribution lines.

6. **DRAW SINGLE LINE DIAGRAM OF SUBSTATION**
   - 6.1 Single line diagram of 33/11kV distribution substation.
   - 6.2 Single line diagram of a 11/0.4 kV distribution substation.

8. **COMPUTER AIDED ELECTRICAL DRAWING USING SOFT WARE**
   - 8.1 Draw Electrical symbols (take Print out)
   - 8.2 Draw D.C. m/c parts (take print out)
   - 8.3 Draw A. C. m/c parts (take print out)
   - 8.4 Draw electrical layout of diagram of Electrical Installation of a building.

Learning Resources:

Sl.No	***Title of the Book***	***Name of Authors***	***Name of the publisher***
1	*Electrical Design and Drawing*	*Surjit Singh*	*Dhanpat Rai & Sons*
2	*Electrical Engineering Drawing*	*C.R. Dargan*	*Asian Publication*

Equipment List

ANALOG ELECTRONICS LAB

Sl. No.	Equipment
1	Breadboard
2	Regulated Power Supply
3	Digital Multimeter
4	JFET Characteristics Trainer kit
5	Rectifier Trainer with Filter
6	Voltage Regulator Trainer Kit using Zener Diode
7	BJT Biasing Trainer (fixed Bias, Emitter Bias, Voltage Divider Bias, Collector Feedback Bias)
8	CE amplifier Trainer
9	RC couple Amplifier Trainer
10	CRO with Probes
11	Step Down Transformer
12	Zener Diode
13	Function Generator
14	Class A,Class B,Class C Tuned Amplifier Trainer
15	Oscillator Trainer kit(Heartly osicalltor,collpits oscillator. Wein Bridge Oscillator, RC Phase Shift Oscillator)
16	Transistor Configuration Trainer Kit
17	Push Pull Amplifier Trainer
18	OPamp Trainer Kit for Differentiation and Integration
19	Multivibrator Trainer Kit(Astable,Bistable,Monostable)

ELECTRICAL MACHINE LAB-I

Sl. No.	Equipment
1	DC SHUNT MOTOR coupled with a DC SHUNT GENERATOR (MG SET)
2	DC SERIES MOTOR
3	DC SHUNT MOTOR
4	DC COMPOUND MOTOR
5	1- PHASE TRANSFORMER
6	MULTIMETER
7	MEGGER
8	VOLTMETER
9	AMMETER
10	WATTMETER
11	TACHOMETER
12	P.F METER
13	VARIABLE RESISTANCE
14	RESISTIVE LOAD BOX
15	LAMP LOAD BOX
16	3 POINT STARTER
17	4 POINT STARTER
18	1PH VARIAC
19	SPRING WEIGHT
20	STAR DELTA STARTER
21	3PHASE INDUCTION MOTOR -SHUNT GENERATOR SET
22	DRUM CONTROL
23	INDUCTIVE LOAD(VARIABLE)
24	CAPACITIVE LOAD
25	2 POINT STARTER
26	OHM METRE

MATLAB S/W- Multiuser

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA									
TEACHING AND EVALUATION SCHEME FOR 4th Semester (Mechanical Engg.) (wef. 2019-20)									
Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Theory of Machine	4		-	20	80	3	100
Th.2		Manufacturing Technology	4		-	20	80	3	100
Th.3		Fluid Mechanics	4		-	20	80	3	100
Th.4		Thermal Engg-II	4		-	20	80	3	100
		Total	*16*			*80*	*320*	-	*400*
		Practical							
Pr.1		Theory of Machine and Measurement lab	-	-	6	25	75	3	100
Pr.2		Mechanical Engg. Lab-II	-	-	6	25	75	3	100
Pr.3		Workshop-III	-	-	6	50	50	4	100
Pr.4		Technical Seminar			2	50			50
		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 etc. ,Seminar and SCA shall be conducted in a section.									

CURRICULLUM OF 4th SEMESTER

For

DIPLOMA IN MECHANICAL ENGINEERING

(Effective FROM 2019-20 Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

TH 1 - THEORY OF MACHINES

Name of the Course: Diploma in **Mech/Auto/ & Other Mechanical Allied Branches**			
Course code:		Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A.RATIONAL:

Mechanical and Automobile engineering is involved with design, manufacturing and use of various types of machines. Each machine consists of a large number of static and moving parts called mechanisms. Theory of machines is study of such different kind of mechanisms.

B.COURSE OBJECTIVES:

Students will develop an ability towards

- Understanding machine system consisting of different link assemblies as components
- Comprehending Working principle of machine components such as clutch, brakes, bearings based on friction
- Comprehending working principles related to power transmission systems and predicting the work involved and efficiency.
- Comprehending working principle in speed and torque regulating devices such as governor and flywheels
- Determination of amount and position of masses required towards static and dynamic balancing
- Comprehending types and causes of vibration in machines and predicting remedial measures

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topic	Periods
01	Simple Mechanism	08
02	Friction	12
03	Power Transmission	12
04	Governors and Flywheel	12
05	Balancing of Machine	08
06	Vibration of machine parts	08
	Total Period:	**60**

D. CONTENT

1.0 Simple mechanism

1.1 Link ,kinematic chain, mechanism, machine
1.2 Inversion, four bar link mechanism and its inversion
1.3 Lower pair and higher pair
1.4 Cam and followers

2.0 Friction

2.1 Friction between nut and screw for square thread, screw jack
2.2 Bearing and its classification, Description of roller, needle roller& ball bearings.
2.3 Torque transmission in flat pivot& conical pivot bearings.
2.4 Flat collar bearing of single and multiple types.
2.5 Torque transmission for single and multiple clutches
2.6 Working of simple frictional brakes.

2.7 Working of Absorption type of dynamometer

3.0 Power Transmission

3.1 Concept of power transmission
3.2 Type of drives, belt, gear and chain drive.
3.3 Computation of velocity ratio, length of belts (open and cross)with and without slip.
3.4 Ratio of belt tensions, centrifugal tension and initial tension.
3.5 Power transmitted by the belt.
3.6 Determine belt thickness and width for given permissible stress for open and crossed belt considering centrifugal tension.
3.7 V-belts and V-belts pulleys.
3.8 Concept of crowning of pulleys.
3.9 Gear drives and its terminology.
3.10 Gear trains, working principle of simple, compound, reverted and epicyclic gear trains.

4.0 Governors and Flywheel

4.1 Function of governor
4.2 Classification of governor
4.3 Working of Watt, Porter, Proel and Hartnell governors.
4.4 Conceptual explanation of sensitivity, stability and isochronisms.
4.5 Function of flywheel.
4.6 Comparison between flywheel &governor.
4.7 Fluctuation of energy and coefficient of fluctuation of speed.
4.8

5.0 Balancing of Machine

5.1 Concept of static and dynamic balancing.
5.2 Static balancing of rotating parts.
5.3 Principles of balancing of reciprocating parts.
5.4 Causes and effect of unbalance.
5.5 Difference between static and dynamic balancing

6.0 Vibration of machine parts

6.1 Introduction to Vibration and related terms (Amplitude, time period and frequency, cycle)
6.2 Classification of vibration.
6.3 Basic concept of natural, forced & damped vibration
6.4 Torsional and Longitudinal vibration.
6.5 Causes & remedies of vibration.

CHAPTERS COVERED UP TO IA- 1,2,3

Learning Resources:

Sl No.	Name of the Book	Author Name	Publisher
1.	Text Book of Theory of Machine	R.S Khurmi	S.Chand
2.	Text Book of Theory of Machine	R.K. Rajput	S.Chand
3.	Text Book of Theory of Machine	P.L.Ballany	Dhanpat Rai
4.	Text Book of Theory of Machine	Thomas Bevan	Pearsion

TH-2 MANUFACTURING TECHNOLOGY

Name of the Course: Diploma in **Mech/Auto/ & Other Mechanical Allied Branches**			
Course code:		Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONAL:

Engineering basically means production of goods and services for human consumption. The major function of mechanical engineering is to manufacture various products using machineries, production processes and production management techniques. Therefore this is one of the most important subjects to be learned by a mechanical and automobile engineer.

B. COURSE OBJECTIVES:

Students will develop an ability towards

- Comprehending required material properties for cutting tools
- Comprehending machining mechanism principle and factors affecting machining performance
- Comprehendingworkingprincipleandcomponentsinmachiningtoolsincludinglathe,milling,shaping,planning,slottingmachines
- Comprehendingrequirementofsurfacefinishandrealizeprinciplesinvolvedingrindingandsuperfinishingoperations

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topic	Periods
01	Tool Materials	04
02	Cutting Tools	06
03	Lathe Machine	08
04	Shaper	06
05	Planning Machine	06
06	Milling Machine	08
07	Slotter	06
08	Grinding	06
09	Internal Machining operations	06
10	Surface finish, lapping	04
	Total Period:	**60**

D. CONTENT

1.0 Tool Materials

1.1 Composition of various tool materials

1.2 Physical properties& uses of such tool materials.

2.1 Cutting Tools

2.1 Cutting action of various and tools such as Chisel, hacksaw blade, dies and reamer
2.3 Turning tool geometry and purpose of tool angle
2.5 Machining process parameters (Speed, feed and depth of cut)
2.6 Coolants and lubricants in machining and purpose

3.0 Lathe Machine

3.1 Construction and working of lathe and CNC lathe

- Major components of a lathe and their function
- Operations carried out in a lathe(Turning, thread cutting, taper turning, internal machining, parting off, facing, knurling)
- Safety measures during machining

3.2 Capstan lathe

- Difference with respect to engine lathe
- Major components and their function
- Define multiple tool holders

3.3 Turret Lathe

- Difference with respect to capstan lathe
- Major components and their function

3.4 Draw the tooling layout for preparation of a hexagonal bolt &bush

4.0 Shaper

4.1 Potential application areas of a shaper machine
4.2 Major components and their function
4.3 Explain the automatic able feed mechanism
4.4 Explain the construction &working of tool head
4.5 Explain the quick return mechanism through sketch
4.6 State the specification of a shaping machine.

5.0 Planning Machine

5.1 Application area of a planer and its difference with respect to shaper
5.2 Major components and their functions
5.3 The table drive mechanism
5.4 Working of tool and tool support
5.5 Clamping of work through sketch.

6.0 Milling Machine

6.1 Types of milling machine and operations performed by them and also same for CNC milling machine

6.2 Explain work holding attachment
6.3 Construction & working of simple dividing head, universal dividing head
6.4 Procedure of simple and compound indexing
6.5 Illustration of different indexing methods

7.0 Slotter

7.1 Major components and their function
7.2 Construction and working of slotter machine
7.3 Tools used in slotter

8.0 Grinding

8.1 Significance of grinding operations
8.2 Manufacturing of grinding wheels
8.3 Criteria for selecting of grinding wheels
8.4 Specification of grinding wheels with example Working of

- Cylindrical Grinder
- Surface Grinder
- Centreless Grinder

9.0 Internal Machining operations

Classification of drilling machines

9.1 Working of

- Bench drilling machine
- Pillar drilling machine
- Radial drilling machine

9.2 Boring

- Basic Principle of Boring
- Different between Boring and drilling

9.3 Broaching

- Types of Broaching(pull type, push type)
- Advantages of Broaching and applications

10 Surface finish, lapping

10.1 Definition of Surface finish

10.2 Description of lapping& explain their specific cutting.

CHAPTERS COVERED UP TO IA- 1, 2,3,4,5

LearningResources:

Sl No.	Name of the Book	Author Name	Publisher
1.	Text Book of Workshop Technology	Hazra Choudhury Vol-I & II	MPP Pvt. Ltd.
2.	Text Book of Workshop Technology	W.A.S Chapman Vol-I & II	
3.	Text Book of Manufacturing Process	P.N Rao	TMH

TH-3 FLUID MECHANICS

Name of the Course: Diploma in **Mech & Other Mechanical Allied Branches**			
Course code:		Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONAL:

Use of fluid in engineering field is of great importance. It is therefore necessary to study the physical properties and characteristics of fluids which have very important application in mechanical and automobile engineering.

B. COURSE OBJECTIVES:

Students will develop an ability towards

- Comprehending fluid properties and their measurements
- Realizing conditions for floatation
- Applying Bernoulli's theorem

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topic	Periods
01	Properties of Fluid	08
02	Fluid Pressure and its measurements	08
03	Hydrostatics	08
04	Kinematics of Flow	08
05	orifices, notches & weirs	08
06	Flow through pipe	10
07	Impact of jets	10
	Total Period:	**60**

D.CONTENT

1.0 Properties of Fluid

1.1 Define fluid

1.2 Description of fluid properties like Density, Specific weight, specific gravity, specific volume and solve simple problems.

1.3 Definitions and Units of Dynamic viscosity, kinematic viscosity, surface tension Capillary phenomenon

2.0 Fluid Pressure and its measurements

2.1 Definitions and units of fluid pressure, pressure intensity and pressure head.

2.2 Statement of Pascal's Law.

2.3 Concept of atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure

2.4 Pressure measuring instruments

Manometers (Simple and Differential)

2.4.1 Bourdon tube pressure gauge(Simple Numerical)

2.5 Solve simple problems on Manometer.

3.0 Hydrostatics

3.1 Definition of hydrostatic pressure

3.2 Total pressure and centre of pressure on immersed bodies(Horizontal and Vertical Bodies)

3.3 Solve Simple problems.

3.4 Archimedes 'principle, concept of buoyancy, meta center and meta centric height (Definition only)

3.5 Concept of floatation

4.0 Kinematics of Flow

4.1 Types of fluid flow

4.2 Continuity equation(Statement and proof for one dimensional flow)

4.3 Bernoulli's theorem(Statement and proof)
Applications and limitations of Bernoulli's theorem (Venturimeter, pitot tube)

4.4 Solve simple problems

5.0 Orifices, notches & weirs

5.1 Define orifice

5.2 Flow through orifice

5.3Orifices coefficient & the relation between the orifice coefficients

5.4 Classifications of notches & weirs

5.5 Discharge over a rectangular notch or weir

5.6 Discharge over a triangular notch or weir

5.7 Simple problems on above

6.0 Flow through pipe

6.1 Definition of pipe.

6.2 Loss of energy in pipes.

6.3 Head loss due to friction: Darcy's and Chezy's formula (Expression only)

6.4 Solve Problems using Darcy's and Chezy's formula.

6.5 Hydraulic gradient and total gradient line

7.0 Impact of jets

7.1 Impact of jet on fixed and moving vertical flat plates

7.2 Derivation of work done on series of vanes and condition for maximum efficiency.

7.3 Impact of jet on moving curved vanes, illustration using velocity triangles, derivation of work done, efficiency.

CHAPTERS COVERED UP TO IA- 1, 2,3,4

Learning Resources:

Sl No.	Name of the Book	Author Name	Publisher
1.	Text Book of Fluid Mechanics	R.K.Bansal	Laxmi
2.	Text Book of Fluid Mechanics	R.S khurmi	S.Chand
3.	Text Book of Fluid Mechanics	R.K.Rajput	S.Chand
4.	Text Book of Fluid Mechanics	Modi & Seth	Rajson's pub. Pvt. lt

THEORY 4 -THERMAL ENGINEERING-II

Name of the Course: Diploma in **Mech/ & Other Mechanical Allied Branches**			
Course code:		**Semester**	**4th**
Total Period:	**60**	**Examination**	**3 hr**
Theory periods:	**4 P/week**	**Class Test:**	**20**
Maximum marks:	**100**	**End Semester Examination:**	**80**

A. RATIONAL:

Modern society needs lots of applications of thermodynamics, which deals with energy possessed by hot vapors, its production and its application in different fields.

B. COURSE OBJECTIVES:

Student will develop ability towards.

- Understanding the power developed in I.C engine and efficiency.
- Understanding the principle, performance and application of air compressor.
- Determining thermodynamic properties of steam using steam tables & mollier chart.
- Comprehending the working of various steam generators i.e. boilers.
- Comprehending the vapor power cycles and computing work done & efficiencies thereof.

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	**Topic**	**Periods**
01	Performance of I. C engine	08
02	Air Compressor	12
03	Properties of steam	12
04	Steam Generator	12
05	Vapor power cycle	08
06	Heat Transfer	08
Total Period:		**60**

D.CONTENT

1. Performance of I.C engine

1.1 Define mechanical efficiency, Indicated thermal efficiency,

Relative Efficiency, brake thermal efficiency overall efficiency

Mean effective pressure &specific fuel consumption.

1.2 Define air-fuel ratio & calorific value of fuel.

1.3 Work out problems to determine efficiencies & specific fuel consumption.

2. Air Compressor

2.1 Explain functions of compressor & industrial use of compressor air

2.2 Classify air compressor & principle of operation.

2.3 Describe the parts and working principle of reciprocating Air compressor.

2.4 Explain the terminology of reciprocating compressor such as bore, stroke, pressure ratio free air delivered &Volumetric efficiency.

2.5 Derive the work done of single stage & two stage compressor with and without clearance.

2.6 Solve simple problems (without clearance only)

3. Properties of Steam

3.1 Difference between gas & vapours.

3.2 Formation of steam.

3.3 Representation on P-V, T-S, H-S, & T-H diagram.

3.4 Definition & Properties of Steam.

3.5 Use of steam table & mollier chart for finding unknown properties.

3.6 Non flow & flow process of vapour.

3.7 P-V, T-S & H-S, diagram.

3.8 Determine the changes in properties & solve simple numerical.

4. Steam Generator

4.1 Classification & types of Boiler.

4.2 Important terms for Boiler.

4.3 Comparison between fire tube & Water tube Boiler.

4.4 Description & working of common boilers (Cochran, Lancashire, Babcock & Wilcox Boiler)

4.5 Boiler Draught (Forced, induced & balanced)

4.6 Boiler mountings & accessories.

5. Steam Power Cycles

5.1 Carnot cycle with vapour.

5.2 Derive work & efficiency of the cycle.

5.3 Rankine cycle.

5.3.1 Representation in P-V, T-S & h-s diagram.

5.3.2 Derive Work & Efficiency.

5.3.3 Effect of Various end conditions in Rankine cycle.

5.3.4 Reheat cycle & regenerative Cycle.

5.4 Solve simple numerical on Carnot vapour Cycle & Rankine Cycle.

6. Heat Transfer

6.1 Modes of Heat Transfer (Conduction, Convection, Radiation).

6.2 Fourier law of heat conduction and thermal conductivity (k).

6.3 Newton's laws of cooling.

6.4 Radiation heat transfer (Stefan, Boltzmann & Kirchhoff's law) only statement, no derivation & no numerical problem.

6.5 Black body Radiation, Definition of Emissivity, absorptivity, & transmissibility.

CHAPTERS COVERED UP TO IA- 1, 2,3.

Sl No.	Reference Book	Author Name	Publisher Name
1	Thermal Engineering	R.S. Khurmi	S.Chand
2	Thermal Engineering	A.R.Basu	Dhanpat Rai
3	Thermal Engineering	A.S. Sarao	Satya Prakash
4	Engineering Thermodynamics	P.k.Nag	TMH
5	Thermal Engineering	Mahesh M Rathore	TMH

PR-1 THEORY OF MACHINES AND MEASUREMENTS LAB

Name of the Course : Diploma in **Mech/ & Other Mechanical Allied Branches**

Course code:		Semester	4th
Total Period:	90	Examination	3 hrs
Lab. periods:	6 P/W	Term Work	25
Maximum marks:	100	End Semester Examination:	75

SL. No	Content
1	Determination of centrifugal force of a governor (Hart Nell / Watt/Porter).
2	Study & demonstration of static balancing apparatus.
3	Study & demonstration of journal bearing apparatus.
4	Study of different types of Cam and followers.
5	Study & demonstration of epicyclic gear train.
6	Determination of the thickness of ground M.S flat to an accuracy of 0.02mm using Vernier Caliper.
7	Determination of diameter of a cylindrical component to an accuracy of 0.01mm using micrometer.
8.	Determine the heights of gauge blocks or parallel bars to accuracy of 0.02mm using Vernier height gauge.
9.	Determine the thickness of ground MS plates using slip gauges.
10.	Determination of angel of Machined surfaces of components using sin bar with slip gauges.

PR- 2 MECHANICAL ENGG. LAB –II

Name of the Course: Diploma in **Mech/ & Other Mechanical Allied Branches**

Course code		Semester	4th
Total Period:	90	Examination	3 hrs
Lab. periods:	6 P/W	Term Work	25
Maximum marks:	100	End Sem Examination:	75

SL. No	Content
1	Study of 2-S, 4-S petrol & diesel engine models
2	Determine the brake thermal efficiency of single cylinder petrol engine.
3	Determine the brake thermal efficiency of single cylinder diesel engine.
4	Determine the B.H.P, I.H.P BSFC of a multi cylinder engine by Morse test.
5	Determine the mechanical efficiency of an air Compressor.
6	Study of pressure measuring devices (manometer, Bourdon tube pressure gauge)
7	Verification of Bernoulli's theorem
8	Determination of Cd from venturimeter
9	Determination of Cc, Cv, Cd from orifice meter
10	Determine of Darcy's coefficient from flow through pipe

PR-3 WORKSHOP PRACTICE-III

Name of the Course: Diploma in **Mech/ & Other Mechanical Allied Branches**			
Course code:		Semester	4th
Total Period:	90	Examination	4 hrs
Lab. periods:	6 P/W	Teamwork	50
Maximum marks:	100	End Semester Examination:	50

Course Objectives:

Students will develop an ability towards

- Preparing components and jobs using foundry, welding and machining
- Realizing process parameters involved and their effects

1		**Machining Practices**
	1.1	Job in evolving drilling, boring
	1.2	Internal/External threading on Turning jobs
	1.3	Job in evolving use of Capstan and turret lathe (Taper Turning & Chamfering)
	1.4	All gear lathe, CNC Lathe Trainer Practice Job involving all turning process on MS Rod & aluminum rod for jobs using CNC Lathe trainer.
2		**Metal Machining**
	2.1	Shaper Preparation of V Block on CI or MS Blocks
	2.2	Milling Machine Preparation of Spur gear on CI or MS round

Pr4. TECHNICAL SEMINAR

Name of the Course: Diploma in MECHANICAL ENGINEERING			
Course code:		Semester	4th
Total Period:	30		
Lab. periods:	02/week	Term Work	50
Maximum marks:	50		

OBJECTIVES:

Each student has to select a recent topic of latest technology in the area of Mechanical Engineering and present a seminar in front of all students of the class. He/She has to prepare a PowerPoint presentation of the selected topic of minimum 10 slides are the total presentation will be approximately 10 minutes duration .There will be interactive session between the presenter and rest of the students including the faculty members of the dept at the end of presentation .A student has to present at least 2 nos.of seminar during a semester and to submit the report for evaluation.

List of Equipments of Theory of Machine and Measurement Lab

Sl. No.	Name of Apparatus	QUANTITY
01	GOVERNOR APPARATUS	01No
02	STATIC AND DYNAMIC APPARATUS	01No
03	JOURNAL BEARING APPARATUS	01 No
04	CAM ANALYSIS APPARATUS	01 No
05	EPICYCLIC GEAR TRAIN	01 No
06	VERNIER CALLIPER	04 Nos.
07	MICROMETER	04 Nos.
08	VERNIER HEIGHT GAUGE	02 Nos.
09	SLIP GAUGE	02 Nos.
10	SINE BAR	02 Nos.

List of Equipments of Workshop Practice-III

Sl. No.	Name of Apparatus	QUANTITY
01	RADIAL DRILL MACHINE	01 No
02	ALL GEAR LATHE	06 Nos.
03	CAPSTAN LATHE	01 Nos.
04	CNC LATHE TRAINER	01 Nos.

List of Equipments of MEL-II

SL. NO.	NAME OF ITEM	QUANTITY
01	MODEL OF 2 STROKE PETROL ENGINE	02 Nos
02	MODEL OF 4 STROKE PETROL ENGINE	02 Nos.
03	MODEL OF 2 STROKE DIESEL ENGINE	02 Nos.
04	MODEL OF 4 STROKE DIESEL ENGINE	02Nos.
05	SINGLE CYLINDER PETROL ENGINE TEST RIG	01 No.
06	SINGLE CYLINDER DIESEL ENGINE TEST RIG	01 No.
07	MORSE TEST APPARATUS	01 No.
08	2 STAGE AIR COMPRESSOR TEST RIG	01 No.
09	PRESSURE MEASURING DEVICES (BOURDON TUBE PRESSURE GAUGE, MANOMETER)	02 Nos. each
10	BERNOULLI'S APPARATUS	01 No.
11	VENTURIMETER APPARATUS	01 No.
12	ORIFICEMETER APPARATUS	01 No
13	FLOW THROUGH PIPE APPARATUS	01 No

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 (5^{th} and 6^{th} sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 5^{th} 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 5^{th} 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

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.

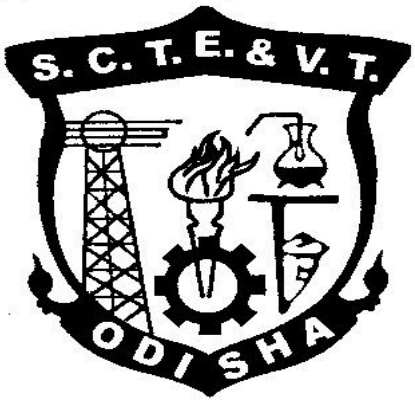
There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

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(5^{th} and 6^{th} sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 5^{th} 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 5^{th} 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

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(5^{th} and 6^{th} sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 5^{th} 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 5^{th} 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

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

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

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

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

F.No. AICTE/ERO/Sub-mission Scheme/Govt. Poly/2014

Date: 30th April, 2014

To,
Secretary/Director
Department of Technical Education and Training, Odisha
At Killmaidan Buxi Bazar Cuttack Orissa-753001.

Sub: Approval for New Govt Polytechnic set up under MHRD's Submission Scheme run in unserved / underserved districts for Academic year 2014-15.

Sir/Madam,

This is with reference to letter No. D.O.No. 1714/ETET dated 29.03.2014 received from Commissioner-cum secretary to Government, Employment & Technical Education & Training Deptt. Government of Odisha State Secretariat, Bhubaneswar-751001.

In pursuance of the policy initiatives of MHRD, Govt. of India for promotion of technical education in unserved / under-served districts across the country vide letter no F.No. 1-26/2011-TSII dated 29.07.2011 & F. No. 1-26/2011-TSII dtd 15/3/2013 informing the Council that partial financial assistance had been released to State government in case of 287 polytechnics intending to start from their temporary / permanent campuses or mentor institutions (as the case may be), and further directing AICTE to consider such cases for AY 2014-15, the EC in its 87th Meeting held on 25/03/2014 vide item no. 87.01.10 resolved to issue Letter of Approvals to all such polytechnics to be set up in unserved / underserved districts as notified, supported under the "Sub-Mission on Polytechnics" scheme of the MHRD with a condition that the institute shall shift to its permanent location within two years.

Accordingly, in view of the above, approval of the AICTE is hereby accorded for the AY 2014-15 as per details below:

Regional Office	ERO	Application Id	1-2068619351
		Permanent Id	
Name of the Institute	Government Polytechnic Bargarh	Institute Address	At-Tentela, Tahasil-Bargarh, Dist-Bargarh-768030
Name of the Organisation	Department of Technical Education and Training Cuttack	Organisation Address	Odisha State Secretariat Bhubaneswar-751001
Institute Type	Govt.		

Opted Women to Co-ed	N	Opted Change of Name	N	Opted Change of Site	N
Approved for Women to Co-ed	N	Approved Change of Name	N	Approved Change of Site	N

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

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Secretary/Director
Department of Technical Education and Training, Odisha
At Killmaidan Buxi Bazar Cuttack Orissa-753001.

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This is with reference to letter No. D.O.No. 1714/ETET dated 29.03.2014 received from Commissioner-cum secretary to Government, Employment & Technical Education & Training Deptt. Government of Odisha State Secretariat, Bhubaneswar-751001.

In pursuance of the policy initiatives of MHRD, Govt. of India for promotion of technical education in unserved / under-served districts across the country vide letter no F.No. 1-26/2011-TSII dated 29.07.2011 & F. No. 1-26/2011-TSII dtd 15/3/2013 informing the Council that partial financial assistance had been released to State government in case of 287 polytechnics intending to start from their temporary / permanent campuses or mentor institutions (as the case may be), and further directing AICTE to consider such cases for AY 2014-15, the EC in its 87th Meeting held on 25/03/2014 vide item no. 87.01.10 resolved to issue Letter of Approvals to all such polytechnics to be set up in unserved / underserved districts as notified, supported under the "Sub-Mission on Polytechnics" scheme of the MHRD with a condition that the institute shall shift to its permanent location within two years.

Accordingly, in view of the above, approval of the AICTE is hereby accorded for the AY 2014-15 as per details below:

Regional Office	ERO	Application Id	1-2068619351
		Permanent Id	
Name of the Institute	Government Polytechnic Bargarh	Institute Address	At-Tentela, Tahasil-Bargarh, Dist-Bargarh-768030
Name of the Organisation	Department of Technical Education and Training Cuttack	Organisation Address	Odisha State Secretariat Bhubaneswar-751001
Institute Type	Govt.		

Opted Women to Co-ed	N	Opted Change of Name	N	Opted Change of Site	N
Approved for Women to Co-ed	N	Approved Change of Name	N	Approved Change of Site	N

All India Council for Technical Education
(A Statutory Body under [illegible])
7th Floor, Chandralok Building, [illegible]
Phone: 23724151/52/53/54/55/56/57 FAX: 011-23[illegible] www.[illegible]

Old Name of Institute

Old Address of Institute:

App. Id : 1-2068619351

Programme	Shift	Level	Course	Full / Part Time	Affiliating Body	Intake approved for 14-15	PIO	NRI	Foreign Collaboration
Engineering & Technology	1st	Diploma	Civil Engineering	Full	Department of Technical Education and Training	60	Nil	Nil	Nil
Engineering & Technology	1st	Diploma	Electrical Engineering	Full	Department of Technical Education and Training	60	Nil	Nil	Nil
Engineering & Technology	1st	Diploma	Mechanical Engineering	Full	Department of Technical Education and Training	60	Nil	Nil	Nil

Note: The approval is granted with the condition that the institute will be shifted to the permanent location within two year.

The Institution shall obtain necessary affiliation / permission from the concerned state technical education department and Admission authority etc. The Institution shall send information about commencement of the above courses to AICTE.

The polytechnics under sub-mission scheme of MHRD shall fulfill the following general conditions:

1. It would run only the approved courses
2. The Approval is valid for only government polytechnics being set by State Government under Sub-Mission Scheme
3. Those running in the Temporary location / mentor institute will shift to permanent location within two years.
4. The admission shall be made strictly as per the course intake approved by the AICTE
5. The admissions shall be made in accordance with the regulations notified by the Council from time to time.
6. The curriculum of the course, the procedure for evaluation / assessment of students shall be in accordance with the norms prescribed by the AICTE and concerned affiliating university / state technical board wherever applicable.
7. The management of the Institution shall not close the Institution or the institution shall not discontinue any course(s) or start any new course(s) or alter intake capacity of seats without prior approval of the Council.
8. No excess admission shall be made by the Institution over and above the approved intake under any circumstances. In case any excess admission is reported to the Council, appropriate action as per the notified regulations shall be initiated against the Institution.
9. 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. In case any violation is reported to the Council, appropriate action as per the notified regulations shall be initiated against the Institution.
10. The Institution shall not conduct any course(s) in the field of technical education in the same premises / campus and / or in the name of the Institution without prior permission / approval of AICTE. If found so, appropriate action as per the notified regulations shall be initiated against the Institution.
11. The institution shall not conduct any non-technical course (s) in the same premises / campus under any circumstances. In case any violation is reported to the Council, appropriate action as per the notified regulations shall be initiated against the Institution.

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

12. The institution shall operate only from the approved location. However it may continue to create its infrastructure, facilities and other requirements at its permanent site.
13. The tuition and other fees shall be charged as prescribed by the Competent Authority within the overall criteria prescribed by the Council from time to time.
14. The Institute shall ensure proper utilization of the grant released by the MHRD under the scheme and shall follow the relevant instructions / guidelines issued by the MHRD in this regard and the accounts of the Institution shall be audited annually as per the government procedure.
15. The Director / Principal and the teaching and other staff shall be appointed in given time frame and selection shall be done according to procedures, qualifications and experience prescribed by the Council from time to time and pay scales are as per the norms prescribed by the Council from time to time.
16. The technical institution shall publish an information booklet before commencement of the academic year giving details regarding the institution and courses / programs 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. The mandatory disclosure information, as per directions in the AICTE website / Approval Process Handbook, shall be put on the Institution Website. The information shall be revised every year with updated information about all aspects of the institution.
17. It shall be mandatory for the technical institution to maintain a Website providing the prescribed information. The Website information must be continuously updated as and when changes take place.
18. If a technical Institution fails to disclose the information or suppress and / or misrepresent the information, appropriate action as per the notified regulations shall be initiated against the Institution.
19. AICTE may also conduct inspections with or without notifying the dates to verify specific complaints, to verify adherence to AICTE norms & standards, and to verify any mis-representation, violation of norms & standards, mal-practices etc.
20. 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.
21. In the event of a student / candidate withdrawing before the starting of the course, the wait listed candidates should be given admission against the vacant seat. The entire fee collected from the student, after a deduction of the processing fee of not more than Rs. 1000/- (Rupees one thousand only) shall be refunded and returned by the Institution / University to the student / candidate withdrawing from the program. It would not be permissible for Institutions and Universities to retain the School / Institution Leaving Certificates in original to force retention of admitted students.
22. The Institute shall take appropriate measures for prevention of ragging in any form, in the light of AICTE regulation "Prevention and Prohibition of Ragging in Technical Institutions, Universities including Deemed to Universities imparting technical education" Regulation 2009 (F.No. 37-3/Legal/AICTE/2009 dated 01/07/2009). In case of failure to prevent the instances of ragging by the Institutions, the Council shall take appropriate action as per the notified regulations.

The Institute shall strictly follow further conditions as may be specified by the Council from time to time. The Council may withdraw the approval, in case it observes any violation of the above conditions and / or non adherence to the norms and standards prescribed by the Council, mis-representation of facts and submitting factually in correct information to it.

30.04.2014

(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 -700098, West Bengal

Government Polytechnic Bargarh 1-2068619351

2. The Principal/Director,
Govt. Polytechnic Bargarh,
At-Tentela, Tahasil-Bargarh,
Dist-Bargarh-768030

3. The Secretary/Chairmen,
Department of Technical Education and Training, Odisha
At Killmaidan Buxi Bazar Cuttack Orissa-753001.

4. 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/1-2492287382/2015/EOA Date: 22-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	1-2492287382
		Permanent Id	1-2068619351
Name of the Institute	GOVERNMENT POLYTECHNIC, BARGARH	Institute Address	AT-TENTELA TAHASIL-BARGARH DIST-BARGARH PIN-768030, BARGARH, BARGARH, Odisha, 768030
Name of the Society/Trust	DTE&T, ODISHA, CUTTACK	Society/Trust Address	AT-KILLAMAIDAN PO-BUXI BAZAR,CUTTACK,CUTTACK,Orissa,753001
Institute Type	Government		

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:29 May 2015

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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: 1-2492287382			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	0	60	NA	NA	NA
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	ELECTRICAL ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	0	60	NA	NA	NA
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MECHANICAL ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	0	60	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 GOVERNMENT POLYTECHNIC, BARGARH 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. Avinash S Pant
Actg Chairman, AICTE

Note: This is a Computer generated Letter of Approval.No signature is required. Letter Printed On:29 May 2015

Printed By : aicn008101

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,**
   GOVERNMENT POLYTECHNIC, BARGARH
   AT-TENTELA
   TAHASIL-BARGARH
   DIST-BARGARH
   PIN-768030,
   BARGARH,BARGARH,
   Odisha,768030

5. **The Secretary / Chairman,**
   DTE&T, ODISHA, CUTTACK
   AT-KILLAMAIDAN
   PO-BUXI BAZAR,
   CUTTACK,CUTTACK,
   Orissa,753001

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/1-2812038298/2016/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	1-2812038298
Name of the Institute	GOVERNMENT POLYTECHNIC, BARGARH	Permanent Id	1-2068619351
Name of the Society/Trust	DTE&T, ODISHA, CUTTACK	Institute Address	AT-TENTELA TAHASIL-BARGARH DIST-BARGARH PIN-768030, BARGARH, BARGARH, Odisha, 768030
Institute Type	Government	Society/Trust Address	AT-KILLAMAIDAN PO-BUXI BAZAR,CUTTACK,CUTTACK,Orissa,753001

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: 1-2812038298			Course	Full/Part Time	Affiliating Body	Intake 2015-16	Intake Approved for 2016-17	NRI Approval status	PIO / FN / Gulf quota Approval status	Foreign Collaborarion/Twining Program 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
ENGINEERIN	1st Shift	DIPLOMA	ELECTRICAL ENGINEERING	FULL TIME	Directorate of Technical	60	60	NA	NA	NA

G AND TECHNOLOGY					Education and Training , Cuttack					
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MECHANICAL ENGINEERING	FULL TIME	Directorate of Technical Education and Training , Cuttack	60	60	NA	NA	NA

The above mentioned approval is subject to the condition that GOVERNMENT POLYTECHNIC, BARGARH 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

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

4. **The Principal / Director,**
   GOVERNMENT POLYTECHNIC, BARGARH
   AT-TENTELA
   TAHASIL-BARGARH
   DIST-BARGARH
   PIN-768030,
   BARGARH,BARGARH,
   Odisha,768030

5. **The Secretary / Chairman,**
   DTE&T, ODISHA, CUTTACK
   AT-KILLAMAIDAN
   PO-BUXI BAZAR,
   CUTTACK,CUTTACK,

Orissa,753001

6. **Guard File(AICTE)**

All India Council for Technical Education

(A Statutory body under Ministry of HRD, Govt. of India)

Nelson Mandela MargVasant Kunj, New Delhi-110067
PHONE: 23724151/52/53/54/55/56/57 FAX: 011-23724183 www.aicte-India.org

F.No. Eastern/1-3324326955/2017/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	1-2068619351	Application Id	1-3324326955
Name of the Institute	GOVERNMENT POLYTECHNIC, BARGARH	Institute Address	AT-TENTELA TAHASIL-BARGARH DIST-BARGARH PIN-768030, BARGARH, BARGARH, Odisha, 768030
Name of the Society/Trust	DTE&T, ODISHA, CUTTACK	Society/Trust Address	AT-KILLAMAIDAN PO-BUXI BAZAR,CUTTACK,CUTTACK,Orissa,753001
Institute Type	Government	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: 1-3324326955			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 Collaborarion/Twining Program Approval status*
Program	Shift	Level								
ENGINEERING AND TECHNOLO	1st Shift	DIPLOMA	CIVIL ENGINEERING	FULL TIME	Directorate of Technical Education , Odisha	60	60	NA	NA	NA

GY										
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	ELECTRICAL ENGINEERING	FULL TIME	Directorate of Technical Education , Odisha	60	60	NA	NA	NA
ENGINEERING AND TECHNOLOGY	1st Shift	DIPLOMA	MECHANICAL ENGINEERING	FULL TIME	Directorate of Technical Education , Odisha	60	60	NA	NA	NA

The above mentioned approval is subject to the condition that
GOVERNMENT POLYTECHNIC, BARGARH
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,**
   GOVERNMENT POLYTECHNIC, BARGARH
   AT-TENTELA
   TAHASIL-BARGARH
   DIST-BARGARH
   PIN-768030,

BARGARH,BARGARH,
Odisha,768030

5. **The Secretary / Chairman,**
DTE&T, ODISHA, CUTTACK
AT-KILLAMAIDAN
PO-BUXI BAZAR,
CUTTACK,CUTTACK,
Orissa,753001

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/1-3509312247/2018/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	1-2068619351	**Application Id**	1-3509312247
Name of the Institute	GOVERNMENT POLYTECHNIC, BARGARH	**Name of the Society/Trust**	DTE&T, ODISHA, CUTTACK
Institute Address	AT-TENTELA TAHASIL-BARGARH DIST-BARGARH PIN-768030, BARGARH, BARGARH, Odisha, 768030	**Society/Trust Address**	AT-KILLAMAIDAN PO-BUXI BAZAR,CUTTACK,CUTTACK,Orissa ,753001
Institute Type	Government	**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	MECHANICAL ENGINEERING	FT	Directorate of Technical Education , Odisha	60	NA	NA	NA
ENGINEERING AND TECHNOLOGY	1st	DIPLOMA	ELECTRICAL ENGINEERING	FT	Directorate of Technical Education , Odisha	60	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,
   GOVERNMENT POLYTECHNIC, BARGARH
   AT-TENTELA
   TAHASIL-BARGARH
   DIST-BARGARH
   PIN-768030,
   BARGARH,BARGARH,
   Odisha,768030
5. The Secretary / Chairman,
   DTE&T, ODISHA, CUTTACK
   AT-KILLAMAIDAN
   PO-BUXI BAZAR,
   CUTTACK,CUTTACK,
   Orissa,753001
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/1-4259623066/2019/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	1-2068619351	**Application Id**	1-4259623066
Name of the Institute	GOVERNMENT POLYTECHNIC, BARGARH	**Name of the Society/Trust**	DTE&T, ODISHA, CUTTACK
Institute Address	AT-TENTELA TAHASIL-BARGARH DIST-BARGARH PIN-768030, BARGARH, BARGARH, Odisha, 768030	**Society/Trust Address**	AT-KILLAMAIDAN PO-BUXI BAZAR,CUTTACK,CUTTACK,Orissa ,753001
Institute Type	Government	**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 Technology	1st	Diploma	Mechanical Engineering	FT	Directorate of Technical Education , Odisha	60	NA	NA
Engineering And Technology	1st	Diploma	Electrical Engineering	FT	Directorate of Technical Education , Odisha	60	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,**
   Government Polytechnic, Bargarh
   At-Tentela
   Tahasil-Bargarh
   Dist-Bargarh
   Pin-768030,
   Bargarh,Bargarh,
   Odisha,768030

4. **The Secretary / Chairman,**
   Dte&T, Odisha, Cuttack
   At-Killamaidan
   Po-Buxi Bazar.
   Cuttack,Cuttack,
   Orissa,753001

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/1-7011853738/2020/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	1-2068619351	**Application Id**	1-7011853738
Name of the Institute	GOVERNMENT POLYTECHNIC, BARGARH	**Name of the Society/Trust**	DTE&T, ODISHA, CUTTACK
Institute Address	AT-TENTELA TAHASIL-BARGARH DIST-BARGARH PIN-768030, BARGARH, BARGARH, Odisha, 768030	**Society/Trust Address**	AT-KILLAMAIDAN PO-BUXI BAZAR,CUTTACK,CUTTACK,,753 001
Institute Type	Government	**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	MECHANICAL ENGINEERING	Directorate of Technical Education , Odisha	60	60	NA	No
ENGINEERING AND TECHNOLOGY	DIPLOMA	ELECTRICAL ENGINEERING	Directorate of Technical Education , Odisha	60	60	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,**
   GOVERNMENT POLYTECHNIC, BARGARH
   At-Tentela
   Tahasil-Bargarh
   Dist-Bargarh
   Pin-768030,
   Bargarh,Bargarh,
   Odisha,768030

3. **The Secretary / Chairman,**
   AT-KILLAMAIDAN
   PO-BUXI BAZAR
   CUTTACK,CUTTACK
   ,753001

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.

OFFICE OF THE PRINCIPAL, GOVERNMENT POLYTECHNIC, BARGARH.
At-Tentla, Po-Kantapali, Via-Bardol, Dist.:-Bargarh-768038 (Odisha) E mail Id-govpolybgr@gmail.com

Office Order No. 116 **/Dated.** 24 / 02 /**2020**

As per All India Council for Technical Education (Redressal of Grievance of Students) Regulation, 2019 vide F. No.1-101/PGRC/AICTE/Regulation/2019 dated 07.11.2019) , the **Student Grievance Redressal Committee(SGRC)** is hereby constituted in favour of Govt. Polytechnic, Bargarh comprising of the following members as follows.

1. Er. S.K. Gokhura, Principal, Govt. Polytechnic, Bargarh -Chairman
2. Miss D. Khamari, HOD (Math & Science Deptt.) -Member
3. Sri A.K. Sahu, HOD (Civil) -Member
4. Miss S.S. Adabar, HOD (Mechanical) -Member
5. Sri Manoj Bhoi, Electrical(1st yr) -Student Reprepresentative

The above committee will act as regulating body for Grievance Redressal in the Institute.

24/02/2020
Principal
Govt. Polytechnic, Bargarh.

Memo No. 117 /Dt. 24 / 02 /2020.

Copy for circulation among all the members of the committee for information & necessary action.

24/02/2020
Principal
Govt. Polytechnic, Bargarh.

24/2/2020

24/02/2020

25/2/20

OFFICE OF THE PRINCIPAL, GOVERNMENT POLYTECHNIC, BARGARH.
At-Tentla, Po-Kantapali, Via-Bardol, Dist.:-Bargarh-768038 (Odisha) E mail Id-govpolybgr@gmail.com

Office Order No. 487 **/Dated.** 12/01/2021

In supersession to all previous orders and as per All India Council for Technical Education(AICTE) approval process Hand Book 2019-20 Appendix 6.3 structure of committees, and notified Regulation for prevention and prohibition of ragging in AICTE approved Technical Institutions vide No.37-3/ Legal/ AICTE/ 2009 dated.01-07-2009, an **Anti-ragging Committee** is hereby constituted in favour of Govt. Polytechnic, Bargarh comprising of the following members as follows.

1. Er. S.K. Gokhura, Principal, Govt. Polytechnic, Bargarh -Chairman
2. Shri B.K. Bag, Head Clerk -Member
3. Miss D. Khamari, HOD(Math & Science Deptt.) -Member
4. Shri A.K. Sahu, HOD (Civil) -Member
5. Shri Tejraj Kumbhar, Student (1st Yr. Civil) -Member
6. Miss Kusum Sa, Student (3rd Yr. Mechanical) -Member
7. Shri Satyajit Pradhan, Parents -Member
8. Shri Premlal Rana, Parents -Member
9. Mrs.Aarati Bhoi, Tahasildar, Bargarh -Member
10. Shri Prafulla Ku. Ratha, Retired Sub Inspector, Bargarh -Member
11. Shri Deepak Sharma, Reporter, OTV Odisha -Member
12. Shri Ananta Charan Samanta, Secretary, Council for Social Welfare, Bargarh(NGO) -Member

The above committee will act as regulating body for prevention and prohibition of ragging in the Institute.

12/01/21
Principal
Govt. Polytechnic,
Bargarh.

Memo No: 488 /Dt. 12/01/2021

Copy for circulation among all the members of the committee for information & necessary action.

12/01/21
Principal
Govt. Polytechnic,
Bargarh.

OFFICE OF THE PRINCIPAL, GOVERNMENT POLYTECHNIC, BARGARH.
At-Tentla, Po-Kantapali, Via-Bardol, Dist.:-Bargarh-768038 (Odisha) E mail Id-govpolybgr@gmail.com

Office Order No. 484 **/Dated.** 11/01/21

As per All India Council for Technical Education notified Regulation for prevention and prohibition of ragging in AICTE approved Technical Institutions, an **Anti-ragging Squad** is hereby constituted in favour of Govt. Polytechnic, Bargarh comprising of the following members as follows.

1.	Sri D. Patra, Lect. (Electrical)	-Chairman
2.	Sri N. Nayak, Lect. (AE&I)	-Member
3.	Sri J.K. Malik, Lect. (Math)	-Member
4.	Miss. B. Mohanty, Lect. (Computer Science)	-Member
5.	Miss U. Pradhan (Civil)	-Member
6.	Sri B.K. Bag, Section Officer	-Member Convenor

The above committee will act as regulating body for prevention and prohibition of ragging in the Institute.

11/01/21
Principal
Govt. Polytechnic, Bargarh.

Memo No. 485 /Dt. 11/01/21

Copy for circulation among all the members of the committee for information & necessary action.

11/01/21
Principal
Govt. Polytechnic, Bargarh.

OFFICE OF THE PRINCIPAL, GOVERNMENT POLYTECHNIC, BARGARH.
At-Tentla, Po-Kantapali, Via-Bardol, Dist.:-Bargarh-768038 (Odisha) E mail Id-govpolybgr@gmail.com

Office Order No. 492 **/Dated.** 16/01/2021

As per Section-4 of All India Council for Technical Education (Gender Sensitization, Prevention and Prohibition of Sexual Harassment of Women Employees and students and Redressal of Grievances in Technical Institutions) Regulations, 2016 vide No.F.AICTE/ WH/2016/01 dated.10-06-2016, an **Internal Complaint Committee** is hereby constituted in favour of Govt. Polytechnic, Bargarh comprising of the following members as follows.

1.	Er. S.K. Gokhura, Principal, Govt. Polytechnic, Bargarh	-Chairman
2.	Miss D. Khamari, HOD (Math & Science Deptt.)	-Member
3.	Sri N.K. Acharya, HOD (Electrical)	-Member
4.	Sri A.K. Sahu, HOD (Civil)	-Member
5.	Miss S.S. Adabar, HOD (Mechanical)	-Member
6.	Head Clerk	-Member Convenor

16/01/21
Principal
Govt. Polytechnic, Bargarh.

Memo No. 498 /Dt. 16/01/2021

Copy for circulation among all the members of the committee for information & necessary action.

16/01/21
Principal
Govt. Polytechnic, Bargarh.

OFFICE OF THE PRINCIPAL, GOVERNMENT POLYTECHNIC, BARGARH.
At-Tentla, Po-Kantapali, Via-Bardol, Dist.:-Bargarh-768038 (Odisha) E mail Id-govpolybgr@gmail.com

Office Order No. 489 **/Dated.** 12/01/21

In partial modification to previous order, as per the Scheduled Castes & Scheduled Tribes (Prevention of Atrocities) Act, 1989, No.33 of 1989, dated.11-09-1989), a **Committee for SC/ST** is hereby constituted in favour of Govt. Polytechnic, Bargarh comprising of the following members as follows.

1. Sri D. Patra, Lect. (Electrical) -Chairman
2. Smt. S. Behera, Lect. (Chemistry) -Member
3. Sri J.K. Malik, Lect. (Math) -Member
4. Smt. B. Mohanty, Lect. (Computer Science) -Member
5. Smt. U. Pradhan (Civil) -Member
6. Sri B.K. Bag, Head Clerk -Convenor

12/01/21
Principal
Govt. Polytechnic, Bargarh.

Memo No. 490 /Dt. 12/01/21

Copy for circulation among all the members of the committee for information & necessary action.

12/01/21
Principal
Govt. Polytechnic, Bargarh.

OFFICE OF THE PRINCIPAL, GOVERNMENT POLYTECHNIC, BARGARH.
At-Tentla, Po-Kantapali, Via-Bardol, Dist.:-Bargarh-768038 (Odisha) E mail Id-govpolybgr@gmail.com

Office Order No. 491 **/Dated.** 12/01/21

As per requirement of All India Council for Technical Education approval process Hand Book 2020-21, the **Internal Quality Assurance Cell (IQAC)** is hereby constituted in favour of Govt. Polytechnic, Bargarh comprising of following members.

1. Er. S.K. Gokhura, Principal, Govt. Polytechnic, Bargarh -Chairman
2. Miss D. Khamari, HOD (Math & Science Deptt.) -Member
3. Sri N.K. Acharya, HOD (Electrical) -Member
4. Sri A.K. Sahu, HOD (Civil) -Member
5. Miss S.S. Adabar, HOD (Mechanical) -Member
6. Sri B.K. Bag, Section Officer -Member Convenor

The Cell will take care & assure the quality of the Institute.

12/01/21
Principal
Govt. Polytechnic, Bargarh.

Memo No. 492 /Dt. 12/01/21

Copy to Person Concerned for information & necessary action.

12/01/21
Principal
Govt. Polytechnic, Bargarh.

OFFICE OF THE PRINCIPAL, GOVERNMENT POLYTECHNIC, BARGARH:
At-Tentla, Po-Kantapali, Via-Bardol, Dist.:-Bargarh-768038 (Odisha) E mail Id-govpolybgr@gmail.com

Office Order No. 88 **/Dated.** 2 / 2 **/2017**

As per All India Council for Technical Education (Establishment of Mechanism for Grievance Redressal) Regulations, 2012, F.No.37-3/ Lega 112012, dated.25-05-2012, **Er. Nala Bhoi** (Former Joint Director (Academic), DTE&T, Odisha, Cuttack is hereby appointed as **OMBUDSMAN** in favour of Govt. Polytechnic, Bargarh.

02/02/17

Principal

Govt. Polytechnic, Bargarh.

Memo No. 88(a) /Dt. 2 / 2 /2017.

Copy to the Person Concerned for information & necessary action.

02/02/17

Principal

Govt. Polytechnic, Bargarh.

Audited Statement of Account of 2017-18(Income & Expenditure Statement for complete year)					
Income			Expenditure		
Sl. No.	Details	Amount	Sl. No.	Details	Amount
1	Tuition Fees	732500	1	Salary	7113351
2	Other fee/amount collected from students	3002035	2	Administrative expenses	1276392
3	Grants from Govt. Allotment - Grant from RUSA for purchased Equipment Balance Available -	1500000	3	Training and Development	5700
4	Grants / Contribution from other sources (Management)	NIL	4	Laboratory consumables	44415
5	Scholarships received	60000	5	Library	NIL
6	Other income	NIL	6	Travel	32776
			7	Fees Paid to SCTE&VT (Tution)- (Welfare Fund)- (Exam)-	NIL 54300 1213748.2
			8	Repairs and Maintenance	4830
			9	Scholarships/ Concessions/ Fellowships/Honorarium etc., awarded/incurred(other than Govt. grants)	NIL
			10	Expenditure of grants received from Govt. Allotment - RUSA of purchase equipment-	7664799
			11	Depreciation	
			12	Any other expenditure	
	Total	5294535		Total	17410311

14/12/2018

Head Clerk
Govt. Polytechnic
Bargarh

Head Clerk
Govt. Polytechnic, Bargarh

14/12/18

Principal
Govt. Polytechnic, Bargarh

Principal
GOVT. POLYTECHNIC
BARGARH