West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Agricultural Engineering [AGR]

Part-III (6th Semester)

2023

WEST BENGAL STATE COUNCIL OF TECHNICAL & VOCATIONAL EDUCATION AND SKILL DEVELOPMENT
(A Statutory Body under West Bengal Act XXVI of 2013)
(Technical Education Division)
Karigari Bhavan, 4th Floor, Plot No. B/7, Action Area-III, Newtown, Rajarhat, Kolkata–700 160

WBSCTVESD Curriculum for Diploma Courses in Engineering and Technology

Semester VI

(Agricultural Engineering)

SL NO	CATEGORY	SUBJECT	TYPE	SEM	L	PR	CONTACT HR PER WEEK	CREDIT	MARKS
1	AGPE4-601 OR AGPE4-602	Handling, Packaging and Storage of Agricultural Products OR Agricultural Waste Utilization	TH	6TH	2		2	2	100
2	OPEN ELECTIVE-II	Renewable Energy	TH	6TH	3		3	3	100
3	AGPC603	Farm Machinery & Equipments	TH	6th	3		3	3	100
4	OPEN ELECTIVE-I	Engineering economics and Project Management	TH	6th	3		3	3	100
5	AGHS604	Entrepreneurship and Start-ups	TH	6th	3		3	3	100
6	AGPC605	Water shed and hydrology	TH	6th	2		2	2	100
7	AGPC606	Renewable Energy Sources Lab.	PR	6th		2	2	1	100
8	AGPC607	Farm Machinery & Equipment Lab	PR	6th		4	4	2	100
9	AGPR608	Project work		6th		2	2	1	100
10	AGSE609	Seminar on project		6th		2	2	1	100
					16	10	26	21	1000

Syllabus for Handling Packaging and Storage of Agricultural Products (Theory)

Program Elective IV

Course Title	**Handling Packaging and Storage of Agricultural Products**
Course Code: AGPE4-601	Semester: Sixth
Duration: Seventeen Weeks	Maximum Marks 100
Teaching Scheme	Examination scheme
Theory: 2 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 30	Class Attendance: 10 Marks
Credit 2	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

Aim:-

The aim of this course is to provide sound technical knowledge on various materials handling equipments, packaging systems and machineries, and storage systems & structures.

Objective :-

Knowledge of various types of handling, packaging, and storage systems is essentially required for processing and preservation of agricultural products. Hence this course is formulated to trend the students with the knowledge of theory, design and operation of various handling equipments, packaging and storage systems.

SL. NO.	TOPIC	Contact period
Unit 1	Material Handling Equipments	10
Unit 2	Packaging materials- selection, form and testing	10
Unit 3	Storage of grains	10
	TOTAL	30

Content: Theory (Handling, Packaging And Storage Of Agricultural Products) 2 hrs/wk

Handling, Packaging and Storage of Agricultural Products

1. Material Handling Equipments

Introduction to different conveying systems like belt conveyors, chain conveyors, screw conveyors, pneumatic conveyors, bucket elevators – their selection, operation.

2. Packaging Materials

Function of Packaging, Types of packaging, Selection of packaging materials, Packaging for different foods-Paper, plastic, glass, metals, Novel packaging, Vacuum packaging.

3. Storage of Grains

Changes in food grain during storage, Factors affecting losses in grain storage, Bag and Bulk Storage, Types of grain storage structure, Functional requirement of a storage structure, Design consideration in grain storage structure, Grain pressure theories

Text book:

1. Crosby, N.T.1981. Food packaging Materials Applied Science Publishers, London.
2. McFarlane Ian. 1983. Automatic control of food manufacturing processes. Applied Science Publishers, London.
3. Multon , J.L. 1989. Preservation and storage of grains, seeds and their by - products. CBS Publishers and Distributors, Delhi - 32.
4. Palling, S.J.(ed) 1980. Developments in Food Packaging. Applied Science Publishers Ltd., London.
5. Ripp, B. E. 1984. Controlled atmosphere and fumigation in grain storage. Elsevier Science Publishing Co.London.
6. Sacharow, S. and R.C.Grittin. 1980. Principles of food packaging. AVI Publishers Co., USA.
7. Shejbal, J. 1980. Controlled atmosphere storage of grains. Elsevier Scientific Publishing Co. London.
8. Wallace,B.Van Arsdel and Michael J. Copley. 1963. Food dehydration. The AVI Publishing Co.USA.

Syllabus for Agricultural Waste Utilization (Theory)

Program Elective IV

Course Title	**Agricultural Waste Utilization**
Course Code: AGPE4-602	Semester: Sixth
Duration: Seventeen Weeks	Maximum Marks 100
Teaching Scheme	Examination scheme
Theory: 2 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 30	Class Attendance: 10 Marks
Credit 2	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

Aim:-

The basic aim is to trend the students for various recycling of the agricultural waste to maintain the natural balance while trapping the energy from them.

Objective :-

The utilization of Agricultural waste is equally important with a view to make effective recycling. The efficient design of agricultural waste fired furnaces, briquetting process, equipment, power alcohol, utilization of wastes for paper production, particle board, by-products of rice husk, rice bran are some of the example which need to known to the students.

Content: Theory (Agricultural Waste Utilization) 2 hrs/wk

SL. NO.	TOPIC	Contact period
Unit 1	Source and availability of agricultural wastes and byproducts – types – solids & liquids – utilization pattern	3
Unit 2	Suitability of wastes as fuel – waste fired furnace – mechanism, construction and efficiency	3
Unit 3	Fuel briquettes – wastes suitable for briquetting – advantages of briquetting – process – types – machinery	3
Unit 4	Fuel briquetting – machinery – construction – working – factors affecting briquetting	4
Unit 5	Power alcohol – suitability of waste materials as raw materials –processes – acid hydrolysis, enzymatic hydrolysis and alkali hydrolysis	4
Unit 6	Production of power alcohol – fermentation, distillation, extractive distillation – effluent treatment in alcohol production	3
Unit 7	Paper board production – suitability of agricultural waste materials – unit operations – importance of proportion of waste and other chemicals for quality of paper boards	4
Unit 8	Testing of paper boards – quality aspects – tensile, tearing, bursting and water absorption characteristics	4

Unit 9	Production of particle boards – raw materials – processes – resins – types – unit operations – chipping, cleaning, mixing, hot pressing – equipments	2
Unit 10	Quality aspects – mechanical strength – water absorption and utility characters	2
		30

Text Book:

Sl NO	Name of Book	Writer's Name	Publisher's Name
1	Rice: Production and Utilization	Luh(ed) S. Bor,	Oxford & IBH Publishing Co. Pvt LTD. New Delhi
2	Food, Feed and Fuel from Biomass	Chahal.D.S	Oxford & IBH Publ ishing Co. Pvt LTD. New Delhi
3	Biotechnology and other Alternative Technologies for Utilization of Biomass/ Agricultural Wastes	Chakraverty,A	Oxford and IBH Publishing Co. New Delhi
4	Post-harvest Technology of cereals and pulses	Chakraverty,A. and D.S.De.	Clarendon Press Oxford
5	Waste Management - Planning, Evaluation, Technologies	David C.Wilson	Ann Arbor Science Publishers,Inc. Michigan
6	Fuels from Biomass and wastes	Donald. L.Klass and Emert H. George	AACC, USA
7	Rice; Chemistry and Technology	Houston,D.F	Elsevier Applied Science Publishers. London
8	Energy Applications of Biomass	Michael.Z. Lowenstein	ICAR
9	Agro-Industrial Byproducts and nonconventional feeds for livestock feeding. Indian Council of Agricultural Research	Ranjhan,S.K	The Solvent Extractors Association of India ,Bombay
10	Hand Book on Rice Bran Processing and utilization of Products	Sheth B.M & B.V Metha	Jain Brothers. New Delhi
11	Biomass briquetting and Utilization	Srivastava P.K.,Maheswari R.C and Ohja T.P.	
12	Biomass Utilization	Wilfred. A. Cote	Plenum Press. New York

Syllabus for Renewable Energy Sources (Theory)

Open Elective Course II

Course Title	**Renewable Energy Sources**
Course Code:	Semester: Sixth
Duration: Seventeen Weeks	Maximum Marks 100
Teaching Scheme	Examination scheme
Theory: 3 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 45	Class Attendance: 10 Marks
Credit 3	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

Syllabus as per council.

Syllabus for Farm Machinery and Equipments (Theory)

Course Title	**Ground Water Wells and Pump**
Course Code: AGPC603	Semester: Sixth
Duration: Seventeen Weeks	Maximum Marks 100
Teaching Scheme	Examination scheme
Theory: 3 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 45	Class Attendance: 10 Marks
Credit 3	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

Aim:-

The aim of the subject is to develop the basic knowledge regarding use of agricultural machineries principle ofoperation, adjustment and maintenance of different agricultural machinery used at various stage of crop production.

Objective :-

This subject deals with the basic knowledge of agricultural machineries, their working principles and techniques forperformance evaluation. The selection of suitable machineries for various uses in crop production is also dealt in this subject. The cost estimation for various uses of agricultural machineries is also taken care under this subject.

SL. NO.	TOPIC	Contact period
Unit 1	INTRODUCTION- Farm Mechanization	3
Unit 2	Tillage implements	8
Unit 3	Sowing and Interculture implements	7
Unit 4	Harvesting and Threshing Implements	8
Unit 5	Silage and Feed preparation	7
Unit 6	Land development and Miscellaneous equipments	6
Unit 7	Ergonomics	6
	TOTAL	45

Content: Theory (Farm Machinery & Equipments) 3 hrs/wk

INTRODUCTION- Farm Mechanization
Status and scope of farm mechanization
Tillage implements
Machinery classifications; Primary and secondary tillage equipment
2.1 Principles of construction, operation of primary and secondary implements

Sowing and Interculture implements
Sowing and planting equipments, Description, operation and calibration
Inter-cultivation tools, plant protection equipment,
Harvesting and Threshing Implements
Principle of crop harvesting and threshing
Crop harvesting tools
Crop threshing tools
Silage and Feed preparation
Chaff cutters and silage filling equipment
Land development and Miscellaneous equipments
land development machinery
special farm machines for sugarcane, cotton, potato, and horticultural crops operation
Ergonomics
Human engineering and safely in farm machinery.

Text book:

1. Farm Machines & Equipments; by: C.P.Nakra, Pub-Dhanpat Rai Publicatoin Pvt. Ltd.
2. 3917, Ganesh Building,Roshanpur,Nai Sarak,Delhi-6
3. Solved Problems in Agricultural Engineering; by:Radhey Lal & A.C.Dutta, Pub-Saroj Prakasan, 64,Katra,Allahabad-2
4. Principles of Farm Machinery, by:Kepner, Bainer & Barger; Pub-The AVI Publishing Company, INC
5. Elements of Farm Machinery; by A.C. Srivastava, Pub-Oxford & Ibh Publishing Co. Pvt. Ltd.
6. Principles of Agricultural Engineering, Vol.-I, by Michael A. M. & Ojha T. P.
7. Elements of Agricultural Engineering; by J. Sahay; Pub- Agro Book Agency, New Chitragupta Nagar, Patna – 20

Syllabus for Engineering Economics and Project Management (Theory)

Open Elective I

Course Title	**Engineering Economics and Project Management**
Course Code:	Semester: Sixth
Duration: Seventeen Weeks	Maximum Marks 100
Teaching Scheme	Examination scheme
Theory: 3 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 45	Class Attendance: 10 Marks
Credit 3	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

Syllabus as per council

Syllabus for Entrepreneurship and Start-ups (Theory)

Course Title	**Entrepreneurship and Start-ups**
Course Code: AGHS604	Semester: Sixth
Duration: Seventeen Weeks	Maximum Marks 100
Teaching Scheme	Examination scheme
Theory: 3 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 45	Class Attendance: 10 Marks
Credit 3	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

Syllabus as per council

Syllabus for Watershed and Hydrology (Theory)

Course Title	**Watershed and Hydrology**
Course Code: AGPC605	Semester: Sixth
Duration: Seventeen Weeks	Maximum Marks 100
Teaching Scheme	Examination scheme
Theory: 2 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 30	Class Attendance: 10 Marks
Credit 2	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

Aim:-

The course aim to make understand different components of hydrological cycle, different form of precipitation,evapo-transpiration, infiltration, porous and their estimation, run-off study, hydrograph, flood and draught.

Objective :-

This subject deals with the major natural resources specially water which is one of the important input to the crops. The knowledge of the subject will certainly help the students to learn hydrological cycles and efficient management with proper planning to save these scare natural resources.

SL. NO.	TOPIC	Contact period
Unit 1	INTRODUCTION	2
Unit 2	PRECIPITATION	4
Unit 3	ABSTRACTIONS FROM PRECIPITATION	4
Unit 4	GEOMORPHOLOGY OF WATERDHED	3
Unit 5	RUNOFF	4
Unit 6	HYDROGRAPH	4
Unit 7	HEAD WATER FLOOD CONTROL	3
Unit 8	HYDROLOGY OF DRY LAND AREAS	3
Unit 9	INTRODUCTION TO WATERSHED MANAGEMENT AND PLANNING	3
	TOTAL	30

Content: Theory (Water Shed And Hydrology) 2 hrs/wk

INTRODUCTION:

Hydrologic cycle

PRECIPITATION:

Forms, rainfall measurement
Mass curve, hyetograph and mean rainfall depth
Frequency analysis of point rainfall, plotting position
Estimation of missing data
Test for consistency of rainfall records

ABSTRACTIONS FROM PRECIPITATION:

Interception
Infiltration
Evaporation and evapo-transpiration

GEOMORPHOLOGY OF WATERDHED:

Stream number, stream length, stream area, stream slope and Horton's laws

RUNOFF:

Affecting factors
Measurement of runoff; stage and velocity
Rating curve, extension of rating curve
Estimation of peak runoff rate and volume by rational method,
Cook's method, SCSmethod, Curve number method

HYDROGRAPH:

Components, base flow separation
Unit hydrograph theory
Unit hydrograph of different durations
Dimensionless unit hydrograph, distribution hydrograph
Synthetic unit hydrograph
Uses and limitations of unit hydrograph

HEAD WATER FLOOD CONTROL:

Methods, retards and their location
Flood routing - graphical methods of reservoir flood routing

HYDROLOGY OF DRY LAND AREAS:

Drought and its classification

9.0 INTRODUCTION TO WATERSHED MANAGEMENT AND PLANNING:

Text book:

1. Watershed Hydrology by R. Suresh, Standard Publishers Distributers.
2. Engineering Hydrology by K.Subramanya. Tata Mc Grow Hill Publishing Company.
3. Handbook of Applied Hydrology, by V.T.Chow. Mc Grow Hill, New York.
4. Hydrology &Water Recourses Engineering, by S.K.Garg, Khanna Publishers Distributors

Syllabus for Renewable Energy Sources Lab

Course Title	**Renewable Energy Sources Lab**				
Course Code: AGPC606	Semester: Sixth				
Duration: Seventeen Weeks	Maximum Marks 100				
Teaching Scheme	Continuous Assessment-60			End Semester Assessment-40	
Practical: 2 hrs./week Total hours: 30	Assignments (to be allotted)	Class Performance	Class Attendance	Assignment on the day of Viva-voce	Viva-voce (Before Board of Examiners)
Credit 1	30	20	10	20	20
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.					

Aim:-

The aim of the subject is to develop basic concepts of different sources of non-conventional energy, theirprinciples and application for human development.

Objective :-

The subject emphases different aspects of non-conventional energy sources like solar, wind, bio-gas, bio-fuel, etc.The study also includes various methods and devices used to transform the energy in accordance to the human need.

Content: Practical (Renewable Energy Sources Lab.) 2 hrs/wk

1. Demonstration of instruments and measurement of different type of radiation.
2. Study of solar radiation characterization,
3. Study and performance evaluation of a Box type solar cooker, Green house technology
4. Visit to domestic biogas plants
5. Visit to community biogas plant
6. Design of float type biogas plants for individual family/community.
7. Design of fixed dome type biogas plants for individual family/community.
8. Study of biogas characterization.
9. Study of design details of different types of gasifiers and their testing with agricultural residues as source ofenergy.
10. Constructional features of different types of windmills, their operations and maintenance.
11. Visit to community biogas plants, industrial application centers of solar energy, wind forms etc.
12. Design of wood chip based gassifiers.

Syllabus for Farm Machinery and Equipment (Lab)

Course Title		**Farm Machinery and Equipment (Lab)**			
Course Code: AGPC607		Semester: Sixth			
Duration: Seventeen Weeks		Maximum Marks 100			
Teaching Scheme	Continuous Assessment-60			End Semester Assessment-40	
Practical: 4 hrs./week Total hours: 60	Assignments (to be allotted)	Class Performance	Class Attendance	Assignment on the day of Viva-voce	Viva-voce (Before Board of Examiners)
Credit 2	30	20	10	20	20
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.					

Aim:-The aim of the subject is to develop the basic knowledge regarding use of agricultural machineries principle ofoperation, adjustment and maintenance of different agricultural machinery used at various stage of crop production.

Objective :-This subject deals with the basic knowledge of agricultural machineries, their working principles and techniques forperformance evaluation. The selection of suitable machineries for various uses in crop production is also dealt in this subject. The cost estimation for various uses of agricultural machineries is also taken care under this subject.

Content: Practical (Farm Machinery & Equipment Lab.) 4 hrs/wk

1. Determination of draft of agricultural implements
2. Familiarization with farm machines and equipment
3. Study of constructional features of M.B. and disc ploughs and their adjustments
4. Study of different seed cum fertilizer drills and planters, their calibration and adjustments
5. Study of construction and operation of sprayers and dusters: their calibration and adjustments
6. Study of cultivators and weeders
7. Study of constructional details and adjustments of mowers and reapers
8. Study of constructional details, operation and adjustments of threshers, and their performance
9. Study of puddlers and cage wheels for rice cultivation
10. Study of nursery raising and paddy transplanter.
11. Study of special machines for potato and groundnut sowing and harvesting
12. Study of sugarcane equipment
13. Calculations on field capacities, field efficiencies and application rates of seed fertilizer and chemicals.

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Architecture [ARCH]

Part-III (6th Semester)

2023

Committee for Model Curriculum of full time Diploma Course in Architecture

AR. DEBABRATA GHOSH, Principal Architect & planner, DECOARCH, FE-90, Salt Lake, Kolkata-700106	EXPERT
AR. SAIBAL KAR, KERR& ASSOCIATE, 10651A,S.N. Banerjee Road, 2nd floor, Kolkata-700014	EXPERT
DR SANJIB NAG, Professor & former Head, Department of Architecture, Jadavpur University, Kolkata	EXPERT
MR AMITAVA ROY, Associate Professor, Department of Architecture, Town & Regional Planning, IIEST, Sibpur, Howrah-711103	EXPERT
MR SAIBAL THAKURATA, Chief Town Planner, Town & country Planning Branch, Urban Development & Municipal Affair Department, Govt. of West Bengal, "NAGARAYAN" DF-8, Sector-I, Bidhannagar, Kolkata-700064	EXPERT
MRS. RITA ROY SARKAR, Junior Lecturer in Dept. of Architecture, North Calcutta Polytechnic, Govt. of West Bengal, Klokata-700002	MEMBER
MR. ABHISEK CHATTERJEE, Lecturer in Dept. of Architecture, Women's Polytechnic, Chandernagore, Govt. of West Bengal.	MEMBER
MR. JAVED AKRAM, Lecturer in Dept. of Architecture, S.N. Bose Govt. Polytechnic, Ratua, malda, West Bengal.	MEMBER
MR. ANIRUDDHA MUTSUDDI, Lecturer in Dept. of Architecture, Govt. Polytechnic, Siliguri , West Bengal.	MEMBER
MS. ANKITA BAKSI, Lecturer in Dept. of Architecture, Women's Polytechnic, Kolkata, Govt. of West Bengal.	MEMBER
MRS.MUNMUN CHAKRAVARTY, Lecturer in Dept. of Architecture, North Calcutta Polytechnic, Govt. of West Bengal, Kolkata-700002	CONVENER

WestBengalStateCouncilofTechnical&VocationalEducationandSkillDevelopment(TechnicalEducationDivision)									
TeachingSchemeforDiplomainEngineeringCourses:Branch-Architecture(6th Semester)									
Sl no	Category	Code No	Course Title	Credits	periods			Contact hours per week	Marks
					L	TU	PR		
THEORY SUBJECTS									
1	Programme core course	HS302	Entrepreneurship and startups	**3**	2	1	0	3	100
2	Programme core course	ARPC302	Estimating,Costing,Specification &Valuation -II	**2**	2	0	0	2	100
3	Programme core course	ARPC304	Contemporary Architecture-II	**2**	2	0	0	2	100
4	Programme core course	ARPC306	Architectural Design–IV	**1**	0	1	0	1	100
5	Open elective	AROE302	Open Elective-I	**3**	3	0	0	3	100
6	Open elective	AROE304	Open Elective-II	**3**	3	0	0	3	100
SESSIONAL SUBJECTS									
7	Programme core course	ARPC308	Architectural Design–IV	**2**	0	0	4	4	100
8	Programme core course	ARPC310	Working Drawing-IV	**3**	0	1	4	5	100
9	Programme elective	ARPE302	Programme Elective-IV	**2**	0	1	2	3	100
10	Major Project	ARPR302	Architectural Project	**3**	0	1	4	5	100
11	Seminar	ARSE302	Architectural Seminar	**1**	0	1	0	1	100
			Total	**25**	**12**	**6**	**14**	**32**	**1100**

LIST OF **PROGRAMME ELECTIVE (PE)** COURSES OF DIPLOMA IN ARCHITECTURE,WBSCT & VE and SD (IV semester–VI semester)

Course Code	Course Title	Hours Per Week			Semester	Credit
		L	TU	PR		
ARPE 202	**Programme Elective-I(Any one to be selected)**					
	Surveying (Sessional)	0	1	2	IV	2
	Alternate Building Technology (Sessional)	0	1	2	IV	2
ARPE 301	**Programme Elective-II(Any one to be selected)**					
	Building Maintenance &Repairing (Theory)	2	0	0	V	2
	Steel Architecture (Theory)	2	0	0	V	2
ARPE 303	**Programme Elective-III(Any one to be selected)**					
	Interior Design (Sessional)	0	1	2	V	2
	Furniture Design (Sessional)	0	1	2	V	2
ARPE 302	**Programme Elective-IV(Any one to be selected)**					
	Landscape Architecture (Sessional)	0	1	2	VI	2
	Architectural Conservation (Sessional)	0	1	2	VI	2

LIST OF **OPEN ELECTIVE (OE)** COURSES OF DIPLOMA IN ARCHITECTURE
(VI Semester)

Course Code	Course Title	Hours Per Week			Semester	Credit
		L	TU	PR		
AROE 302	**Open Elective-I (Compulsory for all branches)**					
	Engineering Economics & Project Management (Theory)	3	0	0	VI	3
AROE 304	**Open Elective-II(Any one to be selected)**					
	Disaster Management (Theory)	3	0	0	VI	3
	Sustainable Architecture (Theory)	3	0	0	VI	3

DETAIL SYLLABUS OF 6th SEMESTER ARCHITECTURE
(THEORY SUBJECTS)

Course Title	**Entrepreneurship and Start-ups**
Course Code	HS 302
Number of Credits	3
Pre Requisites	None
Total Contact Hours	3(L: 2; T: 1)/week = 45 hrs
Course Category	HS

Course Learning Objectives

1. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
2. To motivate and inspire students toward an entrepreneurial career.
3. To understand venture creation process and to develop generic entrepreneurial competences.
4. To introduce students to the basic steps required for planning, starting and running a business.
5. To familiarise students with the different exit strategies available to entrepreneurs.

Course Outcomes:

After completing the course students will able to:

CO 1	Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
CO 2	Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
CO 3	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
CO 4	Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

Detailed Course Content

Unit	Name of the Topic	Hours
1.	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS** • Concept, Competencies, Functions and Risks of entrepreneurship • Entrepreneurial Values& Attitudes and Skills • Mindset of an employee/manager and an entrepreneur • Types of Ownership for Small Businesses o Sole proprietorship o Partnerships o Joint Stock company- public limited and private limited companies • Difference between entrepreneur and Intrapreneur	10
2.	**PREPARATION FOR ENTREPRENEURIAL VENTURES** • Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. • Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard Feasibility Study Report • Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan • Project Report- Concept, its features and components • Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. <u>They **may not** be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.</u>	20
3.	**ESTABLISHING SMALL ENTERPRISES** • Legal Requirements and Compliances needed for establishing a New Unit- o NOC from Local body o Registration of business in DIC o Statutory license or clearance o Tax compliances	03

4.	**START-UP VENTURES** • Concept & Features • Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical • Problems and challenges faced by start-ups. • Start-up Ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. No questions are to be set from the case studies.	04
5.	**FINANCING START-UP VENTURES IN INDIA** • Communication of Ideas to potential investors – Investor Pitch • Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups • Govt Initiatives including incubation centre to boost start-up ventures • MSME Registration for Start-ups –its benefits	06
6.	**EXIT STRATEGIES FOR ENTREPRENEURS** • Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – **Basic Concept only**	02

Examination Scheme

❖ **End Semester Examination: 60 marks**

Suggested Question Paper Scheme for End Semester Examination

Group A: 20marks

Question Type	Number of questions to be set	Number of questions to be answered
MCQ, Fill in the blanks, True or False (Carrying 1 mark each)	25	20

Group B: 40marks

Question Type	Number of questions to be set	Number of questions to be answered
Subjective Type questions (Carrying 8 marks each)	10	5

- **Internal Assessment: 40 marks**
  - Class test : 20 marks
  - Assignment: 10 marks
  - Class attendance: 10 marks

Suggested Learning Resources

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of IndiaLearning Private Ltd
2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Caseson Entrepreneurship	Anjan Raichaudhuri	Prentice Hall of India Learning Private Ltd
6.	How to Start a Business in India	Simon Daniel	Buuks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development and Business Ethics	Abhik Kumar Mukherjee & Shaunak Roy	Oxford University Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

Course Code	:	ARPC-302
Course Title	:	**ESTIMATION, COSTING, SPECIFICATION & VALUATION - II**
Number of Classes	:	2(Lecture: 2, Tutorial:0,Practical: 0)
Number of Credit	:	2
Prerequisites	:	NIL
Course offered in	:	Sixth Semester
Course duration	:	17weeks
Course Category	:	PC

Course Objectives:

On satisfactory completion of the course, a student will**:**—

(i) understand the purposes and factors affecting rate analysis;
(ii) be able to calculate the rate analysis for some common items of work;
(iii) have knowledge regarding the general specifications of first & second classes of buildings and detailedspecifications of some common items of work;
(iv) understand the concepts of valuation, depreciation and other associated issues
(v) Learn to calculate depreciation and valuation of a building by different methods.

M O D U L A R D I V I S I O N O F T H E S Y L L A B U S

Module	Topic	Lecture
1	ANALYSIS OF RATE	12
2	SPECIFICATION	08
3	VALUATION	10
CONTACT PERIODS: 30	**INTERNAL ASSESSMENTS: 4**	**TOTAL PERIODS: 34**

S E M E S T E R E X A M I N A T I O N S C H E M E

MODULE	**OBJECTIVE QUESTIONS**				**SUBJECTIVE QUESTIONS**							
	PART A				PART B				PART C			
	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
1	15	Any THIRTY	1	**1x30=30**	3	Any SIX	2	**2x6=12**	2	Any THREE	6	**6x3=18**
2	15				3				2			
3	15				3				2			

MARKS ALLOTMENT

SL.NO	**INTERNAL ASSESSMENT**		**SEMESTER EXAM**	
	TYPE	MARKS	QUESTION TYPE	MARKS
1	Mid Semester Tests	**20**	Part A	**1x30=30**
2	Quizzes, Viva-voce, Assignments	**10**	Part B	**2X6=12**
3	Class Attendance	**10**	Part C	**6X3=18**
Total Marks: 100				

DETAIL COURSE CONTENT

MODULE NO.	TOPIC	CONTENTS	CONTACT PERIODS
Module 1	**ANALYSIS OF RATE**	DEFINITION — PURPOSE OF RATE ANALYSIS — FACTORS AFFECTING THE RATE PER UNIT OF AN ITEM**:** Materials – Labour – Equipments or Tools & Plants – Overhead or Establishment charges (including incidental) – Profit ANALYSIS OF RATE FOR**:** Earthwork – Brick Soling – Concrete Work – Shuttering & Staging – Damp Proof Course – Brick work – AAC block work-Lime Terracing on RCC roof – Plastering – Pointing – White Wash – Colour Wash	12
Module 2	**SPECIFICATION**	DEFINITION — PURPOSE OF SPECIFICATION — PRINCIPLES OF WRITING SPECIFICATION — TYPES OF SPECIFICATION**:** General specifications & Detailed specifications GENERAL SPECIFICATIONS of a First Class and Second Class Building DETAILED SPECIFICATIONS**:** Earthwork in Excavation – Earthwork in Filling – Brick Soling – Plain Cement Concrete – Reinforced Cement Concrete – Damp Proof Course – First Class Brickwork – Patent Stone Flooring – Terrazzo or Mosaic Flooring laid in situ – Cement Plaster Skirting – Glazed Tiles in Skirting and Dado – Woodwork for door and window frames – Woodwork for door and window shutters – Cement Plastering – Cement Pointing – Lime terracing – White washing – Colour washing – Distempering	08
Module 3	**VALUATION**	DEFINITIONS**:** Value, Cost, Price and Valuation — PURPOSE of Valuation — QUALIFICATIONS &FUNCTIONS OF A VALUER Difference between Value & Cost — SCRAP (or Junk or Demolition) VALUE & SALVAGE VALUE —ASSESSED VALUE — SPECULATIVE VALUE — SINKING FUND DEPRECIATION & OBSOLESCENCE — METHODS OF CALCULATING DEPRECIATION**:** Straight Line Method – Constant Percentage Method or Declining Balance Method – Sinking Fund Method METHODS OF VALUATION**:** Rental Method of Valuation – Land & Building Method of Valuation (or InitialCost based Valuation) – Direct Comparison Method of Valuation	10

REFERENCE BOOK

1. ESTIMATING, COSTING, SPECIFICATION AND VALUATION IN CIVIL ENGINEERING /M.CHAKRABORTI /,21B, Bhabananda Road, Kolkata – 700 026
2. ESTIMATING & COSTING IN CIVIL ENGINEERING THEORY & PRACTICE INCLUDING SPECIFICATION &VALUATION / B. N. DUTTA / UBSPD
3. Schedule of Rates (Volume-I), Building Works, Public Works Department, Govt. of West Bengal

Course Code	:	ARPC -304
Course Title	:	Contemporary Architecture-II
Number of Classes	:	2(Lecture: 2, Tutorial:0,Practical: 0)
Number of Credit	:	2
Prerequisites	:	Knowledge on Contemporary Architecture-I
Course offered in	:	Sixth Semester
Course duration	:	17weeks
Course Category	:	PC

Course Objectives:

On satisfactory completion of the course, the students should be in a position to understand and explain the development of different philosophy and styles of world architecture in second half of the twentieth century with reference to contemporary architecture in independent India.

MODULAR DIVISION OF THE SYLLABUS

SEMESTER EXAMINATION SCHEME

GROUP	MODULE	TOPIC	CONTACT PERIODS
A	1	SCULPTURAL ARCHITECTURE	2
	2	BRUTALISM	2
	3	STRUCTURAL INNOVATIONS	4
	4	POST MODERNISM	2
	5	DECONSTRUCTIONISM	2
	6	NEOMODERNISM	2
B	7	MODERN ARCHITECTURE & INDIA	6
	8	MAINSTREAM INDIAN ARCHITECTURE	6
	9	ALTERNATIVES FOR A DEVELOPING INDIA	4

CONTACT PERIODS: 30 INTERNAL ASSESSMENT: 4 TOTAL PERIODS: 34

S E M E S T E R E X A M I N A T I O N S C H E M E

GROUP	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTIONS							
	PART A				PART B				PART C			
	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	30	Any THIRTY	1	**1x30=30**	6	Any SIX	2	**2x6=12**	4	Any THREE	6	**6x3=18**
B	15				3				2			

MARKS ALLOTMENT

SL.NO	INTERNAL ASSESSMENT		SEMESTER EXAM	
	TYPE	MARKS	QUESTION TYPE	MARKS
1	Mid Semester Tests	**20**	Part A	**1x30=30**
2	Quizzes, Viva-voce, Assignments	**10**	Part B	**2X6=12**
3	Class Attendance	**10**	Part C	**6X3=18**

Total Marks: 100

D E T A I L C O U R S E C O N T E N T

MODULE NO.	TOPIC	CONTENTS	CONTACT PERIODS
G R O U P – A M O D E R N I S M – M O V E M E N T S & C O U N T E R M O V E M E N T S			**14 PERIODS**
1	**SCULPTURAL ARCHITECTURE**	Exploit of constructional resources beyond traditional geometry – Monolithic structures without or with very few right angles – Study of the NOTRE DAME DU HAUT, RONCHAMP, FRANCE (1954) by CORBUSIER	2
2	**BRUTALISM**	Concrete exposed at its roughest – characterized by emphasis on exposed building materials and structural supports – massive monolithic forms with geometric lines – Study of the Boston City Hall, Boston, Massachusetts (1968) by Gerhard Kallmann and Michael McKinnell	2
3	**STRUCTURAL INNOVATIONS**	3.1 **THIN-SHELL STRUCTURE:** Lightweight constructions using typically curved shell elements - Concrete shell structure - Cast as a monolithic dome or vault – Allows wide span without interior columns or exterior buttresses - Study of the TWA TERMINAL, JOHN F. KENNEDY AIRPORT, NEW YORK (1962) by EERO SAARINEN 3.2 **SUSPENDED STRUCTURE:** Catenary-shaped roof - a cable system strung between outer-wall concrete columns angled away from the center - no supports or visual obstructions inside the structure - Study of the DULLES INTERNATIONAL AIRPORT, WASHINGTON DC (1962) by EERO SAARINEN	4

4	**POST MODERNISM**	Pioneer ROBERT VENTURI – THEME: LESS IS BORE – Attacks modernist orthodoxy and elitism of modernist tradition – Urges architecture to come in terms with popular culture – Term formally defined by CHARLES JENKS referring to a style arising in the early 1970s – Hybrid, doubly-coded, half-modern and half-conventional – Study of the PORTLAND MUNICIPAL OFFICES, OREGON (1982) by MICHAEL GRAVES – Prominent works of the following eight post-modernist architects (name only): Robert Venturi, Charles Jenks, Mario Botta, Renzo Piano, Richard Rogers.	2
5	**DECONSTRUCTIONISM**	Influenced by the writings of philosopher JACQUES DERRIDAS – THEME: FORM FOLLOWS FANTASY coined by BERNHARD TSCHUMI – Apparent fragmentation of building forms – Rejection of the right-angle and curve in favour of the sharp acute angle – General reversal or at least questioning of all principles of design and construction conventionally believed to be axiomatic – Prominent works of the following five deconstructionist architects: Peter Eisenman, Zaha Hadid, Frank O. Gehry – Study of the following work: VITRA FIRE STATION, GERMANY (1993) by ZAHA HADID.	2
6	**NEOMODERNISM**	A dominant form of architecture in 20th and 21st century - A reaction to the complexity of postmodern architecture and eclecticism, seeking greater simplicity - Study of the following work : BEETHAM TOWER, MANCHESTER (2006) by IAN SIMPSON & RACHEL HAUGH OF SIMPSON HAUGH & PARTNERS	2
GROUP-B CONTEMPORARY INDIAN ARCHITECTURE			**16 PERIODS**
7	**MODERN ARCHITECTURE & INDIA**	Independent India's Prime Minister Nehru's allegiance to the Western industrial model – Invitation to European & American masters – Study of the (i) CAPITOL COMPLEX BUILDINGS, CHANDIGARH by LE CORBUSIER**:** THE ASSEMBLY (1960), THE HIGH COURT (1956) & THE SECRETARIAT (1956); and, (ii) INDIAN INSTITUTE OF MANAGEMENT, AHMEDABAD (1974) by LOUIS I KAHN.	6
8	**MAINSTREAM INDIAN ARCHITECTURE**	Coming out of the influence of colonial and foreign masters – Assimilation of modernism and late 20th century global architectural trends with the living craft traditions and ritualistic link with heritage – Study of the (i) SANGATH, ARCHITECT'S OWN OFFICE, AHMEDABAD (1980) by BALKRISHNA DOSHI, (ii) ASIAD VILLAGE, NEW DELHI (1982) by RAJ REWAL, and, (iii) KANCHENJUNGA APARTMENTS, BOMBAY (1983) by CHARLES CORREA – Prominent architectural works of the following fifteen Indian architects: Habib Rahman, Achyut P. Kanvinde, Laurie Baker, C. P. Kukreja, Charles Correa, Joseph Allen Stein, B. V. Doshi, Hasmukh C. Patel, Raj Rewal, Romi Khosla, Anant D. Raje, Uttam C. Jain, Dulal Mukherjee, Prabir Mitra, and, Hafiz Contractor	6
9	**ALTERNATIVES FOR A DEVELOPING INDIA**	Design and planning as active agents of change in developing nation: 9.1 APPROPRIATE TECHNOLOGY**:** Alternate building materials & structures – Passive control of built environment – Vernacular building technology & aesthetics – Study of the Centre for Developing Studies, Trivandrum (1975) by Laurie Baker. 9.2 HUMAN SETTLEMENT PROGRAMMES**:** 'Site-and-Services' scheme – Study of the Aranya Township, Indore (1988) by Balkrishna Doshi – Vastu-Shilpa Foundation, Ahmedabad.	4

REFERENCE BOOKS

1. A History of Architecture (Century Edition) / Sir Banister Fletcher / Butterworth Heinemann (Hb), CBSPublishers & Distributors (Pb)
2. The Story of Architecture FROM ANTIQUITY TO THE PRESENT / Jan Gympel / Könemann
3. Puzzle of Architecture / Robin Boyd / Melbourne Architectural Press
4. AFTER THE MASTERS Contemporary Indian Architecture / Vikram Bhatt & Peter Scriver / MapinPublishing Pvt. Ltd., Ahmedabad
5. THE LANGUAGE OF POST-MODERN ARCHITECTURE / Charles Jenks / Academy Editions, London
6. ARCHITECTURE HIGHLIGHTS! / Adams Hubertus and Paul Jochen / DUMONT monte
7. Architecture of Today / Andreas Papadakis & James Steele / TERRAIL
8. AT THE END OF THE CENTURY: ONE HUNDRED YEARS OF ARCHITECTURE / Edited by Russel Ferguson / TheMuseum of Contemporary Art, Los Angeles, Harry N. Abrams Inc., Publishers
9. CRASH COURSE IN ARCHITECTURE / Eva Howarth / Caxton Editions
10. Contempoporary Indian Architecture – Housing & Urban Development / M.N.Joglekar & S.K.Das /Galgotia Publishing Co. New Delhi

Course Code	:	ARPC306
Course Title	:	Architectural Design -IV
Number of Classes	:	1(L-0,T-1,P-0)
Number of Credit	:	1
Prerequisites	:	Knowledge of 5th Semester ADD-III
Course offered in	:	6th Semester
Course Duration	:	17 weeks
Course Category	:	PC
Full Marks	:	**100**

Note: A twelve-hour (six hour each day) end semester examination of 60 marks is to be held during end of 6th Semester on the syllabus of "Architectural Design – IV". 15minutes Tiffin breaks after 3 hours should be given in each day.
The Municipal Building Rules and the National Building Code of India are allowed during theexaminations.

Course Objectives: - On successful completion of the course,

(i) Understand the design guideline & aspects of a public building;
(ii) Understand the definitions of different parts of a public building;
(iii) Develop the architectural design of a high-rise public building in sketch-wise phases;
(iv) Draw the developed architectural design.

Modular Division of Syllabus:

UNIT	TOPIC	Tutorial
1	**INTRODUCTION**	**9**
2	**ARCHITECTURAL DESIGN PROCESS**	**6**
	Total	**15**
CONTACT PERIODS:15 INTERNAL ASSESSMENT:2		**TOTAL PERIODS:17**

Examination Scheme:-

OBJECTIVE QUESTIONS				SUBJECTIVE QUESTIONS			
TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
10	**Any Ten**	ONE	**1 x 10 = 10**	**2**	**1**	**50**	**60**

D E T A I L C O U R S E C O N T E N T

UNIT 1: INTRODUCTION

I. CASESTUDY OF SIMILAR PROJECTS **3 periods**

Brief introduction of different topics mentioned in sessional subject. Case study should be done on projects for better understanding of space & area requirements, circulation details, and design aspects of that project. Also Preparing study sheets on that case study for proper understanding of similar type projects.

II. STUDY OF DESIGN GUIDE LINE **2 periods**

CLIMATIC FACTORS: Solar Radiation & Temperature, Clouds, Relative Humidity, Prevailing wind; ASPECTS OF DAYLIGHTING — Sun path Diagram — building orientation as per sun path diagram and prevailing wind. Effects of shade and shadow on building design — Location Site with surrounding & connectivity

III. STUDY OF DESIGN ASPECTS **2 periods**

Preparing study sheets of design aspects (Site analysis, area calculation, design criteria) of a high-rise public building with respect to site given by faculty, Study of occupancy load.

IV. UNDERSTANDING PARTS OF A PUBLIC BUILDING **2 periods**

Power Point presentation for different space planning details of following mentioned sessional topics.

UNIT II: ARCHITECTURAL DESIGN PROCEDURE **6 periods**

ARCHITECTURAL DESIGN

Design and drawing of any one of the following topics should be conducted as per the modular division of the syllabus throughout the entire 6th semester: (The design problem should not be same with the problem of the subject Architectural Project)

A 30 bedded Luxury Hotel/Resort/ a Community Market/ IT Office Building/ a 30 bedded health Institute (as per proper guideline) or any other topic of equivalent weight age.

The problem should be designed keeping in consideration all the provisions of bye-laws (KMC/ West Bengal by- laws).

Standards, Codes & Regulation (By- laws) study of theselected topic (KMC/ West Bengal by-laws).Literature study, Site study, Case study, Area programming and development of the design concept.

Course Code	:	AROE302 (OPEN ELECTIVE-I)
Course Title	:	Engineering Economics & Project Management
Number of Classes	:	3(L-3,T-0,P-0)
Number of Credit	:	3
Prerequisites	:	NIL
Course offered in	:	6th Semester
Course Duration	:	17 weeks
Course Category	:	OE (Open Elective-I)
Full Marks	:	**100**
Open Elective-I is compulsory for all branches		

Course Objectives:

- To acquire knowledge of basic economics to facilitate the process of economic decision making.
- To acquire knowledge on basic financial management aspects.
- To develop the idea of project plan, from defining and confirming the project goalsand objectives, identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

Group-A

Unit-I (INTRODUCTION, THEORY OF DEMAND & SUPPLY) [9 hours]

Introduction to Engineering Economics, the relationship between Engineeringand Economics

Resources, scarcity of resources, and efficient utilization of resources.

Opportunity cost, rationality costs, and benefits

Theory of Demand: the law of demand, different types of demand, determinantsof demand, demand function, price elasticity of demand.

Theory of Supply: determinants of supply, supply function.

Market mechanism: Equilibrium, basic comparative static analysis (Numericalproblems)

Unit-II (THEORY OF PRODUCTION & COSTS) [10 hours]

: Concept of production (goods & services), Different factors of production (fixed and variable factors), Short-run Production function (Graphical illustration), and Longrun production function (returns to scale).

: Theory of Cost: Short-run and long-run cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost

: Economic concept of profit, profit maximization (numerical problems)

UNIT-III (DIFFERENT TYPES OF MARKET AND ROLE OF GOVERNMENT) [4 hours]

: Perfect Competition: Features of Perfectly Competitive Market.

: Imperfect Competition: Monopoly, Monopolistic Competition, and Oligopoly.

: Role of government in Socialist, Capitalist and Mixed Economy structure withexample.

Group-B

Unit-I (CONCEPT OF PROJECT) [4 hours]

1.1: Definition and classification of projects)1.2:

Importance of Project Management.

1.3: Project life Cycle [Conceptualization→Planning→Execution→Termination]

Unit-II (FEASIBILITY ANALYSIS OF A PROJECT) [10 hours]

: Economic and Market analysis.

: Financial analysis: Basic techniques in capital budgeting – Payback periodmethod, Net Present Value method, Internal Rate of Return method.

: Environmental Impact study – adverse impact of the project on the environment.

: Project risk and uncertainty: Technical, economical, socio-political, andenvironmental risks.

: Evaluation of the financial health of a project – Understanding the basic conceptof Fixed & Working Capital, Debt & Equity, Shares, Debentures etc., and different financial ratios like Liquidity Ratios, Activity Ratios, Debt-equity ratio & Profitability Ratio (Basic concept only).

N.B: Knowledge of financial statements is not required; for the estimation of ratiosthe values of the relevant variables will be provided.

Unit-III (PROJECT ADMINISTRATION) [8 hours]

: Gantt Chart – a system of bar charts for scheduling and reporting the progressof a project (basic concept).
: Concept of Project Evaluation and Review Technique (PERT) and Critical Pathmethod (CPM): basic concept and application with real-life examples.

Examination Scheme:

A. Semester Examination pattern of 60 marks:

1. Objective type Question (MCQ, Fill in the blanks, and Very Short question-1 markeach): At least five questions from each unit. [total marks:20]

2. Subjective questions: Eight questions to be answered taking at least three fromeach group. (Two questions should be given from each unit). [total marks: 40]

B. Assignment (10 Marks)

Guideline for Assignment (10 Marks)

Students should be instructed to prepare a report on a project (preferably theMajor Project they prepare in 6 th Semester), using a popular project management software in IT/Computer Laboratory, under the guidance of theLecturer in Computer Science & Technology and Lecturer in Humanities.

C. Class Test: Two examinations 20 marks each. Take best of two.

D. Attendance: 10 Marks

Suggested reference books:

1. *Principles of Economics – Case and Fair, Pearson EducationPublication*
2. Principles of Economics – Mankiw, Cengage Learning
3. *Project planning, analysis, selection, implementation and review –Prasannachandra – Tata McGraw Hill.*
4. Project Management – Gopala krishnan – Mcmillan India Ltd

Course Code	:	AROE304 (OPEN ELECTIVE-II)
Course Title	:	Disaster Management
Number of Classes	:	3(L-3,T-0,P-0)
Number of Credit	:	3
Prerequisites	:	NIL
Course offered in	:	6th Semester
Course Duration	:	17 weeks
Course Category	:	OE (Open Elective-II)
Full Marks	:	**100**
Students can choose any one subject for Open Elective-II from the list		

Course Learning Objectives:

Following are the objectives of this course:

- To learn about various types of natural and man-made disasters.
- To know pre- and post-disaster management for some of the disasters.
- To know about various information and organisations in disaster management in India and Legal framework of disaster management.

To get exposed to technological tools and their role in disaster management

Module/ Group [as per directives from WBSCT&VE&SD in framing questions of end semester]	Distribution of unit
Module A/ Group A	Unit I and II
Module B/ Group B	Unit III and V
Module C/ Group C	Unit IV

Course Content:

Unit – I: Understanding Disaster

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity – Disaster and Development, and disaster management.

Unit – II: Types, Trends, Causes, Consequences and Control of Disasters

Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire);

Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters, health disaster) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.

Unit- III: Disaster Management Cycle and Framework

Disaster Management Cycle – Paradigm Shift in Disaster Management.

Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness.

During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation –

Post-disaster – Damage and Needs Assessment, addressing Residual issues, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action (HFA).

Unit– IV: Disaster Management in India and Legal framework of disaster management

Disaster Profile of India – Mega Disasters of India and Lessons Learnt.

Disaster Management Act 2005 – Institutional and Financial Mechanism

National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter Governmental Agencies

Refugee Camps and Settlements: Water Supply and Sanitation in Emergency: *Introduction*- Human rights, international humanitarian law and refugee conventions, water and sanitation, refugee camp planning.

Settlement planning- Environmental health risks in emergencies – needs and standards – public health approach to water supply and sanitation in emergencies – partners in the humanitarian response – working with disaster affected people – social diversity – local context Emergency settlements, site selection and planning – introduction – physical planning of emergency settlement – settlement location and physical layout: implications for water supply and sanitation.

Water supply – planning and implementation – water sources – treatment – pumping – tinkering – storage – distribution – collection and use – testing. Waste water – storm water – community involvement.

Waste Management- Phased response – organizational options – staffing needs – monitoring latrine programmers – technical options – options for problem sites- Health risk of solid waste from health centers – dead bodies disposal

Unit– V: Applications of Science and Technology for Disaster Management

Geo-informatics in Disaster Management (RS, GIS and GPS).

Disaster Communication System (Early Warning and Its Dissemination).

Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non Structural Mitigation of Disasters

S & T Institutions for Disaster Management in India

Course outcomes:

After completing this course, student will be:

- Acquainted with basic information on various types of disasters
- Knowing the precautions and awareness regarding various disasters
- Decide first action to be taken under various disasters
- Familiarized with organization in India which are dealing with disasters and Legal framework of disaster management
- Able to select IT tools to help in disaster management

References:

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
2. Bhandani, R. K., An overview on natural & man-made disasters and their reduction, CSIR, New Delhi
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi
4. Alexander, David, Natural Disasters, Kluwer Academic London
5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation
6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.
7. Singh Jagbir, Disaster Management-Future Challenges and Opportunities, IK International Publishing House Pvt. Ltd.
8. Gupta, Harsh K., Disaster Management, Universities Press (India) Pvt. Ltd.
9. Harvey, P.A., Baghri, S. and Reed, R.A. (2002) **Emergency Sanitation: Assessment and programme design**, WEDC, Loughborough University, UK.

Course outcomes:

After completing this course, student will be:

- Acquainted with basic information on various types of disasters
- Knowing the precautions and awareness regarding various disasters
- Decide first action to be taken under various disasters
- Familiarized with organization in India which are dealing with disasters and Legal framework of disaster management
- Able to select IT tools to help in disaster management

Course Code	:	AROE304 (OPEN ELECTIVE-II)
Course Title	:	Sustainable Architecture
Number of Classes	:	3(L-3,T-0,P-0)
Number of Credit	:	3
Prerequisites	:	NIL
Course offered in	:	6th Semester
Course Duration	:	17 weeks
Course Category	:	OE
Full Marks	:	**100**
Students can choose any one subject for Open Elective-II from the list		

Course Objectives

On satisfactory completion of the course, a student will be able to: —

(i) develop energy conscious architectural design, strategies and built form

(ii) understand futuristic vision of urban habitat

MODULAR DIVISION OF THE SYLLABUS

Module	Topic	Lecture
1	INTRODUCTION TO CONCEPTS OF SUSTAINABILITY	08
2	SUSTAINABLE ARCHITECTURE TECHNIQUES	16
3	GREEN BUILDINGS	15
4	GREEN BUILDING COUNCIL & RATING SYSTEMS	06
CONTACT PERIODS: 45	**INTERNAL ASSESSMENTS: 4**	**TOTAL PERIODS: 51**

SEMESTER EXAMINATION SCHEME

MODULE	**OBJECTIVE QUESTIONS**				**SUBJECTIVE QUESTIONS**							
	PART A				PART B				PART C			
	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
1	10	AnyTHIRTY	1	**1x30=30**	3	Any SIX	2	**2x6=12**	1	Any THREE	6	**6x3=18**
2	15				2				1			
3	10				3				2			
4	10				1				2			

MARKS ALLOTMENT

SL.NO	**INTERNAL ASSESSMENT**		**SEMESTER EXAM**	
	TYPE	MARKS	QUESTION TYPE	MARKS
1	Mid Semester Tests	**20**	Part 1	**1x30=30**
2	Quizzes,Viva-voce,Assignments	**10**	Part 2	**2X6=12**
3	ClassAttendance	**10**	Part 3	**6X3=18**
Total Marks: 100				

D E T A I L C O U R S E C O N T E N T

MODULE NO.	TOPIC	CONTENTS	CONTACT PERIODS
Module1	**INTRODUCTION TO CONCEPTS OF SUSTAINABILITY**	DEFINITION OF SUSTAINABILITY AND SUSTAINABLE ARCHITECTURE — THE NEED FOR SUSTAINABLE ARCHITECTURE: environmental, economic, and health and community THE PRINCIPLES OF SUSTAINABLE ARCHITECTURE: energy efficiency, waste management and environment friendly building materials and practices	08
Module2	**SUSTAINABLE ARCHITECTURE TECHNIQUES**	ELEMENTS OF SUSTAINABLE DESIGN: SITE PLANNING – building orientation and day lighting, BUILDING FORM – wind effects and ventilation, stack ventilation, wind tower, earth air tunnel, active and passive heating and cooling techniques, courtyard planning BUILDING ENVELOPE – double external wall skins, rat trap brick bonding, Trombe walls LANDSCAPING – green awnings, green roofs, grass paver tiles RENEWABLE ENERGY – solar panels, wind turbines, grey water recycling, rainwater harvesting, sustainable materials – bamboo, straw, wool brick, sustainable concrete, glazed windows (DEFINITIONS, USES AND EXAMPLES)	16
Module3	**GREEN BUILDINGS**	DEFINITION OF GREEN BUILDINGS – BENEFITS OF GREEN BUILDINGS – Environmental, Economic and Social(efficiency of structural design, energy, water, materials, and waste reduction) GREEN BUILDINGS IN INDIA – Shorabji Godrej Building Hyderabad, ITC Green Center Gurgaon, Infinity Benchmark Salt Lake Kolkata, Suzlon One Earth Pune, Biodiversity Conservation India Ltd Bangalore	15
Module 4	**GREEN BUILDING COUNCIL &RATING SYSTEMS**	INTERNATIONAL GREEN BUILDING RATING SYSTEM – LEED GREEN BUILDING RATING SYSTEMS IN INDIA – IGBC, GRIHA, ECBC (SCOPE AND SALIENT FEATURES)	06

REFERENCE BOOKS

1. Green from the Ground Up/ David Johnston and Scott Gibson
2. Green Building Illustrated/ Francis D.K. Ching and Ian M. Shapiro
3. Green Building Guidance : The Ultimate Guide for IGBC Accredited Professional Examination/ Karthik Karuppu
4. Natural Design, Organic Architecture: Lessons for Building Green/ Frank Lloyd Wright

SYLLABUS OF 6th SEMESTER ARCHITECTURE (SESSIONAL SUBJECTS)

Course Code	:	ARPC308
Course Title	:	Architectural Design -IV
Number of Classes	:	4(L-0,T-0,P-4)
Number of Credit	:	2
Prerequisites	:	Knowledge of 5th Semester ADD-III
Course offered in	:	6th Semester
Course Duration	:	17 weeks
Course Category	:	PC
Full Marks	:	**100**
CONTACT PERIODS: 60	**INTERNAL ASSESSMENTS: 8**	**TOTAL PERIODS: 68**

Course Objectives: - On successful completion of the course,

1) To understand architectural design of a high rise public building following necessary building bylaws.
2) To understand presentation of architectural design.

S E M E S T E R E X A M I N A T I O N S C H E M E

SL. NO.	INTERNAL ASSESSMENT (continuous throughout the semester)		EXTERNAL ASSESSMENT (by external evaluator)	
	TYPE	MARKS	TYPE	MARKS
1	Drawing Sheets	40	Drawing Sheets	20
2	Class Performance, Viva-voce	10	Assignments on the day of exam	10
3	Class Attendance	10	Viva-voce	10
	Total	60	Total	40
			Total Marks	**100**

D E T A I L C O U R S E C O N T E N T

ARCHITECTURAL DESIGN DRAWINGS & PRESENTATION **60**

The design should be presented through a set of architectural drawings in a suitable scale consisting of at least the following sheets: —

(a) Key Plan
(b) Site Analysis , Zoning & Bubble Diagram
(c) site layout showing means of access, approach to the designed building, open parking spaces (if any), planting and landscaping;
(d) plans showing furniture layout, parking spaces (if any), planting and landscaping (wherever applicable);
(e) Road side elevation , Rear side elevation, one side elevation
(f) Minimum two sectional elevations cutting at least the toilet(s), stairs and any other service area (if any).
(g) Block Model / 3-D view

The final drawings should be done entirely on drafting Software (AutoCAD or any similar software) & submission of sheets should be **Print out with proper rendering by a portfolio.**

Course Code	:	ARPC310
Course Title	:	Working Drawing -IV
Number of Classes	:	5(L-0,T-1,P-4)
Number of Credit	:	3
Prerequisites	:	Knowledge of 5th Semester WD-III
Course offered in	:	6th Semester
Course Duration	:	17 weeks
Course Category	:	PC
Full Marks	:	**100**
CONTACT PERIODS: 75	**INTERNAL ASSESSMENTS: 10**	**TOTAL PERIODS: 85**

Course Objectives: - On successful completion of the course a student will be able to: —

Draft Working drawing of a building with foundation, structural detail, Kitchen & toilet detail, water supply and sewerage layout and electrical layout.

S E M E S T E R E X A M I N A T I O N S C H E M E

SL. NO.	**INTERNAL ASSESSMENT** (continuous throughout the semester)		**EXTERNAL ASSESSMENT** (by external evaluator)	
	TYPE	MARKS	TYPE	MARKS
1	Drawing Sheets	40	Drawing Sheets	20
2	Class Performance, Viva-voce	10	Assignments on the day of exam	10
3	Class Attendance	10	Viva-voce	10
	Total	60	Total	40
			Total Marks	**100**

M O D U L A R D I V I S I O N O F T H E S Y L L A B U S

SHEET NO.	TOPIC	CONTACT PERIODS
1	**FOUNDATION**	15
2&3	**STRUCTURAL DETAILS**	15
4	**KITCHEN & TOILET DETAILS**	15
5	**WATER SUPPLY & SEWERAGE**	15
6	**ELECTRICAL LAYOUT**	15
	Total contact period - 75 hours	

D E T A I L C O U R S E C O N T E N T S

A set of working drawings in 1 **:** 50 scale, unless otherwise mentioned, of a simple framed structure. The architectural design may be one designed by the student in the subject Architectural Design – II in Second Semester, or may be supplied by teacher-in-charge.

Topic	Content	Contact hour	Sheet size and quantity
FOUNDATION DETAILS	Showing plot line, columns and tie-beam with center-line dimension, column & wall footing, plinth beam, column, beam and footing marking, one diagonal dimension of corner columns.	15	ONE A2/A1 As required
STRUCTURAL DETAILS	Reinforcement details of – (i) column footing, (ii) column, (iii) tie-beam, (iv) floor beam (from support to support) (transverse & cross section), (v) slab; (vi) lintel with chhajja, (vii) loft slab, (viii) staircase flight with landing [all in 1:20 scale], and, (ix) slab reinforcement layout [in 1:100 scale]. Schedules are to be provided showing type, size, reinforcement, binder for – (i) column footing, (ii) tie-beam, (iii) column, (iv) floor beam, (v) slab.	15	TWO A2/A1 As required
KITCHEN & TOILET DETAIL	Only plan and section [in 1:25 scale] showing fixture positions and dimensions of fixture, counter, Waste Pipe, Soil Pipe, floor trap, water supply line & slope line	15	ONE A2/A1 As required
WATER SUPPLY & SEWERAGE LAYOUT	Ground floor plan [in 1:100 scale] showing plot line, water connection from main to semi underground reservoir, riser main, septic tank, Inspection Chamber, Gully Trap, Yard Gully – sectional plans & elevations of underground reservoir, septic tank & over head tank.	15	ONE A2/A1 As required
ELECTRICAL LAYOUT	Electrical layout of ground floor, typical floor & roof showing conduit positions of meter box, distribution box, switch board, light & fans, socket outlets with symbols in conjunction with furniture layout with single phase OR three phases wiring diagram [in 1:50 scale], and, legend of symbols.	15	ONE A2/A1 As required

Course Code	:	ARPE302 (Programme Elective-IV)
Course Title	:	Landscape Architecture
Number of Classes	:	3(L-0,T-1,P-2)
Number of Credit	:	2
Prerequisites	:	NIL
Course offered in	:	6th Semester
Course Duration	:	17 weeks
Course Category	:	PE
Full Marks	:	**100**
CONTACT PERIODS: 45	**INTERNAL ASSESSMENTS: 6**	**TOTAL PERIODS: 51**
Students can choose any one subject for Programme Elective-IV from the list		

Course Objectives:

On successful completion of the course, a student will be in a position to prepare landscaping schemes for residential and commercial spaces. Also they will have brief idea of site planning in relation to landscaping and natural and manmade elements of landscaping

SEMESTER EXAMINATION SCHEME

SL. NO.	**INTERNAL ASSESSMENT** (continuous throughout the semester)		**EXTERNAL ASSESSMENT** (by external evaluator)	
	TYPE	MARKS	TYPE	MARKS
1	Drawing Sheets	40	Drawing Sheets	20
2	Class Performance, Viva-voce	10	Assignments on the day of exam	10
3	Class Attendance	10	Viva-voce	10
	Total	60	Total	40
			Total Marks	**100**

Course Content:

Students are required to prepare landscaping schemes for residential and commercial spaces. Credit is to be given to the landscaping scheme, and, not to the architectural design of the built space. Each student is to select his or her site in consultation with the teacher-in-charge, which may be designed by the student in the previous semesters or designed by any other architect collected from primary or secondary source.

DETAIL COURSE CONTENT

Module	Topic	Class Type	Contact Periods	Sheet size and quantity
1	INTRODUCTION- 1.1 Definition of Landscaping 1.2 Role of landscaping and landscape architect in architecture	Tutorial	1	_
2	SITE PLANNING – 2.1Need, Definition and Scope for site planning 2.2 Relationship in between site planning and landscaping 2.3 Layout and maintenance of drainage 2.4 Layout and standards of road and pedestrian paths	Tutorial	4	_
3	NATURAL ELEMENTS OF LANDSCAPING – ROCK & LANDFORM — WATER — PLANTS: Different types of trees, shrubs, ground covers and climbers with their characteristics mentioning the basis of their selection for different purposes	Tutorial	4	_
4	MANMADE ELEMENTS OF LANDSCAPING – MATERIALS, CONSTRUCTION DETAILS AND MAINTENANCE of the following manmade elements of landscaping: 4.1 Outdoor Furniture – Outdoor Light Fixtures – Signage & Signboard – Sculpture – Fences 4.2 PAVING: Hard and soft – Layout for formal and informal paving – Different kinds of paving materials: soil, stabilized murrum, brick & stone 4.3 Artificial Rock – Artificial Waterfall	Tutorial	6	_
5	Preparation of landscaping scheme for a residential space which has a recreational space attached to it in the form of a park and / or a playground. Drawings are to be presented in suitable scale providing information regarding the natural and / or manmade elements used along with necessary details of construction wherever necessary.	Sessional	15	A2 sheets as required
6	Preparation of landscaping scheme for a commercial space which has a public space attached to it in the form of a plaza or a square. Drawings are to be presented in suitable scale providing information regarding the natural and / or manmade elements used along with necessary details of construction wherever necessary.	Sessional	15	A2 sheets as required

Learning Outcomes:

On satisfactory completion of the course, the students will able to apply their knowledge on following landscape designing and site planning field;

(i) Landscaping schemes using natural and manmade elements;

(ii) Maintenance of drainage

(iii) Road and pedestrian paths layout

References:

1. TIME-SAVER STANDARDS FOR LANDSCAPE ARCHITECTURE / Dines & Harris / McGraw-Hill
2. LANDSCAPE ARCHITECT'S PORTABLE HANDBOOK / N. Dines / McGraw-Hill
3. Landscape Architecture / J. O. Simonds / Lliffee, London
4. Designs of the Landscape / Preece / CBS
5. Landscape Detailing Vol. I / M. Little wood / CBS
6. Landscape Detailing Vol. II / M. Little wood / CBS
7. Landscape for Living / G. Eckbe / F. W. Dodge Corporation, N.Y.

Course Code	:	ARPE302 (Programme Elective-IV)
Course Title	:	Architectural Conservation
Number of Classes	:	3(L-0,T-1,P-2)
Number of Credit	:	2
Prerequisites	:	NIL
Course offered in	:	6th Semester
Course Duration	:	17 weeks
Course Category	:	PE
Full Marks	:	**100**
CONTACT PERIODS: 45	**INTERNAL ASSESSMENTS: 6**	**TOTAL PERIODS: 51**
Students can choose any one subject for Programme Elective-IV from the list		

Course Objectives:

- To highlight the theory and practice of conservation.
- To sensitize the students with the issues pertaining the conservation of cultural property.
- To familiarize with their problems and the approaches in conservation.
- To focus on limitations of maintenance, repair and restoration.

SEMESTER EXAMINATION SCHEME

SL. NO.	INTERNAL ASSESSMENT (continuous throughout the semester)		EXTERNAL ASSESSMENT (by external evaluator)	
	TYPE	MARKS	TYPE	MARKS
1	Drawing Sheets	40	Drawing Sheets	20
2	Class Performance, Viva-voce	10	Assignments on the day of exam	10
3	Class Attendance	10	Viva-voce	10
	Total	60	Total	40
			Total Marks	**100**

DETAIL COURSE CONTENT

Module	Topic	Class Type	Contact Periods	Sheet
1	1.1 To study the Definition, History, theory of conservation, Philosophy of conservation, Values & Ethics, Cultural heritage, Conservation methods, Classifications. 1.2 To study the conservation principle defined in the Venice Charter and Burra Charter. 1.3 Conservation in India (Acts, Central and state government policies) 1.4 Structure and Material Conservation (behaviour of historic materials and structures, weathering, ageing, problems with masonry, foundation, repair methods, traditional and modern methods, seismic retrofit and disabled access/ services additions to historic buildings, 127 moisture & pollution problems, etc	Tutorial	10	_
2	STUDY & ANALYSIS – 2.1 Students have to study a historic building appropriate for conservation in context of the various conservation values. 2.2 Study the architectural style and survey to prepare a floor plan layout & elevations, inspect its structural and physical condition and suggest the possible method of restoration, management of historic sites.	Sessional	35	Drawing sheets (A2) – 2nos. Study and analysis sheets (A3) – 6 to 8 nos

Learning Outcomes:

On satisfactory completion of the course, the students will able to apply their knowledge on following Conservation field;

1. Develop sensitivity towards heritage and its conservation.
2. Understand the materials and techniques to be used for conservation under various conditions.

References:

1. Architectural Conservation - Principles and Practice / Aylin Orbasli / Wiley
2. History of Architectural Conservation (CONSERVATION AND MUSEOLOGY) / Jukka Jokilehto
3. Living Buildings / Donald Insall
4. Design from Heritage: Strategies for Conservation and Conversion / Marieke Kuipers and Wessel de Jonge
5. Equity in Heritage Conservation: Case of Ahmedabad India / Jigna Desai
6. The Conservation Movement: A History of Architectural Preservation: Antiquity to Modernity / Miles Glendinning
7. Building Limes in Conservation / Brocklebank

Course Code	:	ARPR302
Course Title	:	Architectural Project work
Number of Classes per week	:	5(L-0,T-1,P-4)
Number of Credit	:	3
Prerequisites	:	Continuation of 5th semester Architectural project
Course offered in	:	6th Semester
Course Duration	:	17 weeks
Course Category	:	PC
Total Marks	:	**100**
CONTACT PERIODS: 75	**INTERNAL ASSESSMENTS: 10**	**TOTAL PERIODS: 85**
The Project work of 6th semester is the continuation of the project work of 5th semester.		

Course Objective:

Project Work is intended to provide opportunity for students to develop understanding of the interrelationship between different courses learnt in the entire diploma programme and to apply the knowledge gained from internships at the end of 5th semester in a way that enables them to develop & demonstrate higher order skills. The basic objective of a project class would be to ignite the potential of students' creative ability by enabling them to develop something which has social relevance, aging, it should provide a taste of real life problem that a diploma-holder may encounter as a professional. It will be appreciated if the polytechnics develop interaction with local industry and local developmental agencies viz. different panchayet bodies, the municipalities etc. for choosing topics of projects and / or for case study. The course further includes preparation of a Project Report which, among other things, consists of technical description of the project. The Report should be submitted in two copies, one to be retained in the library of the institute. The Report needs to be prepared in computer using Word, CADD & 3D software wherever necessary.

GENERAL GUIDELINE

Project Work is conceived as a group work through which the spirit of team building is expected to be developed. Students will be required to carry out their Project Works in groups under supervision of a lecturer of their core discipline who will work as a Project Guide. It is expected that most of the lecturers of the core discipline will act as project guide and each should supervise the work of at least two groups. Number of students per group will vary with the number of lecturers acting as Project Guide and student strength of that particular class.

SEMESTER EXAMINATION SCHEME

SL. NO.	**INTERNAL ASSESSMENT** (continuous throughout the semester)		**EXTERNAL ASSESSMENT** (by external evaluator)	
	TYPE	MARKS	TYPE	MARKS
1	Drawing Sheets, Report &Model/3D view	40	Drawing Sheets &Model/3D view	20
2	Class Performance, Viva-voce	10	Report	10
3	Class Attendance	10	Viva-voce	10
	Total	60	Total	40
			Total Marks	**100**
The External Examiner should be Preferably from the Industry or from any Academic Institution other than Polytechnic.				

THE ARCHITECTURAL PROJECT

Each group, under the guidance of a project guide, will select one topic and precaution should be taken so that it does not become repetition of those undertaken under the subjects Architectural Design in each semester. While selection of the topic, care should be taken to see that its scale remains well within the scope of the particular group of students. The choice of medium & mode of presentation, the scale of drawing (s), and, the number of sheets are to be decided by the students under the guidance of the project guide. The project work of 6th semester is the continuation of the project work of 5th semester. The final presentation drawings, Project report, model /3D view will be submitted at the end of 6th semester.

M O D U L A R D I V I S I O N O F T H E S Y L L A B U S

COURSE	MODULE	TOPIC	CONTACT PERIODS
GROUP-A (FIFTH SEMESTER)			
ARCHITECTURAL PROJECT WORK (GROUP – A) Fifth Semester **Course Duration: 15 Weeks** **4 Sessional contact periods per week** **Total Contact Periods: 60**	1	Introduction of the subject "Architectural Project Work"and group formation	**2**
	2	Topic selection and finalization	**4**
	3	Literature study	**8**
	4	Study (from Standards & Reference Books) Design concepts	
	5	Case Study (from Primary & Secondary Sources)	
	6	Site Analysis ,Zoning	**4**
	7	Identification of space and area requirement	**2**
	8	Flow Chart, Bubble Diagram & concept drawing	**8**
	9	Preliminary Design Finalizations	**32**
			TOTAL-60
GROUP-B (SIXTH SEMESTER)			
ARCHITECTURAL PROJECT WORK (GROUP – B) Sixth Semester **Course Duration: 15 Weeks** **5 Sessional contact periods Per Week** **Total Contact Periods: 75**	10	Finalization of Design plans with other details	**15**
	11	Finalization of elevations sections & other details given as per necessary.	**15**
	12	Review of Design in the form of Seminar	**5**
	13	Preparation of Final Presentation Drawings	**10**
	14	Drawing a View and / or making a Model	**5**
	15	Project Report Preparation	**15**
	16	Preparation of Preliminary Estimation of the project	**5**
	16	Final Presentation	**5**
			TOTAL-75

Course Code	:	ARSE302
Course Title	:	**Architectural Seminar**
Number of Classes per week	:	1(L-0,T-1,P-0)
Number of Credit	:	1
Prerequisites	:	NIL
Course offered in	:	6th Semester
Course Duration	:	17 weeks
Course Category	:	SE
Total Marks	:	**100**

Course Objective:-

Seminar on Project Work is intended to provide opportunity for students to present their work in front of a technical gathering with the help of different oral, aural and visual communication aids which they learnt through different courses in 3rd to 6th Semester of the diploma course. In the Seminar, students are expected to present **any related topic on architecture preferably the topics related to the elective subjects they have learnt from 4th semester to 6th semester (mode of presentation either PPT or hard copy or both).**They will also learn to defend the same while answering questions arising out of their presentation.

SEMESTER EXAMINATION SCHEME

SL. NO.	**INTERNAL ASSESSMENT** (continuous throughout the semester)		**EXTERNAL ASSESSMENT** (by external evaluator)	
	TYPE	MARKS	TYPE	MARKS
1	Drawing Sheets/PPT	40	Drawing Sheets/PPT	20
2	Presentation &Viva-voce	10	Presentation	10
3	Class Attendance	10	Viva-voce	10
	Total	60	Total	40
			Total Marks	**100**

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Automobile Engineering [AE]

Part-III (6th Semester)

2023

Semester-wise Detailed Curriculum

Semester VI (Third year)

Branch/Course: Automobile Engineering

Sl. No.	Category	Code	Course Title	Hours per week			Total contact hours/ week	Credits
				Lecture	Tutorial	Practical		
1	Program Core Course	AEPC 601	Garage Practice	3	0	0	3	3
2	Humanities and Social Science Course	HS302	Entrepreneurship and Start-ups	2	1	0	3	3
3	Open Elective	AEOE 621	Engineering Economics and Project Management	3	0	0	3	3
4	Open Elective	AEOE 622/ 623/ 624/ 625	Any one Open Elective	3	0	0	3	3
5	Program Elective Course	AEPE 611/ 612	Any one Programme Elective	3	0	0	3	3
6	Program Core Course	AEPC 602	Garage Practice Lab	0	0	2	2	1
7	Program Core Course	AEPC 603	Driving Practice Lab	0	0	2	2	1
8	Major Project	PR602		0	0	6	6	3
9	Seminar	SE602		0	0	4	2	2
Total				**1**4	**1**	**1**4	**2**9	**22**

List of Programme Electives for Sixth Semester

1. AEPE 611: Modern Vehicle Technology
2. AEPE 612: Vehicle Aerodynamics & Design
3. AEPE 613: Vehicle Body Engineering

List of Open Electives for Sixth Semester

1. AEOE 621: Engineering Economics and Project Management
2. AEOE 622: Electric Vehicle Technology
3. AEOE 623: Industrial Management
4. AEOE 624: Industrial Safety
5. AEOE 625: Disaster Management

Proposed Syllabus of Garage Practice

Course Code	AEPC601
	Garage Practice
Number of Credits and L-T-P	3 [L – 3, T – 0, P - 0]
Course Category	PC
Prerequisites	Automotive Engines and Automotive Chassis

Course Objectives:

1. To impart knowledge of importance of maintenance at regular intervals.
2. To impart adequate knowledge of maintenance and maintenance methods required in modern service station.
3. To impart knowledge of dismantling of various parts/ assemblies and check the parts for proper functioning.
4. To impart knowledge of proper maintenance of the components results in good fuel economy, least environmental pollution and reliability.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
01	**Auto Workshop Layout & Equipments** 1.1 General safety precautions and procedures. 1.2 Equipment used in automobile repairing (Specification, Working, Application,): Shop-cutters, Pullers, Stud-extractor, Torque wrench, Piston ring expander, Piston ring groove cleaner, Wheel Balancer, Wheel Aligner, Arbor Press, Drill Press, Tyre Changer, Car Washer, Battery Charger, Battery Tester, Valve Grinder, Honing Machine, Cylinder Boring Machine, Pneumatic tools, lubrication equipment. 1.3 Measuring and Testing Equipments: Feeler gauge, Cylinder bore gauge, Compression gauge, Ignition timing tester, Spark plug tester, tyre inflator gauge, Micrometer, Callipers, Protectors and their maintenance. 1.4 Vehicle Service Equipment: Air Compressor, Oil Sprayer, Lubricators, Voltage current and resistor tester, Coil condenser tester, Tachometer, Exhaust Gas Analyzer, Diesel Smoke meter. 1.5 Lifts and Hoists: two post lift, four post lift, scissor type lift. 1.6 Service Station and Types. 1.7 Criteria for site selection of Service Station. 1.8 Layout of Modern Auto workshop.	10
02	**Maintenance Management and Record Keeping** 2.1 Necessity of maintenance 2.2 Types of maintenance (Breakdown, Preventive and Predictive) systems, their applications and comparison,. 2.3 Total Productive Maintenance (concept only) 2.4 Vehicle maintenance schedules: Daily, weekly, monthly &	04

		periodic maintenance. for various vehicles Replacement schedule of consumable items (like lubricants, coolant, Filters etc.) 2.5 General servicing procedure. Decision to repair or replace. 2.6 Workshop documents and records - Job Card. 2.7 Operations and Procedures - Workshop activities, Manpower requirements and criteria, billing and warranty claim procedure, insurance claim procedure, customer feedback taking procedure, handling of customer complaints, study of customer service Index (CSI).	
03	**Part 1** 3.1	**Engine Maintenance** 3.1.1 Checking and Servicing of following engine components: Cylinder head, Cylinder block, Cylinder liners, Piston, Piston Ring, Crank-shaft, Connecting rod, Valves etc. 3.1.2 Troubleshooting in: Cylinder head, Cylinder block, Cylinder liners, Piston, Piston Ring, Crank-shaft, Connecting rod, Valves etc.	06
	Part 2 3.2	**Engine System Maintenance** 3.2.1 Fuel feed system: Injector cleaning and testing, FIP phasing and calibration. 3.2.2 Lubrication system service: Change of oil filter, Check oil pump and diagnose causes for excessive oil consumption, external oil leakage and low oil pressure in an automobile engine. 3.2.3 Maintenance of cooling systems and its components: water pump, radiator, thermostat - anticorrosion and antifreeze additives. Bleeding and Flushing of cooling system. 3.2.4 Troubleshooting of Ignition System service and Electronic Ignition System. 3.2.5 Troubleshooting of Engine fuel system, Cooling system, Lubrication system.	08
04	**Part 1** 4.1	**Chassis Maintenance** 4.1.1 Troubleshooting of Clutch. 4.1.2 Troubleshooting of manual Gearbox. 4.1.3 Troubleshooting of Propeller shaft, Rear axle and Differential system. 4.1.4 Troubleshooting of hydraulic brakes, Bleeding of hydraulic brakes and parking brake adjustment. 4.1.5 Troubleshooting of Dependent and Independent suspension systems, Lubrication of leaf springs.	08
	Part 2 4.2	**Chassis frame, Steering, Wheels, Tyre and Body Maintenance** 4.2.1 Symptoms and possible faults in steering system. 4.2.2 Power steering diagnosis and troubleshooting. Fluid flushing, bleeding air out and pressure testing.	08

		4.2.3 Procedure of wheel alignment and procedure of wheel balancing. 4.2.4 Care of wheels and tyres, tyre rotation. 4.2.5 Defects in vehicle chassis and body - diamond, banana, twist, mash type damages. 4.2.6 Body repairs- denting, denting tools and equipments (jacks) 4.2.7 Chassis alignment equipment. 4.2.8 Repainting procedure, patch work. 4.2.9 Painting defects. 4.2.10 Adjustment of doors and locks.	
Total Hours			**42 Hrs**

Weightage distribution in both objective, short and broad answer type questions:

Group	Module Number	Weightage (%)
A	1 & 2	30
B	3	35
C	4	35

Course Outcomes:

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

CO1	Understand the use of relevant tools and equipments required in garage practices.
CO2	Understand different types of maintenance methods/ techniques for vehicles.
CO3	Identify different problems associated with different types of engine systems.
CO4	Interpret troubles associated with transmission system of a vehicle.
CO5	Recognize various difficulties associated with steering, wheels, braking and suspension systems.

Text Books:

1. Vehicle Maintenance and Garage Practice, Dhruv U. Panchal, Jayesh P. Maniar and Jigar A. Doshi, PHI Learning.
2. Automobile Maintenance Service and Repair, Mohd Saad Saleem and Saimah Khan, Bluerose Publishers Pvt. Ltd.
3. Dr. Kripal Singh, Automobile Engineering (Vol. – 1), Standard Publishers Distributors, New Delhi.

Reference Books:

1. S. Srinivasan, Automotive Mechanics, Tata McGraw Hill Education, New Delhi.
2. S.K. Gupta, Automobile Engineering, S.Chand, New Delhi.
3. R.B. Gupta, Automobile Engineering, Satya Prakashan, New Delhi.

Proposed Syllabus of Modern Vehicle Technology

Course Code	AEPE611
	Modern Vehicle Technology
Number of Credits and L-T-P	3 [L – 3, T – 0, P - 0]
Course Category	PC
Prerequisites	Automotive Engine, Automotive Chassis, Automotive Powertrain

Course Objectives:

1. Impart knowledge on the applications and working of different transducers, sensors & actuators used in automobiles.
2. Impart knowledge on the uses of modern peripheral systems in automobiles.
3. Impart knowledge on advanced technologies related to IC Engine.
4. Impart knowledge on advanced safety equipment used in automobiles.
5. Impart knowledge on different modern features of automobiles.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
01	**Applications of Transducers, Sensors & Actuators** 1.1 Concept of general measurement system & difference between Mechanical and electrical/ electronic instruments; 1.2 Measurement of Temperature: Working of Thermocouple and Thermister; 1.3 Measurement of Speed: Contact less electrical tachometer, Inductive, Capacitive type tachometer, Stroboscope; 1.4 Measurement of Force: Strain gauge load cell 1.5 Electrical method for moisture measurement; 1.6 Electromechanical Type Transducer – Potentiometric resistance type, Inductive, Capacitive, Piezometric; Photoelectric. 1.7 Basic requirement of Sensors, Functions, Applications and Circuitry arrangement of various Sensors such as Mass Air flow rate sensor, Exhaust gas Oxygen concentration, Throttle plate angular position, Crankshaft angular position, Coolant temperature, Intake air temperature, Manifold absolute pressure (MAP), Vehicle speed Sensor. Transmission gear selector position, Methanol sensor, Rain Sensor & Rain sensing wiper. 1.8 Working Principal and Functions of various Actuators such as Solenoid Actuators, Motorized Actuators, and Stepper motors.	10

02	**Modernization in IC Engine Performance** 2.1. Concept of Fuel Injection System in SI Engine 2.2. Necessity of Fuel Injection System 2.3. Working principle and function of various fuel injection system in SI engine (MPFI, TBI & GDI) 2.4. Advantages of Fuel Injection System w.r.t Pollution 2.5. Concept of Common Rail Direct Injection System 2.6. Necessity of CRDI System 2.7. Basic concept of single cylinder pump, Inline pump, Distributor or Rotary pump, Low pressure pump & High-Pressure Pump 2.8. Working principle and function of CRDI System 2.9. Advantages of CRDI System w.r.t Pollution	12
03	**Modernization in Peripheral systems** 3.1. Security Systems. Remote keyless entry, Anti-theft system, Alarm system. 3.2. Entertainment and peripheral systems. Integrated communications, Proximity sensors	04
04	**Advance Safety Equipment** 4.1. Seat Belts, Seat Belts pre-tensioners, Smart seatbelt reminder. 4.2. Concepts of Crash test, Crash sensors. 4.3. Air bags - Introduction of air bags, Dual stage air bags, Side Airbags. 4.4. Tyre pressure monitoring system 4.5. Pedestrian Protection & Night vision with pedestrian detection.	06
05	**Modern Features in Automobile** 5.1. Power Sliding doors. 5.2. Electronic stability/ Skid-control system, Traction control system. 5.3. Advanced Driver Assistance System (ADAS), Adaptive cruise Control System (ACC) 5.4. Hill Hold Assist (HHA) 5.5. Telescopic steering wheel/ adjustable pedals. 5.6. Rear mounted Radar & Cameras. 5.7. Electromagnetic suspension and levitation. 5.8. Automatic Lift Axle. 5.9. Regenerative Braking Systems. 5.10. Continuous Variable Transmission. 5.11. Intelligent Parking Assist System, Self-Parking	10
Total Hours		**42 Hrs**

Weightage distribution in both objective, short and broad answer type questions:

Group	Module Number	Weightage (%)
A	1 & 2	40
B	3 & 4	30
C	5	30

Course Outcomes:

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

CO1	Describe construction, functions and applications of various sensors and actuators used in modern vehicle.
CO2	Identify and describe the advanced features of IC Engine
CO3	Identify and describe various advanced peripheral system used in automobile.
CO4	Demonstrate various safety features and equipment used in modern vehicle.
CO5	Identify various modern features for better functioning of vehicle.

Text Books:

1. S.K. Gupta, Automobile Engineering, S.Chand, New Delhi.
2. R.B. Gupta, Automobile Engineering, Satya Prakashan, New Delhi.
3. A.K. Babu, S.C. Sharma, T.R. Banga, Automobile Mechanics, Khanna Publishers

Reference Books:

1. S. Srinivasan, Automotive Mechanics, Tata McGraw Hill Education, New Delhi.
2. Dr. N.K. Giri, Automobile Technology, Khanna Publishers

Proposed Syllabus of Vehicle Aerodynamics & Design

Course Code	AEPE 612
Course Title	Vehicle Aerodynamics & Design
Number of Credits and L-T-P	3 [L – 3, T – 0, P - 0]
Course Category	PE
Prerequisites	Fluid Mechanics

Course Objectives:

1. To understand basic components of Aerodynamics.
2. To understand different aerodynamic effects on a vehicle.
3. To understand the ergonomic of vehicle
4. To understand the optimization process of aerodynamics drag and noise
5. To know about wind tunnel testing
6. To understand the different type vehicle body structure and material

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1.	**Introduction of Aerodynamics:** **1.1.** Road Resistance- Air Resistance – Gradient Resistance Aerodynamic force – Drag force – Lift force – side force - effect of Aerodynamics force in car body **1.2.** Aerodynamics - pitching – yawing - Rolling moment **1.3.** Cross wind sensitivity – Recirculating flow - diffusers **1.4.** Definition of Aerofoil- vehicle as a bluff body - Mechanics of air flow **1.5.** Pressure distribution on a vehicle. **1.6.** Concept of visibility - **1.7.** Concept of blind sport **1.8.** vehicle ergonomic – importance – application – different ergonomic in different vehicle	**10**
2	**Directional Stability:** 2.1. Concept of aerodynamic stability 2.2. Distribution of weight -for three wheeled vehicle and four wheeled vehicle 2.3. Driving with trailer 2.4. Stability of vehicle on slope (derivation & numerical problems). 2.5. Stability of vehicle on turns (derivation & numerical problems).	**6**
3.	**Optimization of vehicle body design:** 3.1. Side wind problems- Dirt accumulation on the vehicle 3.2. Wind noise – different type of noise – minimization process of wind noise in vehicle 3.3. Front and rear wind shield angle – Boat tailing – Hatch back, fast back and square back 3.4. Dust flow patterns at the rear – Effect of gap configuration – Effect of fasteners 3.5. Various body optimization techniques for minimising drag	**8**

4	**Wind Tunnels testing and other testing method** **4.1.** Wind Tunnels for Automotive Aerodynamics Introduction – Principles of wind tunnel technology – Full scale wind tunnels - scale model testing **4.2.** Component balance to measure forces and moments– Stress with scale models — Measurement techniques – Equipment and transducers **4.3.** Road testing methods – Numerical methods –advantages – Limitation-application.	**6**
5	**Vehicle structure** **5.1.** Bus Body Details – Types - mini bus - single decker, two level, split level and articulated bus. **5.2.** Bus Body Lay Out: Floor height, engine location, entrance and exit location, seating dimensions. **5.3.** Constructional details - Frame construction, Double skin construction-Types of metal section used-Regulations-Conventional and Integral type construction. **5.4.** Commercial Vehicle Details - Types of body - Flat platform, drop side, fixed side, tipper body, tanker body. **5.5.** Light commercial vehicle body types, Dimensions of driver's seat in relation to controls, driver's cabin design. **5.6.** Body Materials, Trim And Mechanisms: Steel, timber, plastics, GRP, properties of materials-Corrosion anticorrosion methods, selection of paint and painting process, body trim items.	**12**
	Total Hours	**42**

Weightage distribution in both objective, short and broad answer type questions:

Group	Module Number	Weightage (%)
A	1 & 2	45
B	3 &4	25
C	5	30

Course Outcomes:

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

CO1	Identify the different aerodynamics forces on a vehicle.
CO2	Estimate the vehicle stability against aerodynamics force and slope.
CO3	Differentiate the various drag testing method.
CO4	Identify the different types of wind noise in a vehicle.
CO5	Classify different vehicle structure.

Text book:

1. Aerodynamics of Road vehicles, W. H. Hucho, Butterworths Co. Ltd., 1997
2. Vehicle Body Engineering, A.K. Babu, Publisher: Khanna Publisging House, 2021
3. Vehicle Body Engineering & Dynamics, Bheemasen S Korlahalli, Vinayak S Naik, Eastern Book Promoters Belgaum, 2022.

References

1. Automotive Aerodynamics: Update SP-706, SAE, 1987.
2. Vehicle Aerodynamics, SP-1145, SAE, 1996.

Proposed Syllabus of Vehicle Body Engineering

Course Code	AEPE613
	Vehicle Body Engineering
Number of Credits and L-T-P	3 [L – 3, T – 0, P - 0]
Course Category	PC
Prerequisites	Engineering Mechanics and Automotive Chassis

Course Objectives:

1. Impart knowledge on different car body assemblies, design and safety aspects.
2. Impart knowledge on different bus body assemblies, design and safety aspects.
3. Impart knowledge on different commercial vehicle body assemblies and design aspects.
4. Impart knowledge on aerodynamics approach of automobiles.
5. Impart knowledge on different body materials.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
01	**Car Body Details** 1.1 Car body assembly: underbody, upper body, closure (brief ideas only) 1.2 Types of Car body: Saloon, Hatchback, Convertible, Coupe, Estate Car, Limousine, Racing and sports car (brief ideas with diagram and example) 1.3 Visibility: Types, Regulations, Improvements in visibility, parameters influencing visibility, visibility tests 1.4 Different methods of improving space in cars: lowering floor level, position of spare wheel, compact design 1.5 Seat design: Driver seat design, passenger seat design 1.6 Car body construction: Requirements, methods of construction, various panels in car bodies 1.7 Safety aspect of car body design, Safety requirements for car (seat belt, ABS, TCS, Vehicle cruise control, Electronic stability control, Tyre pressure monitoring system, rear view camera, Supplementary restraint system)	10
02	**Bus Body Details** 2.1. Types of Bus body: based on capacity, based on distance travelled, based on construction, based on comfort, shape and style, engine location. 2.2. Types of material used: crowns, angles and flanges, sections	08

	2.3. Regulation wise overall dimensions 2.4. Constructional details: Components of body structure, design of integral bus, sequence of bus building operation, double skin construction, safety aspect 2.5. Seat design: Driver's seat (with geometrical relations), passenger seat	
03	**Commercial Vehicle Details** 3.1. Different vehicle bodies: Based on engine mounting, based on load-carrying platform, based on their functions, purposes, based on driver cab design 3.2. Flat platform bodies: Trailer, Tipper, Tanker (different types according to type of liquid carrying, shape of the tanker and bulkheads) 3.3. Dimensions of driver's seat in relation to controls, driver's cab design, regulations.	06
04	**Vehicle Aerodynamics** 4.1. Introduction and importance of vehicle aerodynamics 4.2. Aerodynamics forces and moments: Drag, cross wind force, lift. Rolling, pitching, yawing moments (definition and mathematical expression only, no derivation) 4.3. Aerodynamic drag and types: Profile, induced, friction, interference, cooling and ventilation drag 4.4. Drag co-efficient, aerodynamic lift and Pitching moment ((definition and mathematical expression only) 4.5. Side wind effects on forces and moments: side wind on lift force, side wind on moments 4.6. Various body optimization techniques for minimum drag 4.7. Wind tunnels, types of wind tunnels, wind tunnel testing (brief idea)	12
05	**Body Materials** 5.1. Materials used in body construction: steel sheet, aluminum alloy, timber, plastics, GRP, Textiles, Glass, Rubbers (uses, properties, pros and cons) 5.2. Body trim materials: Exterior and Interior trim 5.3. Body mechanisms: Window winder, windshield wiper, windshield washer, door lock mechanism, keyless entry.	06
Total Hours		**42 Hrs**

Weightage distribution in both objective, short and broad answer type questions:

Group	Module Number	Weightage (%)
A	1 & 2	30
B	3 & 4	50

C	5	20

Course Outcomes:

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

CO1	Classify vehicle body according to body shape
CO2	Illustrate the different types and components of car body.
CO3	Illustrate the different types and components of bus and commercial body
CO4	Explain the concept, importance and testing of aerodynamics in vehicle body design.
CO5	Explain different vehicle body materials with their merits and demerits.

Text Books:

1. A.K. Babu, Vehicle Body Engineering, Khanna Publishers
2. J. Powloski, Vehicle Body Engineering, Business Books Ltd, London

Reference Books:

1. J.G. Giles, Body Construction and Design, Butterworth and Co.
2. Dr. N.K. Giri, Automobile Technology, Khanna Publishers

Proposed Syllabus of Garage Practice Lab

Course Code	AEPC 602
	Garage Practice Lab
Number of Credits and L-T-P	1 [L – 0, T – 0, P - 2]
Course Category	PC
Prerequisites	Automotive Engines and Automotive Chassis

Course Objectives:

1. To impart knowledge service procedure in Automobile Workshop.
2. To impart adequate knowledge and skills of overhaul and reconditioning of various engine components.
3. To impart knowledge of overhaul and testing of Injector and FIP of diesel engine for proper functioning.
4. To impart knowledge of overhaul different chassis components for proper functioning of vehicle.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
01	**Study General service procedure in Authorize workshop** 1.1 Four wheeler service, 1.2 Two wheeler service.	02
02	**Overhaul and reconditioning procedures of multi-cylinder petrol/Diesel engine.** 2.1 Cylinder head for warpage and cracks, Refacing by grinding or cutting, Straightening cylinder heads. 2.2 Cylinder block for measurement of ovality and taperedness, Cylinder boring, Honing process, Changing of liners. 2.3 Piston and piston rings for wear, appearance, Piston head for signs of deposits and detonation, oversize piston, ring groove clearance, removing and refitting rings. 2.4 Valve refacing in valve refacer machine, Valve Seat cutting, setting and grinding to match with valves. Lapping of Valves. 2.5 Inspection of Crank Shaft, Assessment of workability and determination of undersize condition of journals. Setting procedure of Crank Shaft of Multi cylinder Engines in Crank Shaft regrinding machine for grinding both crank pin and main Journals, Check for eccentricity of cranks. 2.6 Dismantling and assembling of fuel injectors of a petrol engine, identifying components and refitting. 2.7 Removing the radiator from vehicle, checking it for leak, repairing, flushing, cleaning the radiator and refitting. Removing the thermostat valve, checking and refitting. 2.8 Checking of lubrication system – change oil filter, check oil pump, diagnose causes for excessive oil consumption, external oil leakage, and low oil pressure in an automobile engine.	12

03	**Overhaul and Testing** 3.1 Overhaul and testing of diesel fuel injector, 3.2 Overhaul and testing of single and multi- cylinder fuel injection pumps. 3.3 Calibration, phasing, and spray tests.	06
04	**Overhaul, dismantling and assembling procedures of different chassis components:** 4.1 Leaf springs, coil springs, torsion bar & Telescopic Shock absorber and McPherson strut. 4.2 Wheel Balancing: - Static and Dynamic. 4.3 Wheel alignment – Mechanical and Electronic method	08
Total Hours		**28 Hrs**

Note: Module 01, 03 & 04 is compulsory and minimum 04 job has to be done from module 02.

Course Outcomes:

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

CO1	Illustrate the servicing procedure in Automobile workshop.
CO2	Interpret maintenance methods/ techniques of multi-cylinder petrol/Diesel engine.
CO3	Recognize various difficulties associated with diesel fuel injection system.
CO4	Recognize various difficulties associated with suspension and wheel.

Text Books:

1. Vehicle Maintenance and Garage Practice, Dhruv U. Panchal, Jayesh P. Maniar and Jigar A. Doshi, PHI Learning.
2. Automobile Maintenance Service and Repair, Mohd Saad Saleem and Saimah Khan, Bluerose Publishers Pvt. Ltd.
3. Dr. Kirpal Singh, Automobile Engineering (Vol. – 1), Standard Publishers Distributors, New Delhi.

Reference Books:

1. S. Srinivasan, Automotive Mechanics, Tata McGraw Hill Education, New Delhi.
2. S.K. Gupta, Automobile Engineering, S.Chand, New Delhi.
3. R.B. Gupta, Automobile Engineering, Satya Prakashan, New Delhi.

Proposed Syllabus of Driving Practice Lab

Course Code	AEPC 603
	Driving Practice Lab
Number of Credits and L-T-P	2 [L – 0, T – 0, P - 2]
Course Category	PC
Prerequisites	None

Course Objectives:

1. To develop knowledge of behavior of driver.
2. To impart adequate knowledge of vehicles control and its responses.
3. To impart knowledge of Traffic signs and traffic rules to follow as per government.
4. To develop knowledge and skills of vehicle driving.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
01	**Driving Theory:** **1.1 Qualities required for a good driver**: Good behavior, Patience, Responsibility, Self Confidence, Anticipation, Concentration, Courtesy, Consideration for other Road Users, Defensive Driving, Knowledge of Vehicle Controls, Maintenance, simple mechanism and effect of Competitiveness, **1.2** Over-Confidence and impatience, avoid road rage. **1.3** Legitimate dress code for driving. 1.4 Right of way, yielding. 1.5 Concept of blind spot.	02
02	**2.1 Know Your Vehicle**: Simple introduction to Automobile Engines and their working. Location of VIN plate / Engine serial Number. On Board Diagnosis position, Several Air Bags position, Dual power mode driving, First Aid Kit, Jacking point. **2.2 Vehicle Controls and its Response**: 2.1 Foot Control – Accelerator, Brake, Clutch 2.2 Hand Control – Steering Wheel, Gear Shifting Lever, Hand Brake, Switches for direction Indicators, Head Lights, Horns, Ignition Switch, Dim-Bright Switch, and Wiper switch – Speed Control etc. 2.3 Other Controls – Rear View mirrors – Types- adjustments, Audio controls, Air Condition controls, Instrument Cluster, Description of Speedo meter/Trip meter, RPM Gauge, Oil pressure Gauge, Temp Gauge, Fuel Gauge, and Ammeter other Gauges and Dials, Tail lamps, Audio warnings, Wind Screen – their location and operation. 2.4 Adjustment of seat and seat belts, door locks, Spare key location.	04
03	2.1 **Traffic signs:** Mandatory signs, Cautionary signs, Informatory	02

	signs, Traffic signals displayed on roads. 2.2 Study of Traffic Rules as per State & central Government specification.	
04	**Driving Practice—** **4.1 Pre – Driving Checks**: Before sitting on driver seat, After sitting on driver seat Checking the document pertains to the driver and vehicle. **4.2 Starting**: Precautions and Procedure to be followed while starting. Clutch down start. Accelerator: Proper use of Accelerator. Moving: Precautions to be followed while moving. Use of first gear. **4.3 Clutch Practice**: Biting and Balance point. **4.4 Steering practice**: In basic yard - In bare land and between tyres to develop Judgment Straight, Left and Right Turn, Steering in '8', shaped bend. **4.4 Gear Practice**: Selection of gears, up shifting, down shifting. **4.5 Brake practice**: In level ground and in slope. **4.6 Driving on the Road** **4.7 Overtaking Practice**: Overtaking stationary and Moving vehicles from Left and Right Side. **4.8 Three Point Turn, Five Point Turn, 'U' Turn Practice** **4.9 Reverse Practice.** **4.10 Parking Practice.** **4.11 Other Maneuvers related to driving etc.** **4.12 Demonstrate safe, responsible and proper parking techniques and etc.**	20
Total Hours		**28 Hrs**

Course Outcomes:

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

CO1	Explain the responsible driving attitudes.
CO2	Recognize various controls of vehicles.
CO3	Demonstrate the traffic signs and traffic rules
CO4	Develop competence in integrating the attitudes, skills and knowledge of safety and driving responsibilities into the correct execution of motor skills in traffic.

Note: At the end of this course students are expected to produce Learner License / Driving License (LMV) at the time of final examination.

Proposed Syllabus of Major Project-II

Course Code	PR602
Course Title	Major Project-II
Number of Credits and L-T-P	6 [L – 0, T – 0, P - 6]
Course Category	Major Project
Prerequisites	All Subject Related to Automobile Engineering

Course objectives: -
After completing this course, the students will be able

- To understand the solution process of real life problem
- To achieve the potentiality of doing team work
- To understand the gap between academic knowledge and actual real life problem solving knowledge.
- To prepare the project repot in a skillful way.

Project group:-

1. Formation of project group: Maximum 8 to 12 students per batch.
2. Each project group should select work by consulting the guide.

Course Content:-
It is the *continuation of major project –I* (which is stared on Semester V) during this major project-II, the project work have to be completed by each group.

After completion of the project, each students group should prepare *one* comprehensive report to indicate what are **observed, learnt and contribution** during the project work. The student may contact guide for completing the project and prepared the final report on the assigned topic. The project report should be signed by the guide and HOD of concerned department.

The format of the project report will be as following

Sl. No.	Particulates
1	Title page
2.	Deceleration page
3	Acknowledgement
4	Certificate from guide
5	Abstract
6	Objective
7	Literature review/ background survey/history
8	Present work
9	Methodology
10	Observation
11	Conclusion
12	Future Scope
12	References

Internal Assessment:

1. Project Report: The project Report will be evaluated on the basis of following criteria (as applicable) **40 Marks**

Sl. No.	Criteria for evaluation of Project.
1	Originality
2	Adequacy and purposeful write up
3	Organizations, format, drawing, sketches, style, language
4	Practical applications and relationships with basic theory
5	Concept taught in the outcome

2. Attendance and work process **20 Marks**

External Assessment:

Seminars must be arranged for the student based on the project report, in presence of project guide, Internal Committee constituted by the concerned department of the Institute and External examiner/s. The evaluation will be based on the following criteria; **40 Marks**

Sl. No.	Criteria for evaluation of Report
1	Quality of content presented
2	Proper Planning for presentation
3	Effectiveness of presentation
4	Depth of knowledge and skills
5	Viva voce

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

CO1	learn new skills and supplement knowledge
CO2	Learn & practice communication and teamwork skills.
CO3	Learn strategies like time management, multi-tasking, real time technical knowledge etc.
CO4	Can apply their knowledge to generate new idea for doing some application oriented work.
CO5	Gain practical experience in a real working environment.

Proposed Syllabus of Seminar

Course Code	SE602
Course Title	Seminar
Number of Credits and L-T-P	2 [L – 0, T – 0, P - 4]
Course Category	Seminar
Prerequisites	Up to 5th semester all subject knowledge

Course Objectives:

1. Identify and compare technical and practical issues related to the area of course specialization.
2. Outline annotated bibliography of research demonstrating scholarly skills.
3. Prepare a well-organized report employing elements of technical writing and critical thinking.
4. Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

Guideline

Each student has to select a recent topic of latest technology in the area of Automobile 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.

The Seminar Report will be evaluated on the basis of following criteria (as applicable)

60 Marks

Sl. No.	Criteria for evaluation of Seminar Report
1	Originality
2	Adequacy and purposeful write up
3	Organizations, format, drawing, sketches, style, language
4	Practical applications and relationships with basic theory
5	Concept taught in the course outcome
6	Practical applications, relationships with basic theory and concept taught in the course
7	Attendance record, daily diary, quality of Internship Report.

Seminars must be arranged for the student based on his/her training report, before an Internal Committee constituted by the concerned department of the Institute. The evaluation will be based on the following criteria:

40 Marks

Sl. No.	Criteria for evaluation of Seminar Report
1	Quality of content presented
2	Proper Planning for presentation
3	Effectiveness of presentation
4	Depth of knowledge and skills
5	Viva voce

Course Outcome:

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

CO1	Establish motivation for any topic of interest and develop a thought process for technical presentation.
CO2	Organize a detailed literature survey and build a document with respect to technical publications.
CO3	Analysis and comprehension of proof-of-concept and related data.
CO4	Effective presentation and improve soft skills.
CO5	Make use of new and recent technology for creating technical reports

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Chemical Engineering [CHE]

Part-III (6th Semester)

2023

CURRICULAR STRUCTURE FOR PART-III (SEMESTER 6) OF THE FULL-TIME DIPLOMA COURSES IN CHEMICACAL ENGINEERING

BRANCH: **CHEMICAL ENGINEERING**					**SEMESTER 6**					
SL No	Category	Code No	Course Title	L	P	Total Class per week	Credit	Full marks	Internal Marks	ESE Marks
1	Program Core	CHEPC302	Process Equipment Design and Drawing	3	-	3	3	100	40	60
2	Program Elective	CHEPE302	Petrochemicals/ Waste Management	3	-	3	3	100	40	60
3	Humanities and Social Science	HS302	Entrepreneurship and start-ups	3	-	3	3	100	40	60
4	Open Elective	CHEOE302	Open Elective (Compulsory)	3	-	3	3	100	40	60
5	Open Elective	CHEOE304	Open Elective	3	-	3	3	100	40	60
6	Major Project	PR302	Major Project	-	6	6	3	100	60	40
7	Seminar	SE302	Seminar	3	-	3	1	100	60	40
Total				18	6	24	19	700	320	380

Student contact hours per week: 24hours (Lecture-18 hours; Practical-6 hours)
Theory and Practical Period of 60 minutes each.
Full marks-700 (Internal Marks-320; ESE Marks-380)
L-Lecture, P-Practical, ESE- End Semester Examination

Credit Distribution	**Credit**
Program Core	3
Program Elective	3
Open Elective	6
Major Project	3
Seminar	1
Humanities and Social Science	3
Total	19

Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately in each subject.

Sl. No.	**Program Elective**		**Credit**
1.	Petrochemicals [Sub code: CHEPE302/1]	Any one	3
2.	Waste Management [Sub code: CHEPE302/2]		

Total = 6

Sl. No.	**Open Elective**		**Credit**
1.	Engineering Economics and Project Management (***Compulsory for all Branches***) [Sub code: CHEOE302]		3
2.	Environmental Engineering and Science [Sub Code: CHEOE304/1]	Any one	3
3.	Industrial Management [Sub Code: CHEOE304/2]		
4	Renewable Energy [Sub Code: CHEOE304/3]		

Name of the Course: Diploma in Chemical Engineering	
Category: Program core	**Semester: Sixth**
Code no.: CHEPC302	**Theory: 100** Marks
Course Title: Process Equipment Design and Drawing	**(i) External Assessment: 60 Marks** (End Semester Examination) **(ii) Internal Assessment:40 Marks** [Class Test: 20 Marks Assignment/viva voce/ Quizzes: 10 Marks Class attendance: 10 Marks]
Duration: 17 weeks	
Total lecture class/week: 3	
Credit: 3	
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

1. Course Objectives:

1	Discover basic symbols used instrumentation diagrams.
2	Enhance the knowledge on the mechanical aspects of equipment design.
3	Transform mechanical design specifications in to fabrication drawings for plant erection.
4	Basic ideas on the design of pressure vessels, heat exchangers, evaporators, plate and packed columns and reactors.

2. Course Outcomes:

On completion of the course, students are expected to:	
CO1	Describe the aspects of design, flow sheets and scale up in chemical plant design.
CO2	Design pressure vessels by selecting a suitable material of construction.
CO3	Design heat exchangers.
CO4	Design tray towers and packed towers.
CO5	Design batch and continuous reactors

3. Pre-Requisites:

1.	Knowledge of basic concept on Physics, Chemistry and Mathematics.
2.	Knowledge on basic Chemical Engineering.
3.	Knowledge on basic Strength of Materials.

4. Theory Components:

Unit	Topics & Sub-topics	Teaching Hours
Unit I: Introduction to Plant Design and Process Design Development	Introduction to Design. The anatomy of a chemical manufacturing process, factors of safety (design factors). Basic idea on project documentation. Introduction to flow-sheeting. Introduction to piping and instrumentation (including basic symbols and layout, no detailed calculation).	6
Unit II: Mechanical Design of Process Equipment	Pressure vessels – calculation of thickness of cylindrical and spherical shells subjected to internal pressure. Supports for vessels – bracket or lug supports, leg supports, skirt supports, saddle supports (only description).	6
Unit III: Valves, Pumps and Piping Network	Different types of valves – Gate valves and globe valves – Plug cocks and ball valves – Check valves. Pumps: Classification of pumps – Centrifugal and positive displacement pumps – reciprocating pump (piston pump, and plunger pump), rotary pump (gear pump and lobe pump). Suction lift and cavitation, NPSH. Priming of centrifugal pump. Fans, Blowers, and Compressors – reciprocating compressor and centrifugal compressor (Description of construction only, detailed design not required). General pipe fittings used in piping network. Analysis of Piping Network (Description of construction only, detailed design not required).	12
Unit IV: Heat Transfer Equipment Design	Design of double pipe heat exchangers, Design of shell and tube heat exchangers (1-2, 2-4). Design of single and multiple effect evaporators without boiling point elevation.	9
Unit V: Mass Transfer Equipment Design	Basic concept on bubble cap tray, sieve tray and valve tray units, Calculation of maximum allowable vapour velocities, plate, and column efficiency. Continuous contactors – types of packing, liquid distribution, pressure drop, packing efficiencies. Relative merits of plate and packed towers.	8
Unit VI: Reactor Design	Design of heterogeneous catalytic reactor (for packed bed and mixed flow reactors).	4
Sub Total: Total Lecture Classes		45
No. of classes required for conducting Internal Assessment examination		06
Grand Total:		51

5. Suggested Home Assignments/Students' Activities: The concerned teacher may collect assignments from the students on different units of Chemical Reaction Engineering. He/ She may also conduct viva voce or Quizzes for the students based on the different units of Chemical Reaction Engineering.

6. Suggested scheme for question paper design for conducting internal assessment examination:
(Duration: 45 minutes)

Questions to be set as per Bloom's Taxonomy				
	Distribution of Theory Marks			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply& above)	Total
Class Test - 1	4	8	8	20
Class Test - 2	4	8	8	20

7. Suggested Scheme for End Semester Examination: [Duration 3 hours**]**

Question Paper Type		**Marks**
1.	Objective type questions carrying 1 mark for 20 questions out of 25 questions throughout the syllabus.	1×20=20
3.	Questions carrying 8 marks for 5 questions (Subjective type) out of 8 questions (at least one question from each unit).	5×8=40

8. Rubrics for the Assessment of Students Activity: (20 marks)

Sl No.	**Performance Indicators**
1	Originality of completing the assigned task
2	Presentation Skill
3	In Time submission of Assignment report / micro-project task
4	Viva-voce or Quizzes

9. Suggested Learning Resources:

Sl. No.	**Title of Book**	**Name of Authors**	**Publisher**
1	Process Equipment Design	M.V. Joshi, V.V.Mahajani	Macmillan Publishers,
2	Introduction to Chemical Equipment design	B.C. Bhattacharya,	CBS Publications
3	Applied Process Design for Chemical and Petrochemical Plants, Vol. 1 and 2	E.E Ludwig	Gulf Publishing Co.
4	Coulson Richardson's Chemical Engineering Vol.6 Chemical Engineering	R. K. Sinnott	ELSEVIER
5	Chemical Reaction Engineering	Octave Levenspiel	Wiley Easter Ltd., New York.
6	Process Heat Transfer	D. Q. Kern	McGraw-Hill
7	Mass Transfer Operations	R. E. Treybal	McGraw-Hill
8	Machine Design	Sharma and Aggarwal	S K Kataria and Sons

Name of the Course: Diploma in Chemical Engineering	
Subject: Petrochemicals	**Semester: Sixth**
Category: Programme Elective	**Theory: 100** Marks
Code no.: CHEPE302/1	**Examination Scheme:** **(i) External Assessment: 60** Marks (End Semester Examination) **(ii) Internal Assessment: 40** Marks [Class Test: 20 Marks Assignment/Viva voce/Quizzes: 10 Marks Class attendance: 10 Marks]
Duration: 17 weeks	
Total lecture class/week: 3	
Credit: 3	
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

1. **Course Outcomes**: On completion of the course, students will be able to:

Sl No	Course Outcomes
CO1	Classify the different feedstock of Petrochemicals
CO2	Describe the production of ethylene by naphtha cracking and discuss about some petrochemicals based on ethylene
CO3	Describe the production and separation of BTX aromatics and discuss about some BTX based petrochemicals
CO4	Define detergent and describe some synthetic detergent production process
CO5	Define polymer and describe the production process of some important polymer

2. Theory Components:

Unit	Topics & Sub-topics	Teaching Hours
Unit 1: Introduction	Concept of Petrochemicals Feed stocks for petrochemicals. Manufacture of Methanol from Synthesis Gas Production of Formaldehyde from methanol.	4
Unit 2: Production of Ethylene & some of its derivatives	Production of Ethylene, Propylene and Butadiene by Naphtha Cracking. Production of some important Petrochemicals based on Ethylene: Vinyl chloride monomer (VCM), Vinyl acetate monomer (VAM), Ethylene oxide, Ethanol amines, Acrylonitrile.	12
Unit 3: Production & Separation of BTX Aromatics	Important reactions involved in BTX formation. Production of BTX by catalytic reforming of Naphtha BTX separation from reformate. Separation of BTX aromatics to Benzene, Toluene and Xylene. Concept of Pyrolysis Gasoline. Pyrolysis Gasoline hydrogenation. Recovery of Benzene, Toluene and Xylene by extractive distillation method.	12

	Production of Styrene, Cunene, Phenol, Phthalic anhydride.	
Unit 4: Synthetic Detergent	Concept of Detergent. Classification of Detergent. Production of synthetic detergent like Dodecyl Benzene Sulphonate and Keryl Benzene Sulphonate (Surf).	3
Unit 5: Polymerisation Technology	Concept of polymer, Types of Polymers Concept of polymerization. Methods of Polymerization: Addition and Condensation; Methods of production: Bulk, Solution, Emulsion, and Suspension. Production of Polyethylene (LDPE& HDPE) Production of Poly Vinyl Chloride(PVC) Production of Styrene- Butadiene Rubber (SBR) Production of Viscose Rayon Production of Phenol formaldehyde resin Production of Nylon 6,6 and Nylon 6.	14
Sub Total: Total Lecture Classes		45
No. of classes required for conducting Internal Assessment examination		06
Grand Total:		51

3. Suggested Home Assignments/Students' Activities: The concerned teacher may collect assignments from the students on different units of Petrochemicals. He/she may also conduct Viva-Voce or Quizzes for the students based on the different units of Petrochemicals.

4. **Suggested scheme for question paper design for conducting internal assessment examination :** (Duration: 45 minutes)

Questions to be set as per Bloom's Taxonomy				
	Distribution of Theory Marks			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply& above)	Total
Class Test - 1	4	8	8	20
Class Test - 2	4	8	8	20

5. Suggested Scheme for End Semester Examination: [Duration 3 hours]

Question Paper Type		**Marks**
1.	Objective type questions carrying 1 mark for 20 questions out of 25 questions throughout the syllabus.	1×20=20
3.	Questions carrying 8 marks for 5 questions (Subjective type) out of 8 questions (at least one question from each unit).	5×8=40

6. Rubrics for the Assessment of Students Activity: (20 marks)

Sl No.	Performance Indicators
1	Sketch Flow sheet for different processing of Petrochemicals
2	Accomplishing assigned problem
3	Presentation Skill
4	In Time submission of Assignment report / micro-project task
5	Viva-voce or Quizzes

7. Suggested Learning Resources:

Sl. No.	Title of the Book	Author	Publication
1.	A Text on Petrochemicals	Dr. B.K. Bhaskararao	Khanna Publishers, Delhi--110006
2.	A Text Book of Chemical Technology, Vol. 1 & 2	Sukla and Pandey	Vikas Publishing House Pvt. Ltd., New Delhi.
3.	Outlines of Chemical Technology	Dryden	Khanna Publishers, Delhi
4.	Petrochemical processes, Vol. 1 & 2 (2^{nd} ed.),	Chauvel and Lefebvre	EditionsTechnip, Paris
5.	Trends in Petrochemical Technology	Brownstein	The Petrolium Pub. Co., Tulsa, Oklahoma, U. S. A.

Name of the Course: Diploma in Chemical Engineering **Subject: Waste Management**	
Subject Code: CHEPE302/2	**Semester**: Sixth
Duration: 17 weeks	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 3 hours/week	Mid Semester Exam: 20 Marks
Tutorial: Nil	Attendance, Assignment & Interaction: 10+10 Marks
Practical: Nil	End Semester Exam: 60 Marks
Credit: 3	**Aim:** To recognize and learn about waste management, waste treatment and recycling To understand the impacts on our environment. To learn about pollution, pollutants, waste disposal processes.

1. **Course Outcomes:**

On completion of the course, the students will be able to	
CO 1	Identify solid and hazardous waste.
CO 2	Sample and arrange for storage of waste and design the facility
CO 3	Process solid and biomedical waste and perform quantitative estimation
CO 4	Determine suitable place and method for landfill
CO 5	Identify legal provisions regarding violations of waste disposal

2. Course Content

Unit	Description	Contact hours
Unit1: Sources and Classification of Solid Waste	Types and Sources of Solid and Hazardous Wastes - Need for Solid and Hazardous Waste Management, Waste Generation Rates - Composition – Hazardous Characteristics,	7
Unit2: Sampling and handling of Waste	Waste Sampling - Source Reduction of Wastes - Recycling and Reuse - Handling and Segregation of Wastes at Source - Storage and Collection of Municipal Solid Wastes - Analysis of Collection Systems - Need for Transfer and Transport - Transfer Stations - Labelling and Handling of Hazardous Wastes.	12
Unit3: Waste Processing	Waste Processing - Processing Technologies - Biological and Chemical Conversion Technologies - Composting - Thermal Conversion Technologies - Energy Recovery - Incineration – Solidification and Stabilization of Hazardous Wastes - Treatment of Biomedical Wastes -	12
Unit4: Landfill Technology	Disposal in Landfills - Site Selection - Design and Operation of Sanitary Landfills - Secure Landfills and Landfill Bioreactors - Leachate and Landfill Gas Management - Landfill Closure and Environmental Monitoring - Closure of Landfills - Landfill Remediation –	8
Unit5: Legislation and Management	Legislations on Management and Handling of Municipal Solid Wastes, Hazardous Wastes, and Biomedical Wastes - Elements of Integrated Waste Management.	6
Sub Total: Total Lecture Classes		45
No. of classes required for conducting Internal Assessment examination		06
Grand Total:		51

3. Suggested Home Assignments/Students' Activities: The concerned teacher may collect assignments from the students on different units of Waste Management. He/she may also conduct Viva-Voce or Quizzes for the students based on the different units.

4. **Suggested scheme for question paper design for conducting internal assessment examination :**(Duration: 45 minutes)

Questions to be set as per Bloom's Taxonomy				
	Distribution of Theory Marks			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply& above)	Total
Class Test - 1	4	8	8	20
Class Test - 2	4	8	8	20

5. Suggested Scheme for End Semester Examination: [Duration 3 hours]

Question Paper Type		**Marks**
1.	Objective type questions carrying 1 mark for 20 questions out of 25 questions throughout the syllabus.	1×20=20
3.	Questions carrying 8 marks for 5 questions (Subjective type) out of 8 questions (at least one question from each unit).	5×8=40

6. Rubrics for the Assessment of Students Activity: (20 marks)

Sl No.	**Performance Indicators**
1	Originality of completing the assigned task
2	Presentation Skill
3	In Time submission of Assignment report / micro-project task
4	Viva-voce or Quizzes

7. Suggested Learning Resources:

Sl. No	Book Title	Author	Publisher
1	Elements of Solid Waste Hazardous Management	O.P. Gupta	Khanna Publishing House, New Delhi, 2018
2	Integrated Solid Waste Management	George Tchobanoglous, Hilary Theisen and Samuel A, Vigil	
3	Manual on Municipal Solid waste management	-	Central Public Health and Environmental Engineering Organization, Government of India, New Delhi

Course Title	**Entrepreneurship and Start-ups**
Course Code	HS 302
Number of Credits	3
Pre-Requisites	None
Total Contact Hours	3(L: 2; T: 1)/week = 45 hrs
Course Category	HS

Course Learning Objectives

1. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
2. To motivate and inspire students toward an entrepreneurial career.
3. To understand venture creation process and to develop generic entrepreneurial competences.
4. To introduce students to the basic steps required for planning, starting and running a business.
5. To familiarise students with the different exit strategies available to entrepreneurs.

Course Outcomes:

After completing the course students will able to:

CO 1	Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
CO 2	Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
CO 3	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
CO 4	Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

Detailed Course Content

Unit	Name of the Topic	Hours
1.	ENTREPRENEURSHIP – INTRODUCTION AND PROCESS Concept, Competencies, Functions and Risks of entrepreneurship Entrepreneurial Values& Attitudes and Skills Mindset of an employee/manager and an entrepreneur Types of Ownership for Small Businesses Sole proprietorship Partnerships Joint Stock company- public limited and private limited companies Difference between entrepreneur and Intrapreneur	10
2.	PREPARATION FOR ENTREPRENEURIAL VENTURES Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard Feasibility Study Report Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan Project Report- Concept, its features and components Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. <u>They may not be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.</u>	20
3.	ESTABLISHING SMALL ENTERPRISES Legal Requirements and Compliances needed for establishing a New Unit- NOC from Local body Registration of business in DIC Statutory license or clearance Tax compliances	03
4.	START-UP VENTURES Concept & Features Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical Problems and challenges faced by start-ups. Start-up Ventures in India – Contemporary Success Stories and Case Studies to be	04

	discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. No questions are to be set from the case studies.	
5.	FINANCING START-UP VENTURES IN INDIA Communication of Ideas to potential investors – Investor Pitch Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups Govt Initiatives including incubation centre to boost start-up ventures MSME Registration for Start-ups –its benefits	06
6.	EXIT STRATEGIES FOR ENTREPRENEURS Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – Basic Concept only	02

Examination Scheme

End Semester Examination: 60 marks
Suggested Question Paper Scheme for End Semester Examination
Group A: 20marks

Question Type	Number of questions to be set	Number of questions to be answered
MCQ, Fill in the blanks, True or False (Carrying 1 mark each)	25	20

Group B: 40marks

Question Type	Number of questions to be set	Number of questions to be answered
Subjective Type questions (Carrying 8 marks each)	10	5

Internal Assessment: 40 marks
Class test: 20 marks
Assignment: 10 marks
Class attendance: 10 marks

Suggested Learning Resources

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of IndiaLearning Private Ltd
2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Caseson Entrepreneurship	Anjan Raichaudhuri	Prentice Hall of India Learning Private Ltd

6.	How to Start a Business in India	Simon Daniel	Buuks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development and Business Ethics	Abhik Kumar Mukherjee & Shaunak Roy	Oxford University Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

SYLLABUS OF ENGINEERING ECONOMICS & PROJECT MANAGEMENT

Course Code:	**CHEOE302**
Course Title:	Engineering Economics & Project Management
No. of Credits:	3
Number of theoretical class/weeks	3(L:3, T:0, P:0)
Course Category:	Open Elective (Compulsory for all branches)

Course Learning Objectives

1	To acquire knowledge of basic economics to facilitate the process of economic decision making.
2	To acquire knowledge on basic financial management aspects.
3	To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
4	To develop an understanding of key project management skills and strategies.

Detailed Course Content:

Unit	Name of the Topic	Hours
Unit-I Introduction, theory of demand & supply	Introduction to Engineering Economics, the relationship between Engineering and Economics. Resources, scarcity of resources, and efficient utilization of resources. Opportunity cost, rationality costs, and benefits. Theory of Demand: the law of demand, different types of demand, determinants of demand, demand function, price elasticity of demand. Theory of Supply: determinants of supply, supply function. Market mechanism: Equilibrium, basic comparative static analysis (Numerical problems)	9

Unit-II Theory of Production & Costs	Concept of production (goods & services), Different factors of production (fixed and variable factors), Short-run Production function (Graphical illustration), and long run production function (returns to scale). Theory of Cost: Short-run and long-run cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost etc. Economic concept of profit, profit maximization (numerical problems)	10
Unit-III Different Types of Market and Role of Government	Perfect Competition: Features of Perfectly Competitive Market. Imperfect Competition: Monopoly, Monopolistic Competition, and Oligopoly. Role of government in Socialist, Capitalist and Mixed Economy structure with example	4
Unit-IV Concept of Project	Definition and classification of projects Importance of Project Management. Project life Cycle [Conceptualization→Planning→Execution→Termination]	4
Unit-V Feasibility analysis of project	Economic and Market analysis. Financial analysis: Basic techniques in capital budgeting – Payback period method, Net Present Value method, Internal Rate of Return method. Environmental Impact study–adverse impact of the project on the environment. Project risk and uncertainty: Technical, economical, socio-political, and environmental risks. Evaluation of the financial health of a project – Understanding the basic concept of Fixed & Working Capital, Debt & Equity, Shares, Debentures etc., and different financial ratios like Liquidity Ratios, Activity Ratios, Debt-equity ratio & Profitability Ratio (Basic concept only). N.B: Knowledge of financial statements is not required; for the estimation of ratios the values of the relevant variables will be provided.	10
Unit-VI Project administration	Gantt Chart – a system of bar charts for scheduling and reporting the progress of a project (basic concept). Concept of Project Evaluation and Review Technique (PERT)and Critical Path method (CPM): basic concept and application with real-life examples.	8

Examination Scheme:

Semester Examination pattern of 60 marks:

Objective type Question (MCQ, Fill in the blanks, and Very Short question-1 mark each): At least five questions from each unit. [total marks: 20]

Subjective questions: Eight questions to be answered taking at least three from each group. (Two questions should be given from each unit). [total marks:40]

Assignment (10 Marks)

Guidelines for Assignment (10 Marks)

Students should be instructed to prepare a report on a project (preferably the Major Project they prepare in 6th Semester), using a popular project management software in IT/Computer Laboratory, under the guidance of the Lecturer in Computer Science& Technology and Lecturer in Humanities.

Class Test: Two examinations 20 marks each. Take best of two.
Attendance: 10 Marks

Suggested reference books:

1) Principles of Economics – Case and Fair, Pearson Education Publication
2) Principles of Economics–Mankiw, Cengage Learning
3) Project planning, analysis, selection, implementation, and review –Prasanna Chandra– Tata McGraw Hill.
4) Project Management–Gopalakrishnan –Macmillan India Ltd

SYLLABII FOR OPEN ELECTIVE SUBJECTS ARE AVAILABLE SEPARATELY

1. Environmental Engineering and Science [Sub Code: CHEOE304/1]
2. Industrial Management [Sub Code: CHEOE304/2]
3. Renewable Energy [Sub Code: CHEOE304/3]

Name of the Course: Diploma in Chemical Engineering	
Category: Programme Core	**Semester: Sixth**
Code no.: PR302	**Laboratory: 100** Marks
Course Title: Major Project **Duration: 17 weeks** **Total practical class/week: 6** **Credit: 3**	**Examination Scheme:** **(i) External Assessment: 40** Marks (End Semester Examination) **(ii) Internal Assessment:** 60 Marks [Class Test: 40 Marks Assignment/viva voce: 10 Marks Class attendance: 10 Marks]
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately. Students should submit a report on the assigned project work.	

1. **Course Outcomes**:

On completion of the course, the students will be able to	
CO 1	Understand and apply the concept of designing experiments
CO 2	Analysis of generated data
CO 3	Compare the generated data with related findings available in the literature
CO 4	Display the findings in form of technical report and presentation

2. Contents

Sl. No	**Name of Experiment**
1	**Performing experiments/simulations related to assigned projects**

3. Suggested Home Assignments/Students' Activities: Will be decided by the respective Lecturer

4. **Suggested scheme for question paper design for conducting internal assessment examination :**(Duration: 30 minutes)

Questions to be set as per Bloom's Taxonomy				
	Distribution of Marks			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply& above)	Total
Internal Viva-Voce	8	16	16	**40**

5.Suggested Scheme for End Semester Examination:

6. Rubrics for the Assessment of Students Activity:

7. Suggested Learning Resources:

Sl. No.	**Title of Book**	**Author**	**Publication**
1	Research Methodology: Methods and Techniques	C.R. Kothari Gaurav Garg	New Age International Publishers

Name of the Course: Diploma in Chemical Engineering	
Category: Programme Core	**Semester: Sixth**
Code no.: SE302	**Laboratory: 100** Marks
Course Title: Seminar	**Examination Scheme:** **(i) External Assessment: 40** Marks (End Semester Examination) **(ii) Internal Assessment:** 60 Marks [Class Test: 40 Marks Assignment/viva voce: 10 Marks Class attendance: 10 Marks]
Duration: 17 weeks	
Total Practical class/week: 3	
Credit: 1	
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately. Students should submit a report on the seminar presented.	

1. Course Outcomes:

On completion of the course, the students will be able to	
CO 1	represent tabulated data via presentation
CO 2	represent diagram via presentation

2. Contents

Sl. No	**Task**
1	**Technical Presentation on topics relevant to Chemical Engineering**

3. Suggested Home Assignments/Students' Activities: Will be decided by the respective Lecturer.

4. **Suggested scheme for question paper design for conducting internal assessment examination :**(Duration: 30 minutes)

Questions to be set as per Bloom's Taxonomy				
	Distribution of Marks			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	Total
Internal Viva-Voce	8	16	16	**40**

5. Suggested Scheme for End Semester Examination:

6. Rubrics for the Assessment of Students Activity: (20 marks)

7. Suggested Learning Resources: Various online resources.

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Civil Engineering [CE]

Part-III (6th Semester)

2023

CURRICULAR STRUCTURE FOR PART – III SECOND SEMESTER (SIXTH SEMESTER) OF THE FULL-TIME DIPLOMA COURSE IN CIVIL ENGINEERING

Sl. No.	Subject Code	Subject of Study	HOURS PER WEEK			CREDITS	Marks
		Theoretical Papers	Lecture	TUTORIAL	PRACTICAL		
1	CEPC601	Public Health Engineering	2	0	0	2	100
		LABORATORY/SESSIONAL PAPERS					
2	CEPC602S	Civil Engineering Lab-III: Module-VII: Public Health Engineering Lab	0	0	2	1	100
3	CEPC603S	Advanced Surveying Practices	0	0	2	1	100
		ELECTIVE, MANDATORY COURSES AND SEMINAR					
4	CEPE604	Elective IV: one subject out of Tendering and Accounts (CEPE604/I) / Advanced Construction Technology (CEPE604/II)	3	0	0	3	100
5		Entrepreneurship and Start-ups	3	0	0	3	100
6		Compulsory Open Elective: Open Elective I: Engineering Economics &Project Management	3	0	0	3	100
7		Open Elective II : one subject has to be taken from list of open elective subjects as provided by WBSCT&VE&SD*	3	0	0	3	100
8.	CEPR605S	Major Project-II	0	0	4	2	100
9.	CESE606S	Seminar and Viva -Voce	1	0	0	1	100
		TOTAL	15	0	8	19	900

NOTE: -

1. All subjects (theoretical as well as sessional/practical) are full paper with 100 marks in aggregate as per AICTE and WBSCT&VE&SD

2. Advanced Surveying Field Practices may also be conducted in 2-3 weeks field work continuously instead of having 2 practical classes per week for the entire semester.

Note: Civil students will be benefited if they choose Solid waste management/ Disaster Management/ Construction Management as the subject for Open Elective II from the list provided by WBSCT&VE&SD

Name of the Course	**Diploma in Civil Engineering**	Course duration	6 semester
Course Title	**Public Health Engineering**	Course Code	**CEPC601**
Subject offered in Semester	**Sixth**	Number of Credits	**2 (L:2, T: 0, P: 0)**
Prerequisites	NIL	Course Category	**PC**
Question distribution	As per standing norms of WBSCT&VE&SD	Marks distribution	As per standing norms of WBSCT&VE&SD

Course Objectives: Following are the objectives of this course:

- To learn the principles for identification of sources of surface and subsurface water
- To learn calculation of population and requirement of drinking water
- To understand the flow-diagram of water supply scheme highlighting different features
- To know evaluation of characteristics and treatment of sewage.

Module /Group [as per directives from WBSCT&VE&SD in framing questions of end semester]	**Distribution of unit**
Module A/Group A	Unit I and II
Module B/Group B	Unit III and V
Module C /Group C	Unit IV

Course Content

Unit – I Sources, Demand and Quality of water

- Water supply schemes - Objectives, components
- Sources of water: Surface and Subsurface sources of water,
- Intake Structures, Definition and types, Factors governing the location of an intake structure, Types of intakes.

- Demand of water: Domestic, Industrial, commercial & institutional, public use, losses & wastes, fire demand. Factors affecting rate of demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, (Simple problems on forecasting of population), Design period, Estimation of quantity of water supply required for city or town.
- Quality of water**:** Need for analysis of water, Characteristics of water- Physical, Chemical and Biological, Meaning and importance of different parameters of water- Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Arsenic, Nitrogen and its compounds, Bacteriological tests, Ecoli, Bcoli index, MPN, Sampling of water, Water quality standards as per IS:10500.

UNIT II Purification of water

- Purification of Water: Objectives of water treatment, Screening, Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks, Clariflocculator.
- Filtration - mechanism of filtration, classification of filters: slow sand filter, rapid sand filter, pressure filter. Construction and working of slow sand filter and rapid sand filter, operational problems in filtration. Disinfection: Objects, methods of disinfection, Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, break-point chlorination, residual chlorine and its importance, Flow diagram of water treatment plants.
- Miscellaneous water Treatments: Removal of colour, taste and odour, Introduction to water softening and Defluoridation techniques.

UNIT III Conveyance and Distribution of water

- Conveyance: Types of Pipes used for conveyance of water, choice of pipe material, Types of joints & Types of valves- their use, location and function on a pipeline.
- Distribution of water: Methods of distribution of water- Gravity, pumping, and combined system, Service reservoirs- functions and types, Layouts of distribution of Water- Dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages.

UNIT IV Domestic sewage and System of Sewerages

- Building Sanitation: Necessity of sanitation, Necessity to treat domestic sewage, Definitions-Sewage, sullage, types of sewage. Definition of the terms related to Building Sanitation-Water-pipe, Rainwater-pipe, Soil-pipe, Sullage-pipe, Vent-pipe. Building Sanitary fittings-Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals. Traps- types (P, Q, S, intercepting trap, gully trap, floor trap), qualities of good trap. Systems of plumbing-one pipe, two pipe, single stack, choice of system. Principles regarding design of building drainage, inspection and junction chambers, their necessity, location, size and shape.
- Systems of Sewerage and Sewer Appurtenances: Types of Sewers, Systems of sewerage, self-cleansing velocity and non-scouring velocity, Laying, Testing and maintenance of sewers, Manholes and Drop Manhole-component parts, location, spacing, construction details, Sewer Inlets, Street Inlets.

UNIT V Characteristics and treatment of Sewage

- Analysis of sewage: Characteristics of sewage - Major parameters, B.O.D., C.O.D. and its significance, Central Pollution Control Board Norms for discharge of treated sewage.
- Treatment of Sewage: Objects of sewage treatment and flow diagram of conventional sewage treatment plant - Screening, Types of screens, Grit removal, Skimming, Sedimentation of sewage, Aerobic and anaerobic process, Sludge digestion, trickling filters, Activated sludge process, Disposal of sewage, Oxidation pond, Oxidation ditch. Septic tank, Recycling and Reuse of domestic waste.

Suggested learning resources

- Sharma S.C, Environmental Engineering, Khanna Publishing House, NewDelhi
- Garg, S.K., Environmental Engineering Vol. I and Vol. II, KhannaPublishers
- Birdie, G. S. and Birdie, J. S.Water Supply and Sanitary Engineering, Dhanpat Rai
- Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House,Delhi
- Rao, C.S., Environmental Pollution Control Engineering, New Age International

- Punmia, B C, Environmental Engineering, vol. I and II, LaxmiPublishers
- Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw Hill
- Basak N N, Environmental Engineering, McGraw HillPublishers.

Course outcomes: After completing this course, student will be able to:

- Know the procedure to identify the sources of surface and subsurface water
- Estimate the quantity of drinking water required for a population
- Draw labelled layout for water supply scheme.
- Select suitable water treatment technique.
- Evaluate the characteristics and suggest treatment of sewage.

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Name of the Course	**Diploma in Civil Engineering**	Course duration	6 semester
Course Title	**Civil Engineering Lab-III: Module-VII: Public Health Engineering Lab**	Course Code	**CEPC602S**
Subject offered in Semester	**Sixth**	Number of Credits	**1 (L:0, T: 0, P: 2)**
Prerequisites	NIL	Course Category	**PC**
Question distribution		Marks distribution	As per standing norms of WBSCT&VE&SD

Course Objectives: Following are the objectives of this course:

- To learn the tests for measuring quality of drinking water.
- To learn the tests for measuring quality of Domestic waste water.
- To learn determination of BOD and COD requirement in sewage.

List of Practical to be performed: (Items 1 & 2 compulsory and at least six experiments from the rest)

1	Draw sketches of various valves used in water supply pipe line
2	Draw a sketch of one pipe and two pipe system of plumbing
3	Determine pH value of given sample of water/sewage.
4	Determine the turbidity of the given sample of water.
5	Determine residual chlorine in a given sample of water.
6	Determine suspended, dissolved solids and total solids of given sample of water/sewage.
7	Determine the dissolved oxygen in a sample of water/sewage.
8	Determine Fluoride concentration in given water sample.
9	Determine Arsenic concentration (semi-quantative) in given water sample.
10	Determine the optimum dose of coagulant in a given raw water sample by jar test.
11	Determine B.O.D. & C.O.D. of given sample of sewage.
12	Prepare a report of a field visit to water treatment plant and/or sewage treatment plant if possible

Note: Item no. 12 may be included in internship.

Suggested learning resources:

- Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
- Basak N N, Environmental Engineering, McGraw Hill Publishers.
- Garg, S.K., Environmental Engineering Vol. I and Vol. II, Khanna Publishers

- Birdie, G. S. and Birdie, J. S. Water Supply and Sanitary Engineering, Dhanpat Rai
- Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
- Rao, C.S., Environmental Pollution Control Engineering, New Age International
- Punmia, B C, Environmental Engineering, vol. I and II, LaxmiPublishers
- Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw Hill Publishers.
- BIS: 10500 - DRINKING WATER — SPECIFICATION, BIS, New Delhi.
- CPCB: GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS, CPCB, New Delhi

Course outcomes: After completing this course, student will be able to:

- Perform various tests to assess quality of drinking water
- Perform various tests to assess quality of domestic sewage
- Understand the function of various components of water treatment and sewage treatment plants.

Name of the Course	**Diploma in Civil Engineering**	Course duration	6 semester
Course Title	**Advanced Surveying Practices**	Course Code	**CEPC603S**
Subject offered in Semester	**Sixth**	Number of Credits	**1 (L:0, T: 0, P: 2) ***
Prerequisites	NIL	Course Category	**PC**
Question distribution		Marks distribution	As per standing norms of WBSCT&VE&SD

*** Advanced Surveying Field Practices may also be conducted in 2 - 3 weeks field work continuously instead of having 2 practical class per week for the entire semester.**

Course Objectives: Following are the objectives of this course:

- To know methods of Theodolite surveying and their uses.
- To learn tacheometric surveying and curve setting.
- To understand the principles of Electronic Distance Measurement and Total station and their uses.
- To know the concept of GPS

List of Practical to be performed: [item number 3 and 5 are desirable]

1. Theodolite traverse Survey: A simple closed traverse of at least 5 sides for any suitable site. Preparation of Gale's traverse table. Plotting the traverse with details on A1 size imperial drawing sheet and calculation of area of the closed traverse. Interior details will have to be filled up by theodolite or by plane table which is found to be more suitable.

2. Simple circular curve setting: Setting out a simple circular curve by Rankine's method of Deflection angles (both one theodolite and two theodolite methods) for a given problem and plotting the curve showing the necessary supporting calculations in a tabular form mentioning suitable scale on A-1 size imperial drawing sheet.

3. Surveying with Total Station: Introduction, description of different parts of total station and reflector prism with stand, set up and orientation,

measurement of distances, measurement of horizontal and vertical angles, methods of measuring remote height and area, etc., Construction of a closed traverse of minimum 5 sides for any suitable site- collection and saving of field data in total station, downloading and transfer of raw data from total station to computer, processing of raw data with the help of any suitable software for preparation of drawing.

4. Use Theodolite as a Tacheometer to compute reduced levels and horizontal distances.

5. GPS Surveying: Working with hand held GPS instrument. Collection coordinates of different objects. Downloading raw data from GPS instrument and prepare a report sheet (excel or doc or pdf format).

Suggested learning resources:

- Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi ruh prakashan, Pune.
- Basak, N. N.,Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd.,Noida.
- Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
- Saikia, M D.; Das. B.M.; Das. M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
- Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.
- Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying vol lI, Laxmi Publications Pvt. Ltd., New Delhi.
- Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning Pvt. Ltd., New Delhi.
- Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
- Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Education, Noida.
- De, Alak, Plane Surveying, S.Chand Publications, New Delhi

Course outcomes: After completing this course, student will be able to:

- Prepare plans using Theodolite surveys.
- Find distances and elevations using Tachometer.
- Make measurements using Total Station.
- Locate coordinates of survey stations using GPS

Name of the Course	**Diploma in Civil Engineering**	Course duration	6 semester
Course Title	**Elective IV: Tendering and Accounts**	Course Code	**CEPE604/I**
Subject offered in Semester	**Sixth**	Number of Credits	**3 (L: 3, T: 0, P:0)**
Prerequisites	NIL	Course Category	**PE**
Question distribution	As per standing norms of WBSCT&VE&SD	Marks distribution	As per standing norms of WBSCT&VE&SD

Objective:- Following are the objectives of this course:

- To understand terminologies in contract and tender document and their significance.
- To know different types of contracts and their uses.
- To learn preparation of typical Tender documents for civil engineering work.
- To get acquainted with rent fixation and valuation of civil structures.

Module /Group [as per directives from WBSCT&VE&SD in framing questions of end semester]	**Distribution of unit**
Module A/Group A	Unit I and II
Module B/Group B	Unit III
Module C /Group C	Unit IV and V

Contents:

Unit – I Procedure to execute the work

Administrative approval, Technical sanction, budget provision, expenditure sanction.

Methods for carrying out works- contract method, departmental method -rate list method, piece work method, day's work method, employing labours on daily wages basis.

Unit– II Contracts

• Definition of contract, objects of contract, requirements of contract, overview of Indian Contract Act.

• Types of engineering contract with advantages, disadvantages and their suitability - Lump sum contract, item rate contract, percentage rate contract, cost plus percentage, cost plus fixed fee, cost plus variable percentage and cost plus variable fee contract, labour contract, demolition contract, target contract, negotiated contract, Engineering Procurement Construction Contract (EPC), Annuity Contract.

• Introduction of FIDIC Conditions of contract.

• Classification of contractor on basis of financial limits, Requirement of documents for registration of contractor.

• Build Operate Transfer (BOT) Project, BOT Toll contract, BOT (Annuity) contract, Design, Build, Finance, Operate and Transfer (DBFOT) contract, Hybrid Annuity contract, Operate Maintain and Transfer (OMT) contract, Operation & Maintenance contract (Introduction only).

Unit– III Tender and Tender Documents

• Definition of tender, necessity of tender, types of tender- Local, Global, Limited.

• E -Tendering System – Online procedure of submission and opening of bids (Technical and Financial).

• Notice to invite tender (NIT)- Points to be included while drafting tender notice, Drafting of tender notice.

• Procedure of submitting filled tender Documents (Two envelope system), procedure of opening tender, comparative statement, scrutiny of tenders, award of contract, letter of award.

• Meaning of terms - Earnest Money Deposit (EMD), Performance Security Deposit, Validity period, corrigendum to tender notice and its necessity, Unbalanced bid.

• Tender documents – Index, tender notice, general instructions, special instructions, Schedule A, Schedule B, Schedule C etc.

• Terms related to tender documents – contract conditions- time limit, time extension, penalty, defective material and workmanship, termination of contract, suspension of work, subletting of contract, extra items, price variation clause(escalation), defect liability Period, liquidated Damages.

• Arbitration- Meaning, Qualification of an arbitrator, Appointment, Dispute and Settlement of disputes, Arbitration and Conciliation Act, Arbitration award.

Unit– IV Accounts

- Various account forms and their uses – Measurement Books, E- Measurement book (E-MB), Nominal Muster Roll(NMR), Imprest Cash, Indent, Invoice, Bill, Vouchers, Hand receipt Cash Book, Temporary Advance. Heads of Accounts.
- Mode of Payment to the contractor and its necessity -Interim Payment, Advance Payment Secured Advance, Petty advance, Mobilization advance, Running account bill, Final bill, Retention money, E - payment.

Unit– V Introduction to Valuation

• Definition and purpose of Valuation, role of valuer. Definition - Cost, Price and Value, Characteristics of Value, Factors Affecting Value.

• Types of Value - Book Value, Scrap Value, Salvage Value, Speculative Value, Distress Value, Market Value, monopoly Value, Sentimental Value. Factors affecting value.

• Depreciation, Obsolescence, Sinking Fund, Methods of Calculation of Depreciation – Straight Line Method, Sinking Fund Method, Constant Percentage Method.

• Fixation of rent, Lease – types of lease, lease hold property and free hold property. Mortgage– Mortgage deed, precautions to be taken while making mortgage.

Suggested learning resources:

- Datta, B. N., Estimating and Costing in Civil engineering, UBS Publishers Pvt. Ltd., New Delhi
- Raina, V. K., Construction Management and Contract Practices, Shroff Publishers & Distrib- uters Pvt. Ltd.
- Rangawala, S. C., Estimating and Costing, Charotar Publishing House PVT. LTD., Gujrat
- Birdie, G. S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd., New Delhi
- Patil, B. S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai
- Chakraborti, M., Estimating and Costing, Specification and Valuation in Civil Engineering, Monojit Chakraborti, Kolkata.

Course outcomes: After completing this course, student will be able to:

- Understand various types of contract and when they are used
- Suggest the relevant type of contract for the given civil engineering work.

- Prepare the typical Tender document for the given civil engineering work.
- Decide type of payment for the executed work.
- Justify the rent fixation and valuation of given civil structure.

Name of the Course	**Diploma in Civil Engineering**	Course duration	6 semester
Course Title	**Elective IV: Advanced Construction Technology**	Course Code	**CEPE604/II**
Subject offered in Semester	**Sixth**	Number of Credits	**3 (L: 3, T: 0, P:0)**
Prerequisites	NIL	Course Category	**PE**
Question distribution	As per standing norms of WBSCT&VE&SD	Marks distribution	As per standing norms of WBSCT&VE&SD

Course Objectives: Following are the objectives of this course:

- To gain knowledge on different materials in advanced construction
- To know different methods in concreting.
- To know the relevance of advanced construction methods for particular site condition.
- To identify the requisite hoisting and conveying machinery for the given situation.

Module /Group [as per directives from WBSCT&VE&SD in framing questions of end semester]	**Distribution of unit**
Module A/Group A	Unit I and II
Module B/Group B	Unit III
Module C /Group C	Unit IV and V

Course Content:

Unit – I Advanced Construction Materials

- Fibres: Use and properties of steel, polypropylene, carbon and glass fibres.
- Plastics: Use and properties of PVC, RPVC, HDPE, GFRP, CFRP.
- Miscellaneous Materials: Properties and uses of acoustics materials, wall claddings, plasterboards, micro-silica, waterproofing materials, adhesives, PMC (Polymer modified concrete)

- Use of waste products and industrial by products in bricks, blocks, concrete and mortar.

Unit– II Advanced Concreting Methods and equipment

- Ready Mix Concrete: Necessity and use of ready mix concrete. Products and equipment for ready mix concrete plant. Conveying of ready mix concrete, transit mixers.
- Vibrators for concrete consolidation: Internal, needle, surface, platform and form vibrators.
- Underwater Concreting: Procedure and equipment required for Tremie method, Drop bucket method. Properties, workability and water cement ratio of the concrete.
- Special concrete: procedure and uses of special concretes: High Strength Concrete, High Performance Concrete, Roller compacted concrete, Self-compacting concrete (SCC), Steel fibre reinforced concrete, Foam concrete, Guniting, shotcreting.

Unit– III Advanced Technology in Constructions

- Construction of bridges and flyovers: equipment and machineries required for foundation and super structure.
- Construction of multi-storeyed Building: equipment and machinery required for construction of multi-storeyed building such as use of lifts, belt conveyors, slip-form, pumping of concrete.
- Prefabricated construction: Methods of prefabrication, Plant fabrication and site fabrication, All prefabricated building elements such as wall panels, slab panels, beams, columns, door and window frames etc. equipment and machineries used for placing and Jointing of prefabricated elements.
- Strengthening of embankments by soil reinforcing techniques using geo-synthetics

Unit– IV Hoisting and Conveying Equipment

- Hoisting equipment: Principles and working of Derrick-Pole, Gin Pole, Crane, Power driven scotch derrick crane, Hand operated crane, Locomotive crane, Tower crane,

Lattice Girder, Winches, Elevators, ladders. Crawler cranes, Truck mounted cranes, Gantry cranes, Mast cranes.

- Conveying equipment: Working of belt conveyors, types of belts and conveying mechanism. Capacity and use of dumpers, tractors and trucks.

Unit– V Miscellaneous Machinery and Equipment

- Excavation Equipment: Use, working and output of following machinery – bull dozers, scrapers, graders, Clam Shell, trenching equipment, Tunnel boring machine, Wheel mounted belt loaders, power shovels, JCB, and drag lines.
- Compacting Equipment: Output of different types of rollers such as plain rollers, ship footed rollers, vibratory, pneumatic rollers rammers.
- Miscellaneous Equipment: Working and selection of equipment: Pile driving equipment, Pile hammers, Hot mix bitumen plant, bitumen paver, grouting equipment, guniting equipment, floor polishing and cutting machine selection of drilling pattern for blasting, Bentonite/mud slurry in drilling, Explosives for blasting, Dynamite, process of using explosives.

Suggested learning resources:

- Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Publishing, New Delhi
- Chudly, R., Construction Technology Vol. I to II, ELBS-Longman Group.
- Peurifoy, R. L., Construction Planning Equipment and Methods, McGraw Hill Co. Ltd. New York.
- Seetharaman, S., Construction Engineering and Management, Umesh Publication, New Delhi.
- Sengupta, B. and Guha., Construction Management and Planning, McGraw Hill Education, New Delhi.
- Smith, R. C., Materials of Construction, McGraw Hill Co. Ltd.
- Satyanarayana, R Saxena, S. C., Construction Planning and Equipment, Standard Publication, New Delhi.

- Rangawala,S. C., Construction of Structures and Management of works, Charotar Publication, Anand.
- Ghose,D. N., Materials of Construction, McGraw Hill Publishing Co, New Delhi.

Course outcomes: After competing this course, student will be able to:

- Use relevant materials in advanced construction of structures.
- Use relevant method of concreting and equipment according to type of construction.
- Apply advanced construction methods for given site condition.
- Select suitable hoisting and conveying equipment for a given situation.
- Select advanced equipment required for a particular site condition

Name of the Course	**Diploma in Civil Engineering**	Course duration	6 semester
Course Title	**Entrepreneurship and Start-ups**	Course Code	
Subject offered in Semester	**Sixth**	Number of Credits	**3 (L: 3, T: 0, P: 0)**
Prerequisites	NIL	Course Category	**HS**
Question distribution	As per standing norms of WBSCT&VE&SD	Marks distribution	As per standing norms of WBSCT&VE&SD

Detailed course content will be provided by the council separately

Name of the Course	**Diploma in Civil Engineering**	Course duration	6 semester
Course Title	**Compulsory Open Elective: Open Elective I: Engineering Economics & Project Management**	Course Code	
Subject offered in Semester	**Sixth**	Number of Credits	**3 (L: 3, T: 0, P: 0)**
Prerequisites	NIL	Course Category	**OE**
Question distribution	As per standing norms of WBSCT&VE&SD	Marks distribution	As per standing norms of WBSCT&VE&SD

Detailed course content will be provided by the council separately

Name of the Course	**Diploma in Civil Engineering**	Course duration	6 semester
Course Title	**Open Elective II : one subject has to be taken from list of open elective subjects as provided by WBSCT&VE&SD**	Course Code	
Subject offered in Semester	**Sixth**	Number of Credits	**3 (L: 3, T: 0, P:0)**
Prerequisites	NIL	Course Category	**OE**
Question distribution	As per standing norms of WBSCT&VE&SD	Marks distribution	As per standing norms of WBSCT&VE&SD

Detailed course content of all subjects under open elective II will be provided by the council separately

Name of the Course	**Diploma in Civil Engineering**	Course duration	6 semester
Course Title	**Major Project II**	Course Code	**CEPR605S**
Subject offered in Semester	**SIXTH**	Number of Credits	**2 (L:0, T: 0, P: 4)**
Prerequisites	NIL	Course Category	**PR**
Question distribution		Marks distribution	As per standing norms of WBSCT&VE&SD

Objective: - Following are the objectives of this course:

- To prepare detailed cost estimate of building and various ancillary items of the project.
- To develop professional abilities such as preparation of tender documents and scheduling of the project.
- To develop presentation skill.
- To enhance creative thinking and combination of a complete civil engineering project.

The project report shall be in the following format:

(The project shall be undertaken by a group of 4 to 6 students)

- Topic and objectives
- Collection of data, required survey work,
- Management and construction procedure
- Resources scheduling and networking
- Design details
- Required drawing set
- Utility to society if any
- Conclusion

NOTE: Same Planning, Drawings and detailings of the problem given in the semester 4 will have be used in Major Project I and Major Project II in semester 5 and 6. All drawing will be done by using CAD

Contents:-

- Title of the Project:-Planning and designing of (G+2) Residential Complex for Middle Income Group.
- The details of the Project are given below:

- Each building (RCC framed structure) shall comprise of two symmetrical flat per floor each containing two rooms, bath, WC, kitchen, front verandah with a provision of common staircase and mumty for utilization of roof space and overhead water tank (around 210 sq m. covered area for each building unit and total 100 Nos of flat in the Complex of around 10000 sq m. of total land area) Ground floor to be used for parking spaces.
- The following provisions are to be considered during the project planning:- a) Security room(Single room with WC, Load bearing wall structure), b) Central Park, c) Play Ground, d) Hume Pipe Culvert in between the complex and the 12m wide main road, e) Boundary Wall with main gate, f) Submersible Pump, g) Pump House (Load bearing wall structure), h) Surface Drainage System, i) Bituminous road over WBM inside the complex etc.

1) The project report shall include detailed Estimate and costing of:-

(i) (G+2) Building Unit.

(ii) Security Room.

(iii) Pump House.

(iv) Boundary Wall with main gate.

(v) Submersible Pump.

(vi) Hume Pipe Culvert.

(vii) Bituminous road over WBM.

(viii) Surface Drainage System.

2) The detailed report shall contain total Cost of the Project, Bar Chart, Project completion time using CPM/PERT & Preparation of tender documents for NIT (Notice inviting tender).
(Rate should be taken as per West Bengal PWD Schedule w.e.f 01.11.2017 with latest Corrigendum.)

3) PPT Presentation of the whole projects group wise

Course outcomes: After completing this course, student will be able to:

- Solve the problem by working in a group.
- Estimate the total cost of the project.
- Prepare tender documents and NIT.
- Know about project scheduling.

Name of the Course	**Diploma in Civil Engineering**	Course duration	6 semester
Course Title	Seminar and Viva-voce	Course Code	**CESE606S**
Subject offered in Semester	Sixth	Number of Credits	1 (L: 1, T: 0, P:0)
Prerequisites	NIL	Course Category	**SE**
Question distribution		Marks distribution	As per standing norms of WBSCT&VE&SD

NOTE: Seminar will cover any topic(s) related to the subjects taught from semester 1 to semester 6. Viva-voce will cover any subject covered from semester 1 to semester 6.

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Computer Science & Engineering [CSE], Computer Science & Engineering [CST], Computer Software Technology [CSWT] & Information Technology [IT]

Part-III (6th Semester)

2023

West Bengal State Council of Technical & Vocational Education and Skill Development (Technical Education Division)

Semester VI

Sl. No	Category	Code No.	Course Title	Hours per			Total contact hrs/ week	Credits
				L	T	P		
1.	Program Elective course-4	COPE307/ ***	Program Elective-4 (any one) i) Data Sciences: Data Warehousing & Data Mining, ii) Cloud Computing.	3	1	0	4	4
2.	Humanities and Social Science course	HS302	Entrepreneurship and Start-ups	2	1	0	3	3
3.	Open Elective-1	OE301/* **	Open Elective-1 (Anyone) i)Engineering Economics and Project Management	3	0	0	3	3
4.	Open Elective-2	OE302/***	Open Elective-2 (any one) i) Machine Learning ii) Web Designing	3	0	0	3	3
5.	Major Project	PR302		0	0	6	6	5^
6.	Seminar	SE302		1	0	0	1	1
	Total Credits							**19**

*** Will be mentioned by the subject name.

^2 credit is carried forward from the Vth semester major project evaluation.

Total Credit Point = 82 (Sem 3,4,5,6)

Course Title: Data Warehousing & Data Mining	
Course Code	**COPC207**
Number of Credits: 4 - L: 3, T: 1, P: 0	
Prerequisites	**NIL**
Course Category	PC
Course code: CST	**Semester: Sixth**
Duration: 15 weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 4 hrs./week Total Contact Hours: 60 Hours	Continuous Internal Assessment: 20 Marks Attendance: 10 Marks Viva/Presentation/Assignment/Quiz etc.: 10 Marks End Semester Examination: 60 Marks

Aim of the Course

This course will introduce the concepts of data ware house and data mining, which gives a complete description about the principles, used, architectures, applications, design and implementation of data mining and data ware housing concepts.

Course Objectives

To introduce the student to various data warehousing and data mining techniques. The course will cover all the issues of KDD process and will illustrate the whole process by examples of practical applications.

✣ To make the student capable of applying data mining techniques in real time applications.

✣ To make the student capable to compare and contrast different conceptions of data mining as evidenced in both research and application.

✣ Explain the role of finding associations in commercial market basket data.

✣ Identify and characterize sources of noise, redundancy, and outliers in presented data.

✣ To get an idea about the data that how it is going to be classified into clusters.

Course Content:

Contents (Theory)	Hrs./Unit	Marks
UNIT 1: DATA WAREHOUSE	15	14

1.1 What Is a Data Warehouse? The need for a Separate Data Warehouse.

1.2 Data Warehouse Models: Enterprise Warehouse, Data Mart and Virtual Warehouse; 1.3 Differences between Operational Database Systems and Data Warehouses, Data Warehouse Modeling: Data Cube, Conceptual Modeling of Data Warehouse.

1.4 Concept Hierarchies, Measures: Their Categorization and Computation.

1.5 OLAP Operations, Operations in the Multidimensional Data Model (OLEP).

1.6 Data Warehouse Design and Usage, From Online Analytical Processing to Multidimensional Data Mining. Data Warehouse Implementation.

UNIT 2: INTRODUCTION TO DATA MINING	10	12
2.1 What is Data Mining? Process of Knowledge Discovery. 2.2 Types of Repositories, Data Mining Functionalities, Methods of presenting Derived Model. 2.3 Data Mining Tasks, Data Mining Trends, Data Mining Issues.		
UNIT 3: ASSOCIATION AND CORRELATION ANALYSIS	8	8
3.1 Basic Concepts, how does Association Rule Learning work? 3.2 The Apriori Algorithm: Basics 3.3 FP Growth Algorithm, Applications of Association Rule Learning.		
UNIT 4: CLUSTERING ALGORITHMS AND CLUSTER ANALYSIS	10	10
4.1 Unsupervised Learning basic idea. 4.2 Clustering Algorithms: K-Means Clustering, K-Medoids clustering (PAM), Hierarchical Clustering, Graph-Based Clustering. 4.3 Cluster Analysis basics, Cluster Evaluation 4.4 Outlier Detection and Analysis		
UNIT 5: CLASSIFICATION	10	8
5.1 Supervised Learning: Classification, Issues regarding Classification, Types of Classifiers: Binary Classification, Multiclass Classification. 5.2 Classification Approaches: Bayesian Classification-Naïve Bayes, Association based Classification, Rule-Based Classifier.		
UNIT 6: WEB MINING	**7**	8
6.1 Web Mining, Mining the web page layout structure. 6.2 Mining web link structure, mining multimedia data on the web. 6.3 Automatic classification of web documents and web usage mining. 6.4 Distributed Data Mining.		

Course outcomes

Student should be able to

Sl. No.	**Description**	**Bloom's Taxonomy Level**
1	**Understand** the functionality of the various data mining and data warehousing component	**Knowledge, Understand**
2	**Appreciate** the strengths and limitations of various data mining and data warehousing models	**Apply, Create**
3	**Explain** the analyzing techniques of various data	**Analyze**
4	**Describe** different methodologies used in data mining and data ware housing.	**Analyze**
5	**Compare** different approaches of data warehousing and data mining with various technologies.	**Evaluating**

Reference Books:

Name of Authors	Title of the Book	Edition	Name of the publisher
Arun K Pujari	Data Mining Techniques	3rd Edition	University Press
David Hand, Heikki Mannila, Padhraic Smyth,	Principles of Data Mining	2012Reprint, Eastern Economy edition	PHI Learning Private Limited
Jiawei Han and Micheline Kamber	Data Mining-Concepts and Techniques	Second Edition	Kaufmann Publishers
Vikaram Pudi, P Radha Krishna	Data Mining	2009	Oxford University Press
Pang-Ning Tan & Michael Steinbach & Vipin Kumar	Introduction to Data Mining,	2nd Edition	Pearson Education

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Course Title :	CLOUD COMPUTING
Course Code	COPE307/2
Number of Credits :4	4 (L: 3, T: 1, P: 0)
Prerequisites	Netwoking Concepts
Course Category	PC
Course code : CST	Semester : SIXTH
Duration : 15 weeks	Maximum Marks : 100
Teaching Scheme	Examination Scheme
Theory : - 4 hrs/week	Continuous Internal Assessment : 20 Marks
Lectures:-3hrs/week Tutorial: 1 hr/week	Attendance-10 Marks
Total Contact Hours:60 Hours	Viva/Presentation/Assignment /Quiz etc : - 10 Marks
Practical : NIL	End Semester Examination : 60 Marks
Aim:	**It will provide the students basic understanding about Cloud Computing, virtualization along with its security aspects and how one can migrate over it.**

Course Objectives:

1. **To learn the fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability; benefits, as well as current and future challenges.**
2. **To understand the basics of cloud delivery models.**
3. **To learn about different virtualization techniques that serve in offering software, computation and storage services on the cloud.**
4. **To Analyze the Strategies for Secure Operation the cloud and list of the security requirements**
5. **To comprehend the basic ideas of different cloud tools and applications.**

Course Content:

Contents (Theory)	Hrs	Marks	Module
UNIT 1: Cloud Computing Fundamentals	**11**	11	**A**

- **Origins of Cloud computing. Fundamental concepts and models, Roles and boundaries.**
- **Cloud components.**
- **On-demand self-service, Broad network access, Location independent resource pooling, Rapid elasticity, Measured service.**
- **Comparing cloud providers with traditional IT service providers, Roots of cloud computing**
- **Migrating to clouds.**

UNIT 2: Cloud Delivery Model	**11**	**11**	**A**

- ❖ **Cloud Delivery Models, The SPI Framework.**
- ❖ **Cloud Service Models.**
- ❖ **Cloud Deployment Models.**
- ❖ **Alternative Deployment models**
- ❖ **Expected benefits of the models.**

UNIT 3: Virtualization	12	12	B

- **Characteristics & Taxonomy of virtualization.**
- **Virtualization vs Private Cloud.**
- **Desktop Virtualization, Hardware Virtual Machine (HVM).**
- **Virtual Servers.**
- **Logical Network Perimeter, Network Virtualization**
- **Data Center virtualization, Cloud Storage Device, Cloud usage monitor, Resource replication.**

UNIT 4: Fundamental Cloud Security	14	14	B

- **Cloud Information Security Objectives.**
- **Cloud Security Services & Relevant Cloud Security Design Principles**
- **Secure Cloud Software Requirements.**
- **Secure Development practices, Approaches to Cloud Software Requirement Engineering.**
- **Privacy and Compliance Risks, Threats to Infrastructure,**
- **Data and Access Control, Cloud Service Provider Risks.**
- **Cloud Security Policy Implementation.**

UNIT 5: Cloud Tools and applications	12	12	C

- **Cloud Performance Monitoring tools**
- **General model for Application platform**
- **Apache Virtual Computing Lab, VMWare, CloudSim.**
- **Microsoft Cloud Services (-Azure), Google Cloud Applications, Amazon cloud services.**

Reference Books

1. **"Cloud Computing Concepts, Technology & Architecture"- Thomas Erl, Zaigham Mahmood, and Ricardo Puttini , PrenticeHall**
2. **"Cloud computing a practical approach" - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill**
3. **"Cloud Computing (Principles and Paradigms)"- Rajkumar Buyya, James Broberg, Andrzej Goscinski, John, Wiley & Sons**
4. **"Cloud Computing"-Shailendra Singh, Oxford**
5. **"Cloud Computing-A Practical approach for learning and Implementation"-A Srinivasan & J. Suresh, Pearson**

Course outcomes:

- **Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures**
- **Apply and design suitable Virtualization concept, Cloud Resource Management**
- **Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application**
- **Can understand the basics of security service models.**
- **Analyze the Strategies for Secure Operation the cloud architecture and list the security requirements.**

Unit No.	Unit Title	Group	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Cloud Computing Fundamentals	A	4	4	3	11

2.	Cloud Delivery Model	A	4	4	3	11
3.	Virtualization	B	4	4	4	12
4.	Fundamental Cloud Security	B	4	4	6	14
5.	Cloud Tools and applications	C	4	4	4	12
	Total		**20**	**20**	**20**	**60**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Course Title: Machine Learning	
Course Code	**OE302**
Number of Credits: 3 - L: 3, T: 0, P: 0	
Prerequisites	**Concept of AI**
Course Category	PC
Course code: CST	**Semester: Sixth**
Duration: 15 weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week Total Contact Hours: 45 Hours	Continuous Internal Assessment: 20 Marks Attendance: 10 Marks Viva/Presentation/Assignment/Quiz etc.: 10 Marks End Semester Examination: 60 Marks

Aim of the Course

This course will introduce the concept of Machine Learning through different learning methods.

Course Objectives

- **To learn the concept of how to learn patterns and concepts from data without being explicitly programmed**
- **To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.**
- **Explore supervised and unsupervised learning paradigms of machine learning.**
- **To explore Neural Network and Genetic Algorithm.**

Course Content:

Contents (Theory)	Hrs./Unit	Marks
Unit 1: Supervised Learning (Regression & Classification)	15	20

- ❖ **Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes**
- ❖ **Linear models: Linear Regression, Logistic Regression, Generalized Linear Models**
- ❖ **Introduction to Support Vector Machines, Nonlinearity and Kernel Methods**

Unit 2: Unsupervised Learning	7	10

- **Clustering: K-means/Kernel K-means**
- **Dimensionality Reduction: PCA and kernel PCA**
- **Matrix Factorization and Matrix Completion**

UNIT 3: Artificial Neural Network	8	10

- Neural network representation
- Perception
- Multilayer Network and Back Propagation Algorithm
- Illustrative Example: Face recognition

UNIT 4: Genetic Algorithm	8	10

- Representing Hypotheses
- Genetic Operators
- Fitness Function and Selection
- Hypothesis space search
- Genetic Programming

UNIT 5: Reinforcement Learning	7	10

- **Introduction**
- **The Learning Task**
- **Q Learning**
- **Temporal Difference Learning**

- **Note: Implementation of Machine Learning Algorithm by using suitable software can be done in Project work. Also seminar can be presented on topics of this subject.**

Course outcomes

Student should be able to

Sl. No.	Description	Bloom's Taxonomy Level
1	Understand the concept of machine learning.	**Knowledge, Understand**
2	Identify the regression and classification problem.	Analyze
3	Relate the supervised, unsupervised learning in the real life problem.	**Analyze**
4	Evaluate the machine learning models with respect to the performance parameters.	**Analyze**
5	Design and implement various machine learning algorithms in the range of real world problems.	**Design**

Reference Books:

Name of Authors	Title of the Book	Edition	Name of the publisher
Tom M. Mitchell	Machine Learning	-	Mc Graw Hill
Christopher Bishop	Pattern Recognition and Machine Learning	-	Springer
Rajiv Chopra	Machine Learning	-	Khanna Publishing House
Christopher M. Bishop	Pattern Recognition and Machine	-	Springer

	Learning		

Course Title: Web Designing	
Course Code	OE302/2
Number of Credits: 3 - L: 3, T: 0, P: 0	
Prerequisites	**NIL**
Course Category	PC
Course code: CST	**Semester: Sixth**
Duration: 15 weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week Total Contact Hours: 45 Hours	Continuous Internal Assessment: 20 Marks Attendance: 10 Marks Viva/Presentation/Assignment/Quiz etc.: 10 Marks End Semester Examination: 60 Marks

Aim of the Course

This course will introduce the concepts of PHP frameworks, which gives a complete description about the principles, used, architectures, applications, design and implementation of web development concepts. After the completion of course, students will get hands on experience on various techniques of web development and will be able to design and develop a complete website.

Course Objectives

The objective of this course is to provide the necessary knowledge to design and develop dynamic, database-driven web applications using PHP version 5. Students will learn how to connect to any ODBC-compliant database, and perform hands on practice with a MySQL database to create database-driven HTML forms and reports etc. Students also learn how to configure PHP and Apache Web Server. Comprehensive lab exercises provide facilitated hands on practice crucial to develop competence web sites.

Course Content:

Contents (Theory)	Hrs./Unit	Marks	Module
UNIT 1:	7	12	A

- Overview of PHP
- Static vs. Dynamic Web Sites
- Dynamic Content from Databases
- Developing Dynamic Internet Applications
- Client-Side Scripting vs. Server-Side Scripting
- Overview of PHP Advantages and Capabilities
- Configuring PHP.INI
- PHP vs. ASP
- Basic PHP
- echo and print Statements
- Comments in PHP
- PHP Case Sensitivity
- Defining variable and constant
- PHP Data Types
- PHP Operators

➢ Looping Constructs - while, do...while, for, for each			
UNIT 2:	5	10	A
➢ Introduction to the Apache Web Server - What is Apache? - The main benefits / advantages - Apache Installation - Apache Virtual Host - Name-based Virtual Hosts - IP-based Virtual Hosts ➢ PHP Functions - Introduction to Functions - User Defined Functions - Passing Arguments to Functions - Variable scope - Local and Global Scope - Passing Arguments by Reference - Returning Values from a Function - Using Include Files - The Require Statement - Dynamic Function Calls - Recursive Functions - Predefined PHP Functions ➢ PHP Arrays - What is an Array? - Why do we use arrays? - Indexed Arrays - Associative Arrays - Multidimensional Arrays - Sorting Arrays in PHP - Array Functions ➢ PHP MySQL Database and Forms			
UNIT 3:	10	10	B
➢ What is MySQL? - Queries - PHP's Database APIs - Configuring PHP for Database Support - MySQL vs. Access - MySQL vs. SQL Server - Forms and Program - Insert Data Into - Insert Multiple Records Into MySQL - HTTP GET, POST, And Request methods - Insert Data From a Form Into a Database - PHP MySQL Select (Retrieving Data from Forms) - PHP MySQL The Where Clause - PHP MySQL Order By Keyword - PHP MySQL Update - PHP MySQL Delete - Looping through database - PHP Functions Specific to MySQL ➢ Using Cookies with PHP - What is a Cookie? - How to Create a Cookie? - How to Retrieve a Cookie Value? - How to Delete a Cookie? ➢ PHP Sessions - What is a PHP Session - Starting a PHP Session - Storing and Retrieve Session Variable - Session Unset - Destroy A PHP Session ➢ Miscellaneous PHP Tasks - Error Logging - Using Environment Variables - PHP Redirect To Another URL - Getting IP Addresses from Visitors - PHP - Function preg_match()			
UNIT 4:	6	8	B
➢ PHP File Handling - String Functions ➢ E-Commerce Site - What is E-Commerce - E-commerce platforms on the market ➢ SQL Injection - Introduction ➢ PDO - Introduction ➢ Introduction to Frameworks ➢ Introduction to CMS (Content Management System) - WordPress ➢ AJAX ➢ Introduction to open Source CMF (Content management framework) - Codeigniter			
UNIT 5:	17	20	C
➢ Introduction to Codeigniter - What is a PHP Framework - MVC Pattern - Why Should we use a PHP Framework? - When to use a PHP Framework? - What are the Best PHP Frameworks Available? - Codeigniter Overview - CodeIgniter Features - CodeIgniter Basic Concepts and Application Architecture - Installing Codeigniter - Basic Configuration Options - Database Configuration - CodeIgniter - Application Architecture - Directory Structure - CodeIgniter - MVC Framework - Application URL Structure			

- Controller Introduction - Calling a Controller - Creating & Calling Constructor Method - Controller function - Interacting with views
- Views - Views- Introduction - Loading the View - Working with configuration layout - Creating custom layout - Controller variables and parameters - CodeIgniter URLs - Passing argument through url - Redirection - Form and Getting post data
- Models - Model Introduction - Creating Model Class - User defined function in model - Connecting to a Database - Automatic Connecting - Manual Connecting - Inserting Data to Database - Fetching data - Deleting data - Updating data
- Helpers - Helpers – Introduction - Array Helper, Cookie Helper, Date Helper, URL Helper, etc.. - Loading a Helper - Auto load Configuration
- Session Management - Initializing a Session - Add Session Data - To retrieve all session data - To remove all session data - Flashdata - Retrieve Flashdata
- Cookie Management

Course outcomes

Student should be able to

Sl. No.	Description	Bloom's Taxonomy Level
1	**Understand** the functionality of the various PHP syntax	**Knowledge, Understand**
2	**Appreciate** the strengths and limitations of PHP Frame Work	**Apply, Create**
3	**Explain** the analyzing techniques of CodeIgniter	**Analyze**
4	**Describe** different methodologies used in web Designing.	**Analyze**
5	**Compare** different approaches of web designing with various technologies. Develop different type of Web Application in 6th Semester Project work.	**Evaluating**

Note: Development of Web-page can be done as Project work. Also seminar can be presented on topics of this subject.

Reference Books:

Name of Authors	Title of the Book	Edition	Name of the publisher
Ullman	PHP for the Web: Visual Quick-Start Guide	5th Edition	Pearson
Thomas Myer	Professional CodeIgniter		John Wiley & Sons
Welling	PHP and MySQL Web Development	5th Edition	Pearson
Robin Nixon	Learning Php, MySQL & JavaScript: A Step-By-Step Guide to Creating Dynamic Websites	Second 6th Edition	SPD
Ray Harris	Murach's PHP & MySQL		SPD
Michael Morrison, Lynn Beighley	Head First PHP & MySQL		SPD

	A Brain-Friendly Guide		
Dr. Poornima G. Naik, Dr. Girish R. Naik	PHP Coding with CodeIgniter - Hands-on Experience with CodeIgniter		Educreation Publishing

Unit No.	Unit Title	Group	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Unit 1	A	4	6	2	12
2.	Unit 2	A	4	4	2	10
3.	Unit 3	B	4	2	4	10
4.	Unit 4	B	4	2	2	8
5.	Unit 5	C	4	6	10	20
	Total		**20**	**20**	**20**	**60**

Legends: R = Remember; U = Understand; A = Apply and above levels(Bloom's revised taxonomy)

Course Title: Major Project	
Course Code	PR302
Number of Credits: 5	
Prerequisites	**NIL**
Course Category	PC
Course code: CST	**Semester: Sixth**
Duration: 15 weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 6hrs./week Total Contact Hours: 90 Hours	Marks: 100

Aim of the Course

Student should able to present their Project work or any other advanced topic. (AI, Cloud computing, Data Mining etc.)

Course Objectives

1. To make them understand the concepts of Project Management for planning to execution of projects.

2. To make them understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation.

3. To enable them to comprehend the fundamentals of Contract Administration, Costing and Budgeting.

4. Make them capable to analyze, apply and appreciate contemporary project management tools and methodologies in Indian context.

Course Content:

This project work is a continuation of 5th Semester Project that can be done individually or in group on topic as described in 5th Semester syllabus.

1.Understand project characteristics and various stages of a project.
2. Understand the conceptual clarity about project organization and feasibility analyses – Market, Technical, Financial and Economic.
3. Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.

Course Title: SEMINAR	
Course Code	SE302
Number of Credits: 1	
Prerequisites	**NIL**
Course Category	PC
Course code: CST	**Semester: Sixth**
Duration: 15 weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 1 hrs./week Total Contact Hours: 15 Hours	Marks: 100

Aim of the Course

Student should able to present their Project work or any other advanced topic. (AI, Cloud computing, Data Mining etc.)

Course Objectives

1. Identify and compare technical and practical issues related to the area of course specialization.

2. Outline annotated bibliography of research demonstrating scholarly skills.

3. Prepare a well-organized report employing elements of technical writing and critical thinking.

4. Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

Course Content:

1. **Presentation can be done individually or in group**
2. **Presentation can be done on Project work**
3. **Presentation can be done on any advanced topic or emerging fields.**
4. **There should be sufficient number of slides.**
5. **Each student must present their presentation for at least 10 minutes.**
6. **Questions of audience must be answered.**

CO1 - Establish motivation for any topic of interest and develop a thought process for technical presentation.
CO2 - Organize a detailed literature survey and build a document with respect to technical publications.
CO3 - Analysis and comprehension of proof-of-concept and related data.
CO4 - Effective presentation and improve soft skills.

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Cyber Forensics & Information Security [CFS]

Part-III (6th Semester)

2023

WEST BENGAL STATE COUNCIL OF TECHNICAL & VOCATIONAL EDUCATION AND SKILL DEVELOPMENT

(A Statutory Body under West Bengal Act XXVI of 2013)

(Technical Education Division)

Karigari Bhavan, 4th Floor, Plot No. B/7, Action Area-III, Newtown, Rajarhat, Kolkata–700 160

WBSCTVESD Curriculum for Diploma Courses in Engineering and Technology

Semester – VI

(Cyber Forensics and Information Security Engineering)

6th Semester Cyber Forensics and Information Security Engineering							
Sl. No	Code No.	Course Title	Hours per week				Credits
			L	T	P	Contact Hours	
1.	CFS302	Web Application Security	3	0	0	3	2.5
2.		Program Elective-3	3	0	0	3	2.5
3.	HS302	Entrepreneurship and Start-ups	3	0	1	4	3
4.	OE301	Engineering Economics & Project Management (Open Elective-1)	3	0	0	3	3
5.		Open Elective-2	3	0	0	3	2.5
6.	CFS-PR302	Major Project	0	0	3	3	2
7.	CFS312	Seminar and Group Discussion	0	2	0	2	1
8.	CFS314	Web Application Security Lab	0	0	3	3	1.5
9.		Program Elective-3 Lab	0	0	3	3	1.5
10.		Open Elective-2 Lab	0	0	3	3	1.5
		Total	14	2	13	30	21

List of Program Elective-3 Courses [PE-3] [THEORY]

PE3-CFS304	Basics of Security Operations and Threat Modeling
PE3-CFS306	Malware: Detection and Prevention

List of Open Elective-2 Courses [OE-2] [THEORY]

OE2-CFS308	Network Security Management and Administration
OE2-CFS310	Internet of Things

List of Program Elective-3 Courses [PE-3] [PRACTICAL]

PE3-CFS316	Basics of Security Operations and Threat Modeling Lab
PE3-CFS318	Malware: Detection and Prevention Lab

List of Open Elective-2 Courses [OE-2] [PRACTICAL]

OE2-CFS320	Network Security Management and Administration Lab
OE2-CFS322	Internet of Things Lab

Detailed Curriculum Content for Semester-VI

Syllabus for Web Application Security (Theory)

Course Title	**Web Application Security**
Course Code: CFS302	Semester: Sixth
Duration: Six Months	Maximum Marks:100
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 48	Class Attendance: 10 Marks
Credit: 2.5	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	
Pre-Requisites: Networking and Communication Protocols, Operating Systems, Concepts of Web Applications.	

Course Objectives:

- Gain understanding of basic issues, concepts, principles and techniques in Web Application Security.
- Be able to detect and analyze the attacks in any web applications.
- Gain understanding of the underlying principles and techniques associated with penetration testing.

Course Outcomes: After completion of the course students will be able to learn the following major themes:

- Gain a good understanding of the basic issues and concepts of Web Application Security.
- Gain detailed knowledge of the principles and techniques of Web Application Security.
- Detection Systems for particular Web Application Security requirements.

Course Content

Unit-1 **3 hours**

1. Introduction to Web Application and Penetration Testing

1.1. Introduction to Web Technology
1.2. Understanding client server architecture
1.3. Understanding Client-Side and Server-side Language
1.4. Basics of HTTP/HTTPS Status Code, HTTP/HTTPS Header, Cookie Concepts
1.5. Understanding of details In-Scope and Out-of-Scope items
1.6. Concepts of CVSS Calculator

Unit-2 **9 hours**

2. **Framework for Web Application Security**

2.1. OWASP Top 10

2.1.1 Understanding of Open Web Application Security Project

2.1.2 Understanding of Top 10 Vulnerability

2.2 Sans Top 25

2.2.1 Understanding of SANS framework

2.2.2 Understanding of CWE Top 25

2.3 Mitre ATT&CK

2.3.1 Understanding of Mitre ATT&CK Framework

2.4 NIST Framework

2.4.1 Understanding of NIST Framework

Unit-3 **5 hours**

3 Web Vulnerabilities and Attack Scenarios

3.1 Burp Suite (Swiss Army knife of hackers)

3.1.1 Configure Burpsuite with Browser

3.1.2 Usage of Burpsuite - Spider, Repeater, Intruder, Sequencer

3.2 Learning Web Attack Scenario and Attack Surface

3.2.1 Understanding of Attack Surface

3.2.2 Client-Side Attack

3.2.3 Server-Side Attack

3.2.4 Cluster Attack

Unit-4 **8 hours**

4 Understanding Web services

4.1 Understanding Web services concepts

4.2 Types of API

4.3 REST API

4.4 **Subdomain and Directory enumeration**

4.4.1 Understanding of Directory and Subdomains

4.4.2 Find Subdomains

4.4.3 Discover sensitive files on Web Server

4.5 **Information gathering and Banner grabbing**

4.5.1 OSINT
4.5.2 Google Dorking
4.5.3 Shodan
4.5.4 Art of Banner Grabbing

Unit-5 **6 hours**

5 Authorization, Authentication and Broken Access Control

6.1 Difference Between Authentication and Authorization

6.2 Authentication Testing

6.2.1 Testing for Credentials Transported over an Encrypted Channel, Default Credentials, Weak Lock Out Mechanism, Bypassing Authentication Schema, Vulnerable Remember Password, Browser Cache Weaknesses, Weak Password Policy, Weak Security Question Answer, Weak Password Change or Reset Functionalities, Weaker Authentication in Alternative Channel

6.3 Broken Access Control

6.3.1 Understanding of Role Based Access Model

6.3.2 Testing for Improper Access Control, Bypassing Authorization Schema, Directory Traversal and Privilege Escalation

Unit-6 **15 hours**

7 Security Vulnerability Analysis

7.1 SQL Injection and it's types

7.1.1 Overview of RDBMS

7.1.2 SQL injection Attack Overview

7.1.3 Understanding of 1st order and 2nd Order SQL injection

7.1.4 SQL injection in GET Parameters and POST Body Parameters

7.1.5 In-Band

7.1.5.1 Error Based

7.1.5.2 Union Based

7.1.6 Inferential or Blind

7.1.6.1 Boolean Based

7.1.6.2 Time Based

7.1.7 Out of Band

7.1.8 Automation of SQL injection Attack with SQLmap

7.2 XSS and its types

7.2.1 Overview of Cross-site-Scripting

7.2.2 Reflected Cross-site Scripting

7.2.3 Stored Cross-site Scripting

7.2.4 Dom Based Cross-site Scripting

7.2.5 Blind Cross-site Scripting

7.3 Security Misconfigurations

- 7.3.1 Overview of Security Misconfiguration
- 7.3.2 Insecure default configurations
- 7.3.3 Incomplete or ad-hoc configurations
- 7.3.4 Cross-Origin resource sharing (CORS)
- 7.3.5 Verbose error messages
- 7.3.6 Open cloud storage
- 7.3.7 Misconfigured HTTP Headers

7.4 CSRF(Cross Site Request Forgery)

- 7.4.1 Overview of Cross Site Request Forgery
- 7.4.2 Different case studies to exploit CSRF Vulnerabilities
- 7.4.3 Methods to bypass CSRF Protection

7.5 IDOR(Insecure Direct Object Reference)

- 7.5.1 Concepts of Insecure Direct Object Reference
- 7.5.2 Different case studies to exploit IDOR

7.6 Vulnerable and outdated components with exploits

- 7.6.1 Methods to discover Vulnerable and outdated components in Target Website
- 7.6.2 Exploit Targets with known CVE/CWE

7.7 Heartbleed Attack

- 7.7.1 Concepts of Heartbleed Attack
- 7.7.2 Practical Demonstration of Heartbleed Attack

Unit-7 **2 hours**

8 CMS Application Penetration Testing

- 8.1 WordPress Penetration Testing Approach
- 8.2 Joomla Penetration Testing
- 8.3 Drupal Penetration Testing
- 8.4 Exploit other CMS Application

Syllabus for Basics of Security Operations and Threat Modeling (Theory)

Course Title	**Basics of Security Operations and Threat Modeling (Program Elective – 3)**
Course Code: PE3-CFS304	Semester: Sixth
Duration: Six Months	Maximum Marks:100
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 48	Class Attendance: 10 Marks
Credit: 2.5	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	
Pre-Requisites: Concepts of Cyber Security	

Course Objectives:

- Introduce the concepts of security operations and threats.
- Gain understanding of the technologies for security operations and threat categories.
- Be able to model security threats.

Course Outcomes: After completion of the course students will be able to learn the following major themes:

- Gain a good understanding of the core concepts related to security operations.
- Gain a good understanding of the technologies pertaining to security operations.
- Gain a good understanding of security threat categories and types.
- Gain detailed knowledge of some threat modeling methodologies.

Course Content

Unit-1 8 hours

1. Introduction

1.1. Cyber Space
1.2. Assets
1.3. Vulnerabilities
1.4. Threats
1.5. Risks
1.6. Safeguards
1.7. Cyber Situational Awareness

Unit-2 **8 hours**

2. Basics of Security Operations

2.1 People
2.2 Processes
2.3 Tools
2.4 Threat Intelligence
2.5 Written authorities
2.6 Enabling policies

Unit-3 **8 hours**

3. Technologies for Security Operations

3.1 Asset inventory
3.2 Network Mapping
3.3 Vulnerability Scanning
3.4 Network Monitoring
3.5 Host Monitoring and Defense
3.6 Security Information and Event Management (SIEM)
3.7 Incident Response (IR)

Unit-4 **10 hours**

4. Security Threat Categories and Types

4.1 Deliberate Threats, Accidental Threats and Environmental Threats
4.2 Physical Damage
4.3 Natural Events
4.4 Loss of Essential Services
4.5 Compromise of Information
4.6 Technical Failures
4.7 Unauthorized Actions
4.8 Compromise of Functions

Unit-5 **14 hours**

5. Threat Modeling Methodologies

5.1 STRIDE
5.2 PASTA
5.3 LINDDUN
5.4 CVSS
5.5 Attack Trees
5.6 Persona non Grata
5.7 Security Cards
5.8 hTMM
5.9 Trike
5.10 VAST Modeling
5.11 OCTAVE

Text books:

1. Frank Swiderski and Window Snyder, “Threat Modeling”, Microsoft Press.
2. William Stallings and Lawrie Brown, “Computer Security: Principles and Practice” Pearson.
3. Adam Shostack, “Threat Modeling: Designing for Security”, Wiley.

Reference books:

1. Joseph M Kizza, “Computer Network Security”, Springer Verlag.
2. Thomas Calabres and Tom Calabrese, “Information Security Intelligence: Cryptographic Principles & Application”, Thomson Delmar Learning.

Syllabus for Malware: Detection and Prevention (Theory)

Course Title	**Malware: Detection and Prevention (Program Elective-3)**
Course Code: PE3-CFS306	Semester: Sixth
Duration: Six Months	Maximum Marks:100
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 48	Class Attendance: 10 Marks
Credit: 2.5	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	
Pre-Requisites: Basic Concepts of Computer Networks and understanding of various types of attacks.	

Course Objectives:

- To study the fundamentals of malware.
- To set up a protected static and dynamic malware analysis environment.
- To detect, analyze, understand, control, and eradicate malware.

Course Outcomes: After completion of the course, students will be able to learn the following major themes:

- Learn various malware behavior monitoring tools and actionable detection signatures from malware indicators.
- Learn how to trick malware into exhibiting behaviors that only occur under special conditions.
- Learn how to detect, analyze, understand, control, and eradicate malware.
- Possess the skills necessary to carry out independent analysis of modern malware samples usin g both static and dynamic analysis techniques.
- Understanding of the executable formats, Windows internals and API, and analysis techniques.
- Extract investigative leads from host and network-based indicators associated with a malicious program.
- Apply techniques and concepts to unpack, extract, decrypt or bypass new anti-analysis techniques in future malware samples.
- Achieve proficiency with industry standard tools.

Course Content

Unit-1 **6 hours**

1. Introduction

1.1 Introduction to Malware Analysis
1.2 OS security concepts
1.3 Malware threats
1.4 Evolution of Malware
1.5 Malware types- viruses, worms, rootkits, Trojans, bots, spyware, adware, logic bombs
1.6 Malware analysis: Static, Dynamic
1.7 Static Analysis Techniques
1.8 Dynamic Analysis Techniques
1.9 Debugging and Disassembly Techniques
1.10 Obfuscation Techniques

Unit-2 **4 hours**

2. Malware Analysis

2.1 Types of Malwares
2.2 Analysis Technique
2.3 Malware sample
2.4 Setting up machine for Malware Analysis
2.5 Acquisition with Disk Imaging Tools, Memory Tools etc.

Unit-3 **12 hours**

3. Reverse Engineering

3.1 Introduction to Reversing
3.2 Reversing in depth theory
3.3 VA/RVA/OFFSET & PE File Format
3.4 String References & Basic Patching
3.5 Exploring the Stack
3.6 Algorithm Reversing
3.7 Windows Registry Manipulation
3.8 File Manipulation
3.9 Code Obfuscation
3.10 Analyzing Packer & Manual Unpacking
3.11 Debugging Multi-Thread Application

Unit-4 **8 hours**

4. Static Analysis

4.1 Identification of files – ASCII Files, Structured Files
4.2 Identification of Hashes
4.3 Identification of Strings – ASCII Strings, Unicode Strings
4.4 Using Sandbox and scanners
4.5 File Format Analysis
4.6 Obfuscation identification
4.7 Indicators of Compromise (IOCs)

Unit-5 **5 hours**

5. Obfuscation Techniques

5.1 What is Obfuscation
5.2 Decoding Base64, XOR, etc.
5.3 Packed Malware DE obfuscation
5.4 Anti-Analysis Techniques
5.5 Process Hollowing

Unit-6 **8 hours**

6. Behavior Analysis

6.1 Introduction
6.2 Dynamic Analysis
6.3 Windows Processes
6.4 Sysinternals Tools
6.5 System Processes and Services
6.6 Injection Techniques
6.7 Persistent Methods
6.8 Tools and Automation

Unit-7 **5 hours**

7. Debugging and Disassembly Techniques

7.1 Introduction
7.2 Debugging and Debuggers
7.3 Disassembly and IDA pro
7.4 Other Tools

Text books:

1. Practical malware analysis The Hands-On Guide to Dissecting Malicious Software by Michael Sikorski and Andrew Honig ISBN-10: 159327-290-1, ISBN-13: 978-1-59327-290-6,
2. Computer viruses: from theory to applications by Filiol, Eric Springer Science &BusinessMedia,
3. Android Malware by Xuxian Jiang and Yajin Zhou, Springer ISBN 978-1-4614-7393-0, 2005
4. Hacking exposed™ malware & rootkits: malware & rootkits security secrets & Solutions by Michael Davis, Sean Bodmer, Aaron Lemasters, McGraw-Hill, ISBN: 978-0-07-159119-5,
5. Windows Malware Analysis Essentials by Victor Marak, Packt Publishing, 2015
6. Michael Sikorski and Andrew Honig: Practical Malware Analysis, The Hands-On Guide to Dissecting Malicious Software. No Starch Press. ISBN: 978-1-593-27290-6
7. Monnappa K A: Learning Malware Analysis: Explore the concepts, tools, and techniques to analyze and investigate Windows malware. Packt Publishing. ISBN: 978-1788392501

Reference books:

1. Michael Hale Ligh, Steven Adair, Blake Hartstein and Matthew Richard: Malware Analyst's Cookbook and DVD: Tools and Techniques for Fighting Malicious Code. Wiley. ISBN: 978-0-470-61303-0
2. Chris Eagle: The IDA Pro Book: The Unofficial Guide to the World's Most Popular Disassembler Second Edition. No Starch Press. ISBN: 978-1-59327-289-0
3. "The Rootkit Arsenal: Escape and Evasion in the Dark Corners of the System" Second Editio n by Reverend Bill Blunden
4. "Rootkits: Subverting the Windows Kernel" by Jamie Butler and Greg Hoglund ISBN: 0321294319
5. "Practical Reverse Engineering" by Dang, Gazet, Bachaalany

List of open Source software/learning Websites:

- http://www.malware-analyzer.com
- http://resources.infosecinstitute.com/malware-analysis-basic-dynamic-techniques/#gref
- http://www.remux.org

Course Title	Entrepreneurship and Start-ups
Course Code	HS 302
Number of Credits	4
Pre Requisites	None
Total Contact Hours	4(L: 3; T: 1)/week = 60 hrs
Course Category	HS

Course Learning Objectives

1. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
2. To motivate and inspire students toward an entrepreneurial career.
3. To understand venture creation process and to develop generic entrepreneurial competences.
4. To introduce students to the basic steps required for planning, starting and running a business.
5. To familiarise students with the different exit strategies available to entrepreneurs.

Course Outcomes: After completing the course students will able to:

CO 1	Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
CO 2	Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
CO 3	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
CO 4	Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

Detailed Course Content

Unit	Name of the Topic	Hours

1.	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS**
	• Concept, Competencies, Functions and Risks of entrepreneurship
	• Entrepreneurial Values& Attitudes and Skills
	• Mindset of an employee/manager and an entrepreneur
	• Types of Ownership for Small Businesses
	  o Sole proprietorship
	  o Partnerships
	  o Joint Stock company- public limited and private limited companies
	• Difference between entrepreneur and Intrapreneur
		10

2.	**PREPARATION FOR ENTREPRENEURIAL VENTURES** • Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. • Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard	25

	Feasibility Study Report • Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan • Project Report- Concept, its features and components • Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. <u>They **may not** be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.</u>	
3.	**ESTABLISHING SMALL ENTERPRISES** • Legal Requirements for establishing a New Unit- o NOC from Local body o Registration of business in DIC o Statutory license or clearance • Various Compliances for companies o Registrar related Compliance o Non-Registrar Compliance o Tax compliances	05
4.	**START-UP VENTURES** • Concept & Features • Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical • Problems and challenges faced by start-ups. • Start-up Ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. <u>No questions are to be set from the case studies.</u>	05
5.	**FINANCING START-UP VENTURES IN INDIA** • Communication of Ideas to potential investors – Investor Pitch • Bootstrapping, Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups • Concept of incubation centre with special reference to WEBEL&BCCI Tech Incubation centre • Govt Initiatives to boost start-up ventures • MSME Registration for Start-ups –its benefits	10
6.	**EXIT STRATEGIES FOR ENTREPRENEURS** • Merger and acquisition exit, Selling stake to a partner or investor, Family & General Succession, Acqui-hiring, Management and employee buyouts (MBO), Initial Public Offering (IPO), Liquidation, Bankruptcy – **Basic Concept only**	05

Examination Scheme

- **End Semester Examination: 60 marks**

Suggested Question Paper Scheme for End Semester Examination

Group A: 20marks

Question Type	Number of questions to be set	Number of questions to be answered
MCQ, Fill in the blanks, True or False (Carrying 1 mark each)	25	20

Group B: 40marks

Question Type	Number of questions to be set	Number of questions to be answered
Short answer type question (Carrying 2 marks each)	8	4
Objective Type questions (Carrying 8 marks each)	8	4

- **Internal Assessment: 40 marks**
  - Class test : 20 marks
  - Assignment: 10 marks
  - Class attendance: 10 marks

Suggested Learning Resources

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of IndiaLearning Private Ltd
2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Caseson Entrepreneurship	Anjan Raichaudhuri	Prentice Hall of India Learning Private Ltd
6.	How to Start a Business in India	Simon Daniel	Buuks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development and Business Ethics	Abhik Kumar Mukherjee & Shaunak Roy	Oxford University Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

Syllabus Network Security Management and Administration (Theory)

Course Title	**Network Security Management and Administration (Open Elective-2)**
Course Code:OE2-CFS308	Semester: Sixth
Duration: Six Months	Maximum Marks:100
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 48	Class Attendance: 10 Marks
Credit: 2.5	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	
Pre-Requisites: Familiarization with Network components such as Router, Switch, LAN, Firewall etc.) and Computer networking.	

Course Objectives:

- Introduction to network management and Administration.
- Introduction to network faults and troubleshooting.

Course Outcomes: The students will be able to –

- Describe the different types of network directory services.
- Know the network management and administration.
- Apply the different types of network technologies for internet connection.
- Troubleshoot and repair the network faults.

Course Content

Unit-1 **5 hours**

1. Introduction

1.1 Duties of the System Administrator Linux as well as other OS Administrator, Steps of Installing and Configuring Servers.

1.2 Planning the Network – describing the Topologies, planning and Implementing the Security.

Unit-2 **20 hours**

2. Network Services

2.1. Configuring Printer

2.2. TCP/IP Networking – Understanding Network Class, Configuring the Network, Exploring Directory Services and Remote Network Access.

2.3. The Network File System – NFS overview, Configure an NFS Server, Configure an NFS Client, NFS Security.

2.4. Network Related Jobs – Network Administrator, Network Engineer, Network Architecture / Designer, Other Network Related Jobs.

2.5. Directory Services - Define Directory Services, Definition of Novelle Directory, Windows NT domains, Microsoft's Active Directory, X500 Directory Access Protocol, Lightweight Directory Access Protocol, Forests, Trees, Roots and Leaves. Configuring Samba Server

2.6. Active Directory Architecture – Object Types, Object Naming, Canonical Names, LDAP Notation, Globally unique identifiers, User Principle Names, Domain, Trees & Forests.

2.7. Remote Network Access – Need of Remote Network Access, Public Switched Telephone Network, Integrated Services Digital Network, Digital Subscriber Line, CATV.

2.8. Virtual Private Network – VPN Protocols, Types of VPNs, VPN Clients, SSL VPNs

Unit-3 **15 hours**

3. Network Connection and Printing Services

3.1 Dynamic Host Configuration Protocol (DHCP) – DHCP Origins, Reverse Address Resolution Protocol (RARP), The Bootstrap Protocol (BOOTP), DHCP Objectives, IP Address Assignment, DHCP Architecture.

3.2 Introduction to Domain Name System(DNS) - DNS Objectives, Domain Naming, Top Level Domains, Second Level Domains, Sub domains, DNS Functions, Resource Records, DNS Name Resolution, Resolves, DNS Requests, Root Name Servers, Resolving a Domain Name, DNS Name Registration.

3.3 Understand Network Printing Concepts - Understand Network Printing Concepts, locally connected print devices, setting up local print devices, Shared print devices, Sharing Locally Attached Print Devices, Describe Windows Network Printing, and Add Print Wizard

Unit-4 **9 hours**

4. Implementation of Network

4.1 Designing Network – Accessing Network Needs, Applications, Users, Network Services, Security and Safety, Growth and Capacity Planning, Meeting Network, Needs – Choosing Network Type, Choosing Network Structure, Choosing Servers.

4.2 Configuring a Database Server

4.3 Creating VNC Server

4.4 Providing Additional Network Services – Configuring a Time Server, Providing a Caching Proxy Server.

4.5 Optimizing Network Services

Unit-5 **9 hours**

5. Administering Windows and Linux Server (The Basics)

5.1 Working with User Accounts - Adding a User, Modifying User Account, Deleting or Disabling a User Account.

5.2 Working with Windows Security Groups – Creating Group, Maintaining Group Membership.

5.3 Working with Shares – Understanding Share Security, Cresting Shares, Mapping Drives

5.4 Administering Printer Shares – Setting up Network Printer,

Unit-6 **6 hours**

7. Troubleshooting and security of Network

7.1 Understanding the Problem – Troubleshooting, Segmenting the Problem, Isolating the Problem, Setting Priorities.

7.2 Troubleshooting Tools – Hardware Tools, Software Tools, Monitoring and Troubleshooting Tools

7.3 Internal Security – Account Security, File and Directory permissions, Practices and user education.

7.4 External Threats – Front Door threats, Back Door threats, Denial services threats, Viruses, worms and other Malicious codes

Text books:

Windows Portion:

1. Windows Server Security. A Technical Reference. Roberta Bragg. Addison-Wesley

Linux Portion:

2. Linux Administration Handbook. Second Edition. Evi Nemeth, Garth Snyder, Trent R. Hein. Prentice Hall

Reference Links:

- National Security Agency: http://www.nsa.gov/
- NIST, Computer Security Division, Computer Security Resource Center: http://csrc.nist.gov/
- Common Criteria for Information Technology Security Evaluation: http://www.commoncriteriaportal.org/
- U.S. Department of Homeland Security: http://www.dhs.gov/
- ITU (International Telecommunication Union: http://www.itu.int/
- Internet Society (ISOC): http://www.isoc.org/
- The Internet Engineering Task Force (IETF): http://www.ietf.org/
- Internet Architecture Board (IAB): http://www.iab.org/
- International Organization for Standardization (ISO): http://www.iso.org
- IEEE Computer Society: http://www.computer.org
- Association for Computing Machinery (ACM): http://www.acm.org/
- USENIX: The Advanced Computing Systems Association: http://www.usenix.org/

Syllabus for Internet of Things (Theory)

Course Title	**Internet of Things (Open Elective – 2)**
Course Code: OE2- CFS 310	Semester: sixth
Duration: Six Months	Maximum Marks:100
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 48	Class Attendance: 10 Marks
Credit: 2.5	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	
Pre-Requisites: Networking and Communication Protocols	

Course Objectives:

- Internet of Things (IoT) is presently an important technology with wide ranging interest from Government, academia and industry. IoT cuts across different application domain verticals ranging from civilian to defence sectors which includes agriculture, space, health care, manufacturing, construction, water, mining, etc. Today it is possible to build different IoT solutions such as shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems. Therefore, it is very important to learn the fundamentals of this emerging technology.

Course Outcomes: After completion of the course students will be able to learn the following major themes:

- Gain a good understanding of various aspect of IoT.
- Gain detailed knowledge of some IoT tools.
- Develop basic implementation skills of IoT.
- Understand how connected devices work together to update other applications.
- Acquire knowledge to interface sensors and actuators with microcontroller based Arduino platform.
- Writing C programs in Arduino IDE .

Course Content

Unit-1 **10 hours**

1. **Introduction to IoT**
   1.1. Fundamentals
   1.2. Sensing
   1.3. Actuation

Unit-2 **10 hours**

2. Networking

2.1 Basics of IoT Networking
2.2 Communication Protocols
2.3 Sensor networks

Unit-3 **10 hours**

3. Arduino Programming

3.1 Introduction to Arduino programming
3.2 Integration of Sensors/Actuators to Arduino

Unit-4 **10 hours**

4. Implementation

4.1 Implementation of IoT with Raspberry Pi
4.2 Data Handling Analytics

Unit-5 **8 hours**

5. Case Studies

5.1 Agriculture
5.2 Healthcare
5.3 Activity Monitoring

Text books:

1. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press.
2. Dr. Jeeva Jose, "Internet of Things", 2017, Khanna Publishing House.

Reference books:

1. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach" Universities Press.
2. Raj Kamal, "Internet of Things: Architecture and Design Principles", McGraw Hill Education.

List of open Source software/learning Websites:

- https://nptel.ac.in/noc/individual_course.php?id=noc17-cs22.

Syllabus Web Application Security (Practical)

Course Title	**Web Application Security Lab**				
Course Code: CFS314	Semester: Sixth				
Duration: Six months	Maximum Marks:100				
Teaching Scheme	Continuous Assessment-60			End Semester Assessment-40	
Practical: 3 hrs./week Total hours: 48	Assignments (to be allotted)	Class Performance	Class Attendance	Assignment on the day of Viva-voce	Viva-voce (Before Board of Examiners)
Credit: 1.5	30	20	10	20	20
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both continuous assessment and end semester Assessment separately.					
Pre-Requisites: Networking and Communication Protocols, Operating Systems, Concepts of Web Applications.					

Skills to be developed:

- Evaluate Intrusion Detection Systems for particular security requirements.
- Perform the entire penetration testing process including planning, reconnaissance, scanning, exploitation, post-exploitation and result reporting.

List of Laboratory Experiments:

LAB-I: 6 Hours

1. Setup LAMP and XAMP to replicant Web Server.
2. Web Penetration basics Lab **(**HTTP Status Code, HTTP Header, Cookie Concepts, details In-Scope and Out-of-Scope items and CVSS Calculator.

LAB-II: 8 Hours

1 Creating your own Web Pen-Testing box

1.1 Setup Attacking System with open-source tools -Recon-NG, SubFinder, Knockpy, Dirb, Gobuster, etc

1.1 Setup Browser extensions to speed up the Pen Testing

2 How to choose your tool wisely

2.1 Difference between others tools and limitation of each Tools

2.1 Choose own tools sets

3 Burp Suite (Swiss Army knife of hackers)

3.1 Configure Burpsuite with Browser

3.1 Usage of Burpsuite - Spider, Repeater, Intruder, Sequencer.

LAB-III: **Implementation of OWASP TOP 10.** 20 Hours

LAB-IV: 14 Hours

1 Vulnerable and outdated components with exploits

1.1 Methods to discover Vulnerable and outdated components in Target Website

1.2 Exploit Targets with known CVE/CWE

2 Heartbleed Attack

2.1 Concepts of Heartbleed Attack

2.2 Practical Demonstration of Heartbleed Attack

3 CMS Application Penetration Testing

3.1 WordPress Penetration Testing Approach

3.2 Joomla Penetration Testing

3.3 Drupal Penetration Testing

3.4 Exploit other CMS Application

Syllabus Basics of Security Operations and Threat Modeling (Practical)

Course Title	**Basics of Security Operations and Threat Modeling Lab (Program Elective-3)**				
Course Code: PE3-CFS316	Semester: Sixth				
Duration: Six months	Maximum Marks:100				
Teaching Scheme	Continuous Assessment-60			End Semester Assessment-40	
Practical: 3 hrs./week Total hours: 48	Assignments (to be allotted)	Class Performance	Class Attendance	Assignment on the day of Viva-voce	Viva-voce (Before Board of Examiners)
Credit: 1.5	30	20	10	20	20
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both continuous assessment and end semester Assessment separately.					
Pre-Requisites: Pre-Requisites: Concepts of Cyber Security					

Skills to be developed:

- Gain a good understanding of the technologies pertaining to security operations.
- Be able to perform threat modeling.

List of Laboratory Experiments:

LAB-I:	Network Monitoring and Vulnerability Scanning.	9 Hours
LAB-II:	Security Information and Event Management (SIEM).	9 Hours
LAB-III:	Threat Modeling using STRIDE.	10 Hours
LAB-IV:	Threat Modeling using Attack Graphs.	10 Hours
LAB-V:	Threat Modeling using OCTAVE.	10 Hours

References:

1. William Stallings and Lawrie Brown, “Computer Security: Principles and Practice”, Pearson.
2. Adam Shostack, “Threat Modeling: Designing for Security”, Wiley.

Bruce Schneier, “Secrets and Lies: Digital Security in a Networked World”, Wiley.

Syllabus Malware: Detection and Prevention (Practical)

Course Title	**Malware: Detection and Prevention Lab (Program Elective-3)**				
Course Code: PE3-CFS318	Semester: Sixth				
Duration: Six Months	Maximum Marks:100				
Teaching Scheme	Continuous Assessment-60			End Semester Assessment-40	
Practical: 3 hrs./week Total hours: 48	Assignments (to be allotted)	Class Performance	Class Attendance	Assignment on the day of Viva-voce	Viva-voce (Before Board of Examiners)
Credit: 1.5	30	20	10	20	20
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both continuous assessment and end semester Assessment separately.					
Pre-Requisites: Basic Concepts of Computer Networks and understanding of various types of attacks.					

List of Laboratory Experiments:

LAB-I:	Set up Sandbox to analyze malware.	2 Hours
LAB-II:	Evidence Acquisition using KAPE	2 Hours
LAB-III:	File Identification	6 Hours
LAB-IV:	Working with Windows Processes	8 Hours
LAB-V:	Reverse Engineering	20 Hours
LAB-VI:	Manual Unpacking	10 Hours

Syllabus Network Security Management and Administration (Practical)

Course Title	**Network Security Management and Administration Lab (Open Elective-2)**				
Course Code: OE2-CFS320	Semester: Sixth				
Duration: Six Months	Maximum Marks:100				
Teaching Scheme	Continuous Assessment-60			End Semester Assessment-40	
Practical: 3 hrs./week Total hours: 48	Assignments (to be allotted)	Class Performance	Class Attendance	Assignment on the day of Viva-voce	Viva-voce (Before Board of Examiners)
Credit: 1.5	30	20	10	20	20
Pass Criterion: Students have to obtain at least 40% marks(pass marks) in both continuous assessment and end semester Assessment separately.					
Pre-Requisites: Familiarization with Network components such as Router, Switch, LAN, Firewall etc.) and Computer networking.					

List of Practical:

Installation: 10 Hours

1. Creating Windows Server/Linux Boot Disk
2. Installing Windows Server/Linux
3. Installing Active Directory
4. Create new Users & give the Permission
    a) User and group administration
    b) Creating and deleting users from the system
    c) Modifying user's profile
    d) Creating and deleting groups
    e) Important system files related to user administration

Configuration 26 Hours

1. Configuring Linux as DHCP server
2. Configuring various clients for DHCP server (Windows & Linux)
3. Configure Network File Sharing Server
4. Mounting NFS exports on NFS clients
5. Configuring Apache Web Server
6. Configuring Apache for multiple sites using IP-based, port-based and name-based virtual hosting
7. Configuring FTP Server
8. Configuring SMTP services

9. Configuring POP3/IMAP service on Linux
10. Configuring samba to act as member server for Windows Network
11. Configuring samba service for file sharing with windows systems
12. Creating AD Objects
13. Setting up Local Print Device
14. Installing and Configuring a Network – Capable Print Device

Maintaining and Automation 8 Hours

1. Configure Backup and Disaster Recovery.
    a. Introduction to various types of backup media
    b. Backup and restoring data using dump / restore commands
    c. Backup and restoring using tar and CPIO commands
2. Configure Logging and Monitoring
3. Automating Administrative Tasks

Project: 4 Hours

1. Group of four students prepare a mini report on Latest Networking Technology

Syllabus Internet of Things (Practical)

Course Title	**Internet of Things Lab (Open Elective-2)**				
Course Code: OE2-CFS322	Semester: Sixth				
Duration: Six months	Maximum Marks:100				
Teaching Scheme	Continuous Assessment-60			End Semester Assessment-40	
Practical: 3 hrs./week Total hours: 48	Assignments (to be allotted)	Class Performance	Class Attendance	Assignment on the day of Viva-voce	Viva-voce (Before Board of Examiners)
Credit: 1.5	30	20	10	20	20
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both continuous assessment and end semester Assessment separately.					
Pre-Requisites: Networking and Communication Protocols, Operating Systems, Concepts of Web Applications.					

Skills to be developed:

After completing the module, the learner will be able to:

- Understand how connected devices work together to update other applications.
- Acquire knowledge to interface sensors and actuators with microcontroller based Arduino platform.
- Writing C programs in Arduino IDE
- Understand the Communication between microcontroller and PC using serial communication.
- Build IoT based applications and understand how data flows between things.

List of Laboratory Experiments:

LAB-I:	Experiments based on Arduino Programming	12 Hours
LAB-II:	Experiments based on Raspberry Pi.	12 Hours
LAB-III:	Networking for Raspberry Pi	12 Hours
LAB-IV:	Mini projects (using Arduino/Raspberry Pi) on topics like: Earthquake detector, RGB color mixer, LED controller, Smoke detection with MQ-2 detector, Home automation, Water monitoring system, Voice controller air purifier, Contactless IoT doorbell, IoT temperature and mask scan entry etc.	12 Hours

Seminar and Group Discussion [Code: CFS312]

The following topics are recommended but are not limited to:

Operating Systems and Networking Fundamentals

- Linux Fundamentals
- Tools in Kali Linux and System Security
- OS Security and Basics of Networking
- Network Security and Protocols.

Cryptography and Application Security

- Cryptography and Access Control
- Session Management and Web Security
- Web Technologies and Database Security
- File Security and Mobile Security

Cyber Security and Ethical Hacking

- Secure Development Methodologies and Cyber Security
- Ethical Hacking
- Anonymity and Information Gathering
- Advanced Reconnaissance and Network Scanning
- Enumeration

Web Application Hacking and OWASP

- Vulnerability Analysis and Introduction to Web Application Hacking
- Advanced Web Application Hacking
- SQL Injection and Tools
- Session Hijacking and OWASP

Steganography and Watermarking

- Spatial domain Steganography
- Transform domain Steganography
- Edge-based Steganography
- Fragile/Semi-fragile/Robust Watermarking
- Authentication and Access control using Watermarking

Firewall Web Application

- Inspecting and cleaning of the HTTP traffic between web application and the Internet
- Cross-site scripting
- File insertion

Blocking RFID

- Radio-frequency identification
- Software that prevents RFID readers from reading cards

Data leaks [Cloud Computing Environment]

- SQL injection in the database
- Safeguard the data and secure the privacy of the information from scammers

Major Project for 5th and 6th semester [Code: CFS-PR302]

- Duration of the Project: Six months + Six months [Total approx. engagement 96 hours]
- All students must submit the project report duly signed by the project guide after completion of the major project. Students must undergo the following phases while they are developing their projects:

Project Plan

A project plan is a blueprint of the entire project. A well-designed project plan should determine the list of activities, outcomes of the activities, the time frame, dependencies, constraints involved etc.

Making the project proposal

- Problems and solutions
- Framework
- List of equipment [Software and Hardware]

Design of the project

Title selection and overview of the project.
Project topics may be solicited from the Industries, Government Organizations and Research Institutes.

Project Execution

Project execution plan is to be developed that identifies, prioritizes, and assigns the tasks and resources required to execute the activities of the project.

Monitoring and Controlling phase

In the monitoring and controlling phase the project guide or faculty member(s) monitors the overall progress of the project through weekly meeting / discussion with the students and giving necessary instructions.

Preparation of project report:

A project report can be defined as a written document that contains detailed information about the project. It should include the table of contents, acknowledgement, and specific sections on the motivation of the project, problem definition, related work, methodology undertaken for solving the problem, implementation details, results and discussion, possible future work, and references. All commented source code and / or circuit details are to be included.

Presentation of the Project:

Final phase of the project is to prepare and deliver a Power point Presentation about the entire project followed by viva-voce.

Specific areas of interest in the Major Project include (but are not limited to):

1) Keylogging Attacks and Remedies

2) Packet Sniffing

3) Bug Bounties

4) Breaking Shift Cipher

5) SQL Injection Attacks and Remedies

6) Password Cracking and Strengthening

7) Blocking RFID

8) Hacking an Offline Device

9) Image Encryption and Steganography

10) Detection and Prevention of Malware

11) Study of Online Fund Transfer methods and relevant Encryption

12) Study of One-way Hash Function and Signature Generation

13) ***USB storage device Scanner***

14) Web Application Firewall

15) Bug tracking

16) Secure File Storage System

17) ***Data Acquisition for Forensic Analysis***

18) ***Reverse Engineering***

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Electrical & Electronics Engineering [EEE]

Part-III (6th Semester)

2023

EEE-6thSemester Detailed Syllabus

Sl.No	Category of course	Code No	Course Title	Credits	Marks	Total Contact Hours per Week	
						L	P
1	Program Core Course	**EEPC302**	Energy conservation and Audit	3	100	3	0
2	Program Core Course	**EEPC304**	Energy conservation and Audit Laboratory	1	100	0	2
3	Program Elective course IV	**EEPE 302/1**	**Any one of the following subjects to be chosen** 1.Industrial Instrumentation and Condition Monitoring	3	100	3	0
		EEEPE 302/2	2. Maintenance of Electronic Equipments				
		EEEPE 302/3	**3.** Data Communication and Computer Networking				
4	Program Elective course IV Lab	**EEPE 304/1**	**Any one of the following subjects to be chosen** 1.Industrial Instrumentation and Condition Monitoring lab	1	100	0	2
		EEEPE 304/2	2 Maintenance of Electronic Equipments Laboratory				
		EEEPE 304/3	3.Data Communication and Computer Networking Laboratory				
5	Humanities and Social Science	**HS302**	Entrepreneurship and Start-ups	3	100	3	0
6	Open Elective course-I	**OE302**	Engineering Economics and Project Management	3	100	3	0
7	Open Elective course- II	**OE304**	**Any one of the following subjects to be chosen.** i. Mechatronics ii. Disaster management iii. Internet of Things iv. Environmental Engineering and Science v. Industrial Management vi. Sustainable development vii. Industrial Safety Engineering viii. Medical Electronics	3	100	3	0
8	Major Project	**PR302**		2	100	0	4
9	Seminar	**SE302**		2	100	0	4
	Total			**21**	**900**	**15**	**12**
Total contact hrs= 27hrs/week							

****NB: The following subject codes are similar with Diploma Electrical Engineering Syllabus: EEPC 302, EEPC 304, EEPE 302/1, EEPE 304/1**

- **Student contact hrs./ week =27**
- Theory and practical periods of 60 minutes each
- Abbreviation: L: Lecture class; P: Practical class
- **For Theoretical subjects:** Internal Assessment (40 Marks): Mid semester class test: 20 Marks; Quizzes, viva-voce, Assignment: 10 Marks; Attendance: 10; External Assessment: 60 Marks.
- **For Practical/ Sessional Subjects:** Internal Assessment-60 Marks [Continuous Evaluation:50; Class Attendance:10]; End Semester Assessment-40 Marks [Assignment on the day of Viva-voce and Practical Report submission:20; Viva-voce:20]
- To make the students more familiar with software, effort should be made to prepare laboratory report (like graph; data table etc.) in soft format in addition with traditional hard copy wherever possible.

Course Code	:	EEPC302
Course Title	:	**ENERGY CONSERVATION AND AUDIT**
Semester		6
Number of Credits	:	3 (L:3,T:0,P:0)
Prerequisites	:	NIL
Course Category	:	PC

Course Objective

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

1. Know energy conservation in various electrical machines and electrical installation systems.
2. Know Energy conservation through Cogeneration and Tariff.
3. Know energy audit of electrical systems.

Contents(Theory)		Hrs./Unit
Unit:1	**Energy Conservation Basics:** 1.1 Energy Scenario: Primary and Secondary Energy, Energy demand and supply, National scenario. 1.2 Energy conservation and Energy audit– concept, need and difference. 1.3 Indian Electricity Act2003; relevant clauses of energy conservation 1.4 BEE and its Roles in energy conservation 1.5 Star Labelling: Concept, Need and its benefits.	**04**
Unit:2	**Energy Conservation in Electrical Machines:** 2.1 Need for energy conservation in induction motor and transformer. 2.2 Energy conservation techniques in induction motor by– i) Improving Power quality. ii) Motor survey. iii) Matching motor with loading. iv) Minimizing the idle and redundant running of motor. v) Operating in star mode lower output power. vi) Rewinding of motor. vii) Replacement by energy efficient motor viii) Periodic maintenance 2.3 Energy conservation techniques in Transformer by– i) Load sharing ii) Parallel operation iii) Isolating techniques. iv) Replacement by energy efficient transformers. v) Periodic maintenance. 2.4 Energy Conservation Equipment: i) Soft starter ii) Automatic star delta converter	**11**

	iii) Variable Frequency Drives iv) Automatic p.f. controller (APFC) v) Intelligent p.f. controller(IPFC) 2.5 Energy efficient motor–features, advantages, applications and limitations. 2.6 Energy efficient transformers, amorphous transformers, epoxy Resin cast transformer /Dry type of transformer.	
Unit:3	**EnergyconservationinElectrical Installationsystems:** 3.1 Aggregated Technical and commercial losses (AT&C) – Power system at state, regional, national and global level. 3.2 Causes of Technical losses and measures to reduce it– i) Controlling I^2R losses ii) Optimizing distribution voltage iii) Balancing phase currents iv) Compensating reactive power flow v) Demand side management 3.3 Causes of Commercial losses and measures to reduce it– i) In meter reading ii) In metering iii) Theft of electricity by any means 3.4 Energy conservation equipment: Maximum Demand Controller, KVAR Controller, Automatic Power Factor controller (APFC); Active harmonic filter. 3.5 Energy Conservation in Lighting System– i) Replacing Lamp sources. ii) Using energy efficient luminaries. iii) Using light controlled gears. iv) Installation of separate transformer/ servo stabilizer for lighting. v) Periodic survey and adequate maintenance programs. 3.6 Energy Conservation techniques in fans, Electronic regulators. 3.7 Techniques of Energy Saving in Ventilating systems and Air Conditioners 3.8 Techniques of Energy Saving in Furnace , Ovens and Boiler.	**12**
Unit:4	**Energy conservation through Cogeneration and Tariff:** 4.1 Co-generation and Tariff–concept, significance for energy conservation 4.2 Co-generation – Types of cogeneration on basis of sequence of energy use (Topping cycle, Bottoming cycle) 4.2.1 Types of cogeneration basis of technology (Steam turbine cogeneration, Gas turbine cogeneration, Reciprocating engine cogeneration). 4.2.2 Factors governing the selection of cogeneration system. 4.2.3 Advantages of cogeneration. 4.3 Tariff: Types of tariff structure: Special tariffs; Time-off-day tariff, Peak-off-day tariff, Power factor tariff, Maximum Demand tariff, Load factor tariff. Application of tariff system to reduce energy bill. 4.4 Energy conservation by improving load factor and power factor.	**09**
Unit:5	**Energy Audit of Electrical System:** 5.1 Energy audit (definition as per Energy Conservation Act). 5.2 ABC analysis–its need and application.	**09**

	5.3 Energy audit instruments and their use. 5.4 Questionnaire for energy audit projects. 5.5 Energy flow diagram (Sankey diagram) and its importance. 5.6 Calculation of simple payback period for energy conservation equipment. Energy Audit procedure (walkthrough audit and detailed audit). 5.7 Energy Audit report format. 5.8 Numericals on energy audit.	
	Total	**45**

References:

1. Guide Books No. 1 and 3 for National Certification Examination for Energy Managers and Energy Auditors, Bureau ofEnergy Efficiency (BEE), Bureau of Energy Efficiency (A Statutory body under Ministry of Power, Government of India)(FourthEdition 2015).

2. O.P.Gupta, Energy Technology, Khanna Publishing House, New Delhi

3. Henderson,P.D.,India -The EnergySector,UniversityPress,Delhi,2016.ISBN: 978-0195606539

4. Turner,W.C.,EnergyManagement Handbook,Fairmount Press,2012,ISBN9781304520708

5. Sharma,K.V.,Venkataseshaiah;P.,Energy Management and Conservation,IKInternational Publishing House Pvt.Ltd; 2011 ISBN9789381141298

6. Mehta,V.K.,Principleso f PowerSystem,S.Chand&Co.NewDelhi,2016,ISBN9788121905947

7. Singh, Sanjeev; Rathore, Umesh, Energy Management, SK Kataria & Sons, NewDelhi ISBN-13: 9789350141014.

8. Desai,B.G.;Rana,J.S.;A.Dinesh,V.;Paraman,R.,Efficient Use and Management of Electricity in Industry,DevkiEnergyConsultancy Pvt. Ltd.

9. Chakrabarti, Aman, Energy Engineering And Management, e-books Kindle Edition

CourseOutcomes:

The theory 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 energy conservation policies in India.
b) Know energy conservation techniques in electrical machines & implement it.
c) Know different types of measuring instruments for measuring electric power.
d) Apply energy conservation techniques in electrical installations.
e) Use Co-generation and relevant tariff or reducing losses in facilities.
f) Know energy audit for electrical system and apply It for real cases.

InternalAssessment(40Marks)		
MidSemesterClassTest:20Marks	Quizzes,viva-voce,Assignment:10Marks	Attendance:10
External Assessment(End Semester Examination:60Marks)		

GROUP	UNIT
A	1,2
B	3
C	4,5

Course Code	:	EEPC304
Course Title	:	**ENERGY CONSERVATION AND AUDIT LABORATORY**
Number of Credits	:	1(L:0,T:0,P:2)
Prerequisites	:	NIL
Course Category	:	PC

Course Objective

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences –

1. Apply energy conservation in various electrical machines and electrical installation systems.
2. Apply Energy conservation through Cogeneration and Tariff.
3. Apply energy audit in electrical systems

List of Practicals: (At least EIGHT are to be performed)

1. Experiment to compare power consumption of different types of TL with electromagnetic ballast, electronic ballast and LED lamps by direct measurements and estimate energy saving.
2. Experiment to determine the reduction in power consumption in star mode operation of Induction motor compared to delta mode at different load conditions.
3. Experiment to estimate energy saving by improving power factor using PFC/APFC for an electrical load.
4. Experiment to estimate energy saving by improving load factor for an establishment.
5. Perform experiment to determine the reduction in power consumption by replacement of Fans and regulators in a class room / laboratory.
6. Collect electricity bill of a residential consumer and suggest suitable means for energy conservation and reduce consumption.
7. Prepare an energy audit report (Phase-I, Phase-II, Phase-III) for a Workshop/ Institute.
8. Identify star labeled electrical apparatus and compare the data for various star ratings.
9. Collect electricity bill of a commercial consumer and suggest suitable tariff for energy conservation and reduction of its energy bill
10. Collect electricity bill of an industrial consumer and suggest suitable tariff for energy conservation and its impact on energy bill.
11. Prepare a sample energy audit questionnaire for the given industrial/Commercial facility.
12. Energy flow diagram (Sankey diagram) through EMS software Web Link : demo.ecostruxure-power monitoring-expert. se.app/Web ;User ID : demo; Password : demo

Course Outcomes

The theory, practical 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 energy conservation policies in India.
b) Implement energy conservation techniques in electrical machines.
c) Apply energy conservation techniques in electrical installations..

d) Use Co-generation and relevant tariff for reducing losses in facilities.
e) Apply energy audit for electrical system.

EXAMINATION SCHEME(SESSIONAL)

1. Continuous Internal Assessment of 60 marks is to be carried out by the teachers throughout the fourth Semester. Distribution of marks: Continuous evaluation:50 Marks; Class Attendance: 10 Marks

2. External Assessment (end Semester examination) of 40 marks shall be held at the end of the sixth Semester on the entire syllabus. Assignment on the day of Viva-voce and practical report submission:20; Viva-voce:20

CourseCode	:	EEPE302/1
Course Title	:	**INDUSTRIAL INSTRUMENTATION AND CONDITION MONITORING**
Number of Credits	:	3 (L:3,T:0,P:0)
Prerequisites	:	NIL
Course Category	:	PE

Course Objective

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences –

- Knowledge about different transducers.
- Know about of signal conditioning.
- Know about condition monitoring.

Contents(Theory):		**Hrs./Unit**
Unit:1	Fundamentals of instrumentation 1.1 Basic purpose of instrumentation. 1.2 Basic block diagram (transduction, signal conditioning, signal presentation) and their functions. 1.3 Construction, working and application of switching devices- Push button, limit switch, float switch, pressure switch, thermostat, electromagnetic relay.	**4**
Unit:2	Transducers 2.1 Concept of Transducers. 2.2 Distinguish between Transducers: 2.2.1 Primary and Secondary Transducers. 2.2.2 Electrical and Mechanical Transducers. 2.2.3 Analog and Digital Transducers. 2.2.4 Active and passive Transducers. 2.3 Advantages of electric transducers. 2.4 Required characteristics of transducers. 2.5 Factors affecting the choice of transducers. 2.6 Construction, working principle and application (with diagram & explanation) of following transducers: 2.6.1 RTD, Thermistor, Thermocouple. 2.6.2 Potentiometer (various types) 2.6.3 Strain gauge (No derivation only formula) Types of strain gauges like unbonded, bonded and semiconductor 2.6.4 LVDT and RVDT, measurement for displacement, Piezoelectric transducer. 2.6.5 Contact and non-contact type tachometer for speed measurement. 2.6.6 Construction and Working of Flow measurement by electromagnetic and Turbine Flow meter.	**10**

Unit:3	**Operational Amplifier** 3.1 Different Parameters of op-amp: Input offset voltage, Input offset current, Input bias current, Differential input resistance, CMRR, SVRR, voltage gain, output voltage, slew rate, gain band- width. Output, short circuit current. 3.2 Use of op-amp (IC-741) as adder, subtractor, integrator, differentiator, comparator. 3.3 Instrumentation Amplifier.	**6**
Unit:4	**Signal conditioning:** 4.1 Basic Concept of signal conditioning System. 4.2 Block diagram of AC and DC signal conditioning and working. 4.3. V to I converter, I to V converter, V to F converter. 4.4 Filters - Types and frequency response (No derivation) and circuits. 4.5 Multiplexing – Fundamentals, different types. 4.6 Sample and hold circuits - operation and its application	**8**
Unit:5	**Data Acquisition System** 5.1 Generalized DAS- Block diagram and description of Transducer, signal conditioner, multiplexer, converter and recorder. 5.2 Draw Single Channel and Multi-channel DAS- Block diagram only. Difference between Signal Channel and Multi-Channel DAS. 5.3 Concept of electrical and electronic data transmission- serial, parallel, synchronous, asynchronous. 5.4 Digital display device- operation and its application of seven segment display, dot matrix display and concept of 3½, 4½ digits, LED and LCD applications.	**7**
Unit:6	**Condition Monitoring and Diagnostic Analysis** 6.1 Definition of condition monitoring 6.2 Condition monitoring of: power transformer, electrical motors, alternators and circuit breakers - purpose and key benefits. 6.3 Test for condition monitoring: Insulation resistance, tan delta test and Polarization index, partial discharge test, transformer oil breakdown voltage test. 6.4 Concept of thermal imaging for condition monitoring.	**10**
	Total	**45**

References:

1. Sawhney, A.K. Electric and Electronic Measurement and instrumentation, Dhanpat Rai and Co.Author, Nineteenth revised edition 2011 reprint, 2014, ISBN:10: 8177001000
2. Rangan, C.S. G.R.Sharma. andV.S.V.Mani, Instrumentation devices and system, Pen ram International Publishing India Pvt. Ltd. Fifth edition, ISBN:10: 0074633503
3. Mehta, V.K. Electronics and instrumentation, Third edition-S.Chand and company Pvt Ltd Re-print, 2010, ISBN:81-219-2729-3
4. Singh, S.K. Industrial instrumentation and control, Tata McGraw-Hill, 1987. ISBN: 007451914X, 9780074519141.
5. J.G. Joshi, Electronic Measurement and Instrumentation, Khanna Publishing House, New Delhi(ISBN: 978-93-86173-621).
6. Rao,BVSAsiaClubHouse,FirstReprint,2011,OperationandMaintenanceofElectricalEquipment Vol-I, ISBN No 8185099022 7. Tarlok Singh; S. K. Kataria and Sons; Installation, Commissioning and Maintenance of Electrical Equipments.

Course outcomes:

The theory 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) Understand electrical transducers for measurement of electrical quantities and to select relevant transducers according to the applications.

b) Understand non-electrical transducers for measurement of non-electrical quantities and to select relevant transducers according to the applications.

c) Know about operational amplifier and its use in the field of instrumentation.

d) Know about signal conditioning system for their proper functioning.

e) Interpret data acquisition systems in various applications.

f) Undertake condition monitoring for diagnostic analysis of electrical equipment.

Internal Assessment(40Marks)		
Mid Semester Class Test: 20 Marks	Quizzes, viva-voce, Assignment: 10Marks	Attendance:10
External Assessment (End Semester Examination: 60Marks)		
GROUP	UNIT	
A	1,2	
B	3,4	
C	5,6	

Course Code	:	EEPE304/1
Course Title	:	**INDUSTRIAL INSTRUMENTATION AND CONDITION MONITORING LABORATORY**
Number of Credits	:	1 (L:0,T:0,P:2)
Prerequisites	:	NIL
Course Category	:	PE

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

• Use instrumentation equipment for condition monitoring and control.

Practicals

List of Practical:(atleastEIGHTareto bedone)	
1.	Identify float, proximity, limit switches, push button, pressure switch, thermostat, electromagnetic relay used in instrumentation system.
2.	Measure linear displacement by L.V.D.T.
3.	Measure the strain with the help of strain gauge.
4.	Measure temperature by PT-100, thermistor, thermocouple along with simple resistance bridge.
5.	Use Thermocouple to control the temperature of a furnace/machine
6.	Measure angular speed of rotating machine using stroboscope and tachometer.
7.	Measure the flow using flow meter (Electromagnetic/turbine).
8.	Use op-amp(IC-741) as differentiator.
9.	Use op-amp(IC -741) as integrator.
10.	Use op-am p(IC-741)as instrumentation amplifier.
11.	Break Down Voltage test of transformer oil.
12.	Visit to testing center of electrical testing lab for tan delta and diagnostic tests and determine polarization index.
13.	Prepare a Report on various tools and equipment used for condition monitoring of electrical machines.
14.	Use of infrared camera for thermal imaging of electrical equipment..

Course outcomes:

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) Select relevant instruments used for measuring electrical and non-electrical quantities.
b) Select relevant transducers/sensors for various applications.
c) Use relevant instruments for measuring non-electrical quantities.
d) Check the signal conditioning system for their proper functioning.
e) Use data acquisition systems in various applications.
f) Undertake condition monitoring for diagnostic analysis of electrical equipment.

Course Code	:	EEEPE302/2
Course Title	:	**Maintenance of Electronic Equipments**
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PE

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

Contents(Theory):		**Hrs/Unit**
Unit:1	**Fundamental Troubleshooting Procedures Inside an Electronic Equipment** a) Fundamental Troubleshooting Procedures b) Inside An Electronic Equipment: Reading Drawings And Diagrams – Block Diagram, Circuit Diagram, Wiring Diagram; c) Dis-assembly and re-assembly of equipment, d) Equipment Failures and causes such as poor design, production deficiencies, careless storage and transport, inappropriate operating conditions, e) Nature of faults, Fault location procedure, Fault finding aids – Service and maintenance manuals and instruction manuals, f) Test and Measuring instruments, special tools Troubleshooting techniques, Approaching components for tests, g) Grounding systems in Electronic Equipment, h) Temperature sensitive Intermittent problems Corrective actions, Situations where repairs should not be attempted.	**10**
Unit:2	**Passive Components and Their Testing** a) Passive Components and Their Testing Passive Components- Resistors, Capacitors, Inductors b) Failures in fixed resistors, testing of resistors, variable resistors, variable resistors as potentiometers, failures in potentiometers, testing of potentiometers, servicing potentiometers, LDRs and Thermistors c) Types of capacitors and their performance, Failures in capacitors, testing of capacitors and precautions therein, variable capacitor types, d) Testing of inductors and inductance measurement	**10**
Unit:3	**Testing of Semiconductor Devices** a) Testing of Semiconductor Devices Types of semiconductor devices, b) Causes of failure inSemiconductor Devices, Types of failure c) Test procedures for Diodes, special types of Diodes, Bipolar Junction Transistors, Field Effect Transistors, Thyristors Operational Amplifiers, d) Fault diagnosis in op-amp circuits	**07**

Unit:4	**IC Testing** a) Logic IC families, Packages in Digital ICs, IC identification, IC pin-outs, Handling ICs, b) Digital troubleshooting methods – typical faults, testing digital ICs with pulse generators Logic clip, Logic Probe, Logic Pulser, Logic Current Tracer, Logic Comparator c) Special consideration for fault diagnosis in digital circuits d) Handling precautions for ICs sensitive to static electricity Testing flip-flops, counters, registers, multiplexers and de-multiplexers, encoders and decoders; e) Tri-state logic.	**10**
Unit:5	**Repairing of Surface Mount Assemblies** a) Rework and Repair of Surface Mount Assemblies b) Surface Mount Technology and surface mount devices c) Surface Mount Semiconductor packages – SOIC, SOT, LCCC, LGA, BGA, COB, Flatpacks and Quad Packs, Cylindrical Diode Packages, d) Packaging of Passive Components as SMDs Repairing e) Surface Mount PCBs, Rework Stations.	**08**
	Total	**45**

References:

1. ELECTRONIC EQUIPMENT MAINTENANCE, Author Dr. Chanchal Sharma. Diploma level book recommended by All India Council for Technical Education. Softcopy available for free from https://ekumbh.aicte-india.org/
2. Maintenance of Electronic Equipments by K.S. Jamwal (DhanpatRai& Co.)
3. Modern Electronic Equipment: Troubleshooting, Repair and Maintenance: Khandpur. TMH 2006
4. Electronic Instruments and Systems: Principles, Maintenance and Troubleshooting: R. G. Gupta Tata McGraw Hill Edition 2001
5. Student Reference Manual for Electronic Instrumentation Laboratories David L Terrell Butterworth-Heinemann
6. Electronic Testing and Fault DiagnosisG. C. Loveday, A. H Wheeler Publishing

COURSE OUTCOMES:

Students will be Able to:

CO-1: Understand the procedure of troubleshooting electronic equipment
CO-2: Test passive components such as Resistors, capacitors, and inductors
CO-3: Identify causes of failures in semiconductor devices and fault diagnosis in OPAMP circuits
CO-4: Apply knowledge of digital IC testing in fault diagnosis of digital circuits
CO-5: Repair surface mount assemblies and PCBs
CO-6: Evaluate electronic equipment's working condition

Internal Assessment(40Marks)		
MidSemesterClassTest:20Marks	Quizzes,viva-voce,Assignment:10 Marks	Attendance:10

External Assessment (End Semester Examination:60Marks)	
GROUP	UNIT
A	1
B	2,3
C	4, 5

Course Code	:	**EEEPE 304/2**
Course Title	:	**Maintenance of Electronic Equipments Laboratory**
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PE

Courseobjectives:
The aim of this course is to help the student to attain the following industry identified competencythroughvariousteaching learning experiences:

Practicals:

List of Practicals: (At least EIGHT are to be performed)	
1.	To remove and replace electronic components using a soldering iron and desoldering pump.
2	To use a multimeter to test components such as resistors, capacitors, and diodes.
3	To identify and fix faults in electronic circuits, including the use of a signal tracer, oscilloscope, and logic analyzer.
4.	To clean electronic equipment using appropriate cleaning solutions and techniques to prevent damage to components.
5.	To perform routine maintenance on electronic equipment such as cleaning, lubrication, and calibration.
6.	To repair and troubleshoot power supplies, including AC/DC adapters and switching power supplies.
7.	To troubleshoot and repair of switches with power or signal flow issue.
8.	To repair and replace components on PCBs.
9.	To diagnose and repair issues with LCD displays, such as dead pixels or backlight issues.
10.	Use of an ESD-safe workstation to protect equipment from ESD damage.
11.	Troubleshoot common problems with power amplifiers, such as distortion or noise.
12.	Use of an Oscilloscope for analyzing and troubleshooting signals in electronic equipment
13	Install DTH receiver (Indoor and Outdoor unit)
14	Identify or test various ICs (analog & digital) using IC tester.
15	Assemble computer systems, OS, application software & antivirus installation.

Course Code :		EEEPE 302/3
Course Title :		**Data Communication and Computer Networking**
Number of Credits :		3 (L: 3, T: 0, P: 0)
Prerequisites :		NIL
Course Category :		PE

Contents(Theory):		**Hrs/Unit**
Unit:1	**Introduction to data communication** Concept of analog and digital signals. Bandwidth. Network architecture. Basics of OSI and TCP/IP reference models. Types of Computer Networks – Personal Area Network, Local Area Network, Metropolitan Area Network, Wide Area Network, Internetwork. Computer Network Topologies – Point to Point, Bus topology, Star topology, ring topology, mesh topology, tree topology, Daisy Chain, Hybrid Topology, Computer Network Model. Transmission media. Wired and wireless connectivity.	**10**
Unit:2	**Digital & Analog Transmission** Digital Transmission – Digital to Digital Conversion, Line Coding, Unipolar Encoding, Polar Encoding, Bipolar Encoding, block Coding Analog Transmission - Analog-to-Digital Conversion, Digital to analog Conversion, Analog to Analog Conversion. Sampling, Quantization, Encoding, Transmission Modes.	**10**
Unit:3	**Wireless Communication** Radio, Microwave, Infra-red, Light Transmission. Wireless Communication Standards, Characterization of the Wireless Channel, Receiver Techniques for Fading Dispersive Channels, Mobility Management in Wireless Networks, Mobile IP, Mobile Ad hoc Networks, Ad hoc Routing Protocols, Performance Analysis of DSR and CBRP, Cluster Techniques, Incremental Cluster Maintenance Scheme, Space time Coding for Wireless Communication	**07**
Unit:4	**Data Link Layer Technologies.** Types of Network Routing, Network Layer Protocols. FDM, TDM and CDMA. Circuit and packet switching. Frame relay and ATM switching. ISDN. Local area network protocols. Fibre optic networks. Satellite networks. Data link layer design issues: its functions and protocols. Internet protocol. Routing algorithms. Congestion control algorithms. IP addressing schemes. Internetworking and sub-netting. Error Detection and Correction - Types of Errors, Detection, Correction Switching and Data link layer, data link control and protocols	**10**
Unit:5	**Transmission Media & Transmission Control protocol** Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.	**08**
	Total	**45**

SUGGESTED REFERENCE BOOKS

S. No	Title of Book	Author	Publication
1	Computer Networking A top down Approach	J.F.Kurose	Pearson
2	Computer Networks and	Internet D.E. Comer	Pearson
3	Wireless Communications: Principles and Practice, 2nd edition	T. Rappaport	Prentice Hall, 2002.
4	Wireless Communication and Networking	John W. Mark, WeihuaZhuang	
5	Modelling and Analysis of Computer Communication Networks	Jeremiah F. Hayes	
6	Data communication & Networking	Stallings	

Course Outcomes:

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

CO1: understand network communication using the layered concept, Open System Interconnect (OSI) and the Internet Model.

CO2: explain various types of transmission media, network devices; and parameters of evaluation of performance for each media and device.

CO3: explain the concept of flow control, error control and LAN protocols and algorithms used in, the physical data link layers.

CO4: understand the functions performed by a Network Management System and to analyze connection establishment and congestion control with respect to TCP Protocol.

Internal Assessment(40Marks)		
MidSemesterClassTest:20Marks	Quizzes,viva-voce,Assignment:10 Marks	Attendance:10
External Assessment (EndSemester Examination:60Marks)		
GROUP	UNIT	
A	1	
B	2,3	
C	4,5	

Course Code :		EEEPE 304/3
Course Title :		**Data Communication and Computer Networking**
Number of Credits:		1 (L: 0, T: 0, P: 2)
Prerequisites :		NIL
Course Category :		PE

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

Use devices and equipments for data communication and computer networking.

List of Practicals (Any Eight to be done):

1. To study the different physical equipment used for networking
2. Study the different internetworking devices in a computer network
3. Study the working of basic networking commands
4. To study PC to PC communication using parallel port
5. Study of LAN in Star Topology
6. Study of LAN in Bus Topology

7. Study of LAN in Tree Topology
8. Study and configuration of modem of computer
9. Study of wireless communication
10. Study of DAC and ADC
11. Studying PC Communication using LAN

Courseoutcomes:

Student should be able to configure peer-to-peer network. This will help to understand different issues involved in peer-to-peer network.

CO1: Apply skills to install and configure TCP/IP protocol
CO2: Ability to configure peer network
CO3: Apply concept of TCP/IP mode

Course Code	:	PR302
Course Title	:	**Major Project**
Number of Credits	:	2 (L: 0,T:0, P:4)
Prerequisites	:	Knowledge of subjects up to 5 th Semester of Electrical & Electronics Engineering
Course Category	:	PR

Course Objective:

The aim of this course isto help the student to attain the following industry identified competency through various teaching learning experiences:

• Design and development of small electrical and electronics device/equipment.

Project group:

1. Formation of project group: Maximum 6 students per batch.

2. Each project group should select work by consulting the guide.

Activity (Atleast one):

i. Speed control of stepper motor/ dc motor using microcontroller.

ii. Robotic car using microcontroller.

iii. Over voltage/ over current protection using microcontroller/ static system.

iv. Battery management system using microcontroller.

v. Home automation using microcontroller.

vi. Any topic relevant to Diploma in Electrical & Electronic Engineering course as suggested by the Department/supervisor(s).

References:

1. A K Sawhney; A course in Electrical Machine Design; Dhanpat Rai & Co.

2. Raina Bhattacharya; Electrical Design, Estimating and Costing; New Age International Publishers

3. V. Rajini and V.S. Nagarajan; Electrical Machine Design; Pearson

4. Bhattacharya Chatterji; Projects in Electrical, Electronics, Instrumentation and computer Engineering.

Course outcome:

i. Develop proper planning to achieve the project goal.

ii. Collect relevant information and resources.

iii. Identify and apply proper techniques.

iv. Analyse the performance of project output.

v. Organize the Written documentation of the project work

E X A M I N A T I O N S C H E M E (SESSIONAL)

1. **Continuous Internal Assessment of 60 marks** is to be carried out by the teachers throughout the fourth Semester. Distribution of marks: Continuous evaluation: 30 Marks; Project report:20 Class Attendance: 10 Marks

2. External Assessment (end Semester examination) of 40 marks shall be held at the end of the sixth

Semester on the entire syllabus. Project and project report:20; Viva-voce:20.

Course Code	:	SE302
Course Title	:	**Seminar**
Number of Credits	:	2 (L: 0,T:0, P:4)
Prerequisites	:	Knowledge of subjects up to 5th Semester of Electrical and Electronics Engineering
Course Category	:	SE

The course 'Seminar' is intended to enable a student to read, understand, prepare and present reportabout an academic document. The learner shall search in the literature including various journals,books, project reports, online resources etc., and identify an appropriate paper /report in her/his areaof interest, in consultation with her/his seminar guide. This course can help the learner to experiencehow a presentation can be made about a selected academic document and also empower her/him toprepareatechnicalreport.

CourseObjectives:

- To do literature survey in a selected area of study.
- To understand an academic document from the literature and to give a presentation about it.
- To prepare a technical report.

General Guidelines: It's advisable to choose topics for the Seminar to be closely linked with followingtopics.

Seminar1: Based on any theoretical paper/ laboratory/ previous semester project or any other topics as instructed by concerned teacher.

Seminar2: Based on final semester project.(group/individual student)

(Every student has to submit report and presentation on Seminar1andSeminar2.)

The Electrical& Electronics Engineering Department shall form an Internal Evaluation Committee for the seminar.During the seminar presentation of a student, all members of committee shall be present. Formation of group of students and corresponding guide allotment shall be completed as earlier after completion of 5th semester examination.

Course Outcomes:

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

- Identifyacademicdocumentsfromtheliteraturewhicharerelatedtoher/hisareasofinterest.
- Read and apprehend an academic document from the literature which is related to her/ hisareasofinterest.
- Prepare a presentation about an academic document.
- Give a presentation about an academic document.
- Prepare a technical report.

EXAMINATION SCHEME (SESSIONAL)

1. Continuous Internal Assessment of 60 marks is to be carried out by the teachers throughout thefourth Semester. **Distribution of marks:** Continuous evaluation: 30 Marks; Presentation report:20ClassAttendance:10Marks

2. External Assessment (end Semester examination) of 40 marks shall be held at the end of the sixthSemester:Presentation:20;Viva-voce:20

Course Title	Entrepreneurship and Start-ups
Course Code	HS 302
Number of Credits	3
Pre Requisites	None
Total Contact Hours	3(L: 2; T: 1)/week = 45 hrs
Course Category	HS

Course Learning Objectives

1. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
2. To motivate and inspire students toward an entrepreneurial career.
3. To understand venture creation process and to develop generic entrepreneurial competences.
4. To introduce students to the basic steps required for planning, starting and running a business.
5. To familiarise students with the different exit strategies available to entrepreneurs.

Course Outcomes:

After completing the course students will able to:

CO 1	Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
CO 2	Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
CO 3	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
CO 4	Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

Detailed Course Content

Unit	Name of the Topic	Hours

1.	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS**
	• Concept, Competencies, Functions and Risks of entrepreneurship
	• Entrepreneurial Values& Attitudes and Skills
	• Mindset of an employee/manager and an entrepreneur
	• Types of Ownership for Small Businesses
	  o Sole proprietorship
	  o Partnerships
	  o Joint Stock company- public limited and private limited companies
	• Difference between entrepreneur and Intrapreneur
		10

2.	**PREPARATION FOR ENTREPRENEURIAL VENTURES** • Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. • Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard	20

	Feasibility Study Report • Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan • Project Report- Concept, its features and components • Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. <u>They **may not** be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.</u>	
3.	**ESTABLISHING SMALL ENTERPRISES** • Legal Requirements and Compliances needed for establishing a New Unit- o NOC from Local body o Registration of business in DIC o Statutory license or clearance o Tax compliances	03
4.	**START-UP VENTURES** • Concept & Features • Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical • Problems and challenges faced by start-ups. • Start-up Ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. <u>No questions are to be set from the case studies.</u>	04
5.	**FINANCING START-UP VENTURES IN INDIA** • Communication of Ideas to potential investors – Investor Pitch • Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups • Govt. Initiatives including incubation centre to boost start-up ventures • MSME Registration for Start-ups –its benefits	06
6.	**EXIT STRATEGIES FOR ENTREPRENEURS** • Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – **<u>Basic Concept only</u>**	02

Examination Scheme

- **End Semester Examination: 60 marks**

Suggested Question Paper Scheme for End Semester Examination

Group A: 20marks

estion Type	mber of questions to be set	mber of questions to be answered
CQ, Fill in the blanks, True or False (Carrying 1 mark each)	25	

Group B: 40marks

estion Type	mber of questions to be set	mber of questions to be answered
objective Type questions (Carrying 8 marks each)		

- **Internal Assessment: 40 marks**
  - Class test : 20 marks
  - Assignment: 10 marks
  - Class attendance: 10 marks

Suggested Learning Resources

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of IndiaLearning Private Ltd
2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Caseson Entrepreneurship	Anjan Raichaudhuri	Prentice Hall of India Learning Private Ltd
6.	How to Start a Business in India	Simon Daniel	Buuks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development and Business Ethics	Abhik Kumar Mukherjee & Shaunak Roy	Oxford University Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

Draft Syllabus of Engineering Economics & Project Management

Course Code:	OE301
Course Title:	Engineering Economics & Project Management
No. of Credits:	3 (L:3, T:0,P: 0)
Prerequisites:	NIL
Course Category:	Open Elective (Compulsory for all branches)

Course Objectives:

- To acquire knowledge of basic economics to facilitate the process of economic decision making.
- To acquire knowledge on basic financial management aspects.
- To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

Group-A

Unit-I (INTRODUCTION, THEORY OF DEMAND & SUPPLY) [9 hours]

1.1 Introduction to Engineering Economics, the relationship between Engineering and Economics

1.2 Resources, scarcity of resources, and efficient utilization of resources.

1.3 Opportunity cost, rationality costs, and benefits

1.4 Theory of Demand: the law of demand, different types of demand, determinants of demand, demand function, price elasticity of demand.

1.5 Theory of Supply: determinants of supply, supply function.

1.6 Market mechanism: Equilibrium, basic comparative static analysis (Numerical problems)

Unit-II (THEORY OF PRODUCTION & COSTS) [10 hours]

2.1 Concept of production (goods & services), Different factors of production (fixed and variable factors), Short-run Production function (Graphical illustration), and Long run production function (returns to scale).

2.2 Theory of Cost: Short-run and long-run cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost etc.

2.3 Economic concept of profit, profit maximization (numerical problems)

UNIT-III (DIFFERENT TYPES OF MARKET AND ROLE OF GOVERNMENT) [4 hours]

3.1 Perfect Competition: Features of Perfectly Competitive Market.

3.2 Imperfect Competition: Monopoly, Monopolistic Competition, and Oligopoly.

3.3 Role of government in Socialist, Capitalist and Mixed Economy structure with example.

Group-B

Unit-I (CONCEPT OF PROJECT) [4 hours]

1.1 Definition and classification of projects)

1.2 Importance of Project Management.

1.3 Project life Cycle [Conceptualization→Planning→Execution→Termination]

Unit-II (FEASIBILITY ANALYSIS OF A PROJECT) [10 hours]

2.1 Economic and Market analysis.

2.2 Financial analysis: Basic techniques in capital budgeting– Payback period method, Net Present Value method, Internal Rate of Return method.

2.3 Environmental Impact study–adverse impact of the project on the environment.

2.4 Project risk and uncertainty: Technical, economical, socio-political, and environmental risks.

2.5 Evaluation of the financial health of a project–Understanding the basic concept of Fixed & Working Capital, Debt & Equity, Shares, Debentures etc., and different financial ratios like Liquidity Ratios, Activity Ratios, Debt-equity ratio & Profitability Ratio (Basic concept only).

N.B: Knowledge of financial statements is not required; for the estimation of ratios the values of the relevant variables will be provided.

Unit-III (PROJECT ADMINISTRATION) [8 hours]

3.1 Gantt Chart– a system of bar charts for scheduling and reporting the progress of a project (basic concept).

3.2 Concept of Project Evaluation and Review Technique (PERT) and Critical Path method (CPM): basic concept and application with real-life examples.

Examination Scheme:

A. SemesterExaminationpatternof60 marks:

1. Objective type Question (MCQ, Fill in the blanks, and Very Short question-1 mark each): At least

five questions from each unit. [Total marks: 20]

2. Subjective questions: Eight questions to be answered taking at least three from each group. (Two questions should be given from each unit). [Total marks: 40]

B. Assignment (10Marks)

Guideline for Assignment (10 Marks)

Students should be instructed to prepare a report on a project (preferably the Major Project they prepare in 6th Semester), using a popular project management software in IT/ Computer Laboratory, under the guidance of the Lecturer in Computer Science & Technology and Lecturer in Humanities.

C. Class Test: Two examinations 20 marks each. Take best of two.

D. Attendance: 10 Marks

Suggested reference books:

1 *Principles of Economics – Case and Fair, Pearson Education Publication*
2 *Principles of Economics – Mankiw, Cengage Learning*
3 *Project planning, analysis, selection, implementation and review – Prasannachandra–Tata McGraw Hill.*
4 *Project Management – Gopala Krishnan – Mcmillan India Ltd*

Draft Syllabus for Open Elective Subjects for Electrical & Electronics Engineering (Any One has to be chosen)

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Electrical Engineering [EE]

Part-III (6th Semester)

2023

6th Semester

Sl.No	Category of course	Code No	Course Title	Credits	Marks	Total Contact Hours per Week	
						L	P
1	Program Core Course	**EEPC302**	Energy conservation and Audit	3	100	3	0
2	Program Core Course	**EEPC304**	Energy conservation and Audit Laboratory	1	100	0	2
3	Program Elective course IV	**EEPE 302/1**	**Any one of the following subjects to be chosen** 1. Industrial Instrumentation and Condition Monitoring	3	100	3	0
		EEPE 302/2	2. Electrical Testing and Commissioning				
		EEPE 302/3	**3.** Electric vehicles				
4	Program Elective course IV Lab	**EEPE 304/1**	**Any one of the following subjects to be chosen** 1.Industrial Instrumentation and Condition Monitoring lab	1	100	0	2
		EEPE 304/2	2. Electrical Testing and Commissioning Laboratory				
		EEPE 304/3	3. Electric vehicles Laboratory				
5	Humanities and Social Science	**HS302**	Entrepreneurship and Start-ups	3	100	3	0
6	Open Elective course-I	**OE302**	Engineering Economics and Project Management	3	100	3	0
7	Open Elective course- II	**OE 304**	**Any one of the following subjects to be chosen.** i. Mechatronics ii. Disaster management iii. Internet of Things iv. Environmental Engineering and Science v. Industrial Management vi. Sustainable development vii. Industrial Safety Engineering viii. Medical Electronics	3	100	3	0
8	Major Project	PR302		2	100	0	4
9	Seminar	SE302		2	100	0	4
	Total			**21**	**900**	**15**	**12**
Total contact hrs= 27 hrs/week							

- Student **contact hrs./ week =27**
- Theory and practical periods of 60 minutes each
- Abbreviation: L: Lecture class; P: Practical class
- **For Theoretical subjects**: Internal Assessment (40 Marks): Mid semester class test: 20 Marks; Quizzes, viva-voce, Assignment: 10 Marks; Attendance: 10; External Assessment: 60 Marks.
- **For Practical/ Sessional Subjects**: Internal Assessment-60 Marks [Continuous Evaluation:50; Class Attendance:10]; End Semester Assessment-40 Marks [Assignment on the day of Viva-voce and Practical Report submission:20; Viva-voce:20]
- To make the students more familiar with software, effort should be made to prepare laboratory report (like graph; data table etc.) in soft format in addition with traditional hard copy wherever possible.

Course Code	:	EEPC302
Course Title	:	**ENERGY CONSERVATION AND AUDIT**
Semester		6
Number of Credits	:	3 (L:3,T:0,P:0)
Prerequisites	:	NIL
Course Category	:	PC

Course Objective

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

1. Know energy conservation in various electrical machines and electrical installation systems.
2. Know Energy conservation through Cogeneration and Tariff.
3. Know energy audit of electrical systems.

Contents (Theory):		Hrs./Unit
Unit : 1	**Energy Conservation Basics:** 1.1 Energy Scenario: Primary and Secondary Energy, Energy demand and supply, National scenario. 1.2 Energy conservation and Energy audit – concept, need and difference. 1.3 Indian Electricity Act 2003; relevant clauses of energy conservation 1.4 BEE and its Roles in energy conservation 1.5 Star Labelling: Concept, Need and its benefits.	**04**
Unit : 2	**Energy Conservation in Electrical Machines:** 2.1 Need for energy conservation in induction motor and transformer. 2.2 Energy conservation techniques in induction motor by – i) Improving Power quality. ii) Motor survey iii) Matching motor with loading. iv) Minimizing the idle and redundant running of motor. v) Operating in star mode lower output power. vi) Rewinding of motor. vii) Replacement by energy efficient motor viii) Periodic maintenance 2.3 Energy conservation techniques in Transformer by – i) Load sharing ii) Parallel operation iii) Isolating techniques. iv) Replacement by energy efficient transformers. v) Periodic maintenance. 2.4 Energy Conservation Equipment: i) Soft starter ii) Automatic star delta converter	**11**

	iii) Variable Frequency Drives iv) Automatic p. f. controller (APFC) v) Intelligent p. f. controller (IPFC) 2.5 Energy efficient motor – features, advantages, applications and limitations. 2.6 Energy efficient transformers, amorphous transformers, epoxy Resin cast transformer / Dry type of transformer.	
Unit: 3	**Energy conservation in Electrical Installation systems:** 3.1 Aggregated Technical and commercial losses (AT&C) – Power system at state, regional, national and global level. 3.2 Causes of Technical losses and measures to reduce it – i) Controlling I^2R losses ii) Optimizing distribution voltage iii) Balancing phase currents iv) Compensating reactive power flow v) Demand side management 3.3 Causes of Commercial losses and measures to reduce it – i) In meter reading ii) In metering iii) Theft of electricity by any means 3.4 Energy conservation equipment: Maximum Demand Controller, KVAR Controller, Automatic Power Factor controller (APFC); Active harmonic filter. 3.5 Energy Conservation in Lighting System – i) Replacing Lamp sources. ii) Using energy efficient luminaries. iii) Using light controlled gears. iv) Installation of separate transformer / servo stabilizer for lighting. v) Periodic survey and adequate maintenance programs. 3.6 Energy Conservation techniques in fans, Electronic regulators. 3.7 Techniques of Energy Saving in Ventilating systems and Air Conditioners 3.8 Techniques of Energy Saving in Furnace, Ovens and Boiler.	**12**
Unit: 4	**Energy conservation through Cogeneration and Tariff:** 4.1 Co-generation and Tariff – concept, significance for energy conservation 4.2 Co-generation – Types of cogeneration on basis of sequence of energy use (Topping cycle,Bottoming cycle) 4.2.1 Types of cogeneration basis of technology (Steam turbine cogeneration, Gas turbine cogeneration, Reciprocating engine cogeneration). 4.2.2 Factors governing the selection of cogeneration system. 4.2.3 Advantages of cogeneration. 4.3 Tariff: Types of tariff structure: Special tariffs; Time-off-day tariff, Peak-off-day tariff, Power factor tariff, Maximum Demand tariff, Load factor tariff. Application of tariff system to reduce energy bill. 4.4 Energy conservation by improving load factor and power factor.	**09**
Unit: 5	**Energy Audit of Electrical System:** 5.1 Energy audit (definition as per Energy Conservation Act). 5.2 ABC analysis – its need and application.	**09**

	5.3 Energy audit instruments and their use. 5.4 Questionnaire for energy audit projects. 5.5 Energy flow diagram (Sankey diagram) and its importance. 5.6 Calculation of simple payback period for energy conservation equipment. Energy Audit procedure (walk through audit and detailed audit). 5.7 Energy Audit report format. 5.8 Numericals on energy audit.	
	Total	**45**

References:

1. Guide Books No. 1 and 3 for National Certification Examination for Energy Managers and Energy Auditors, Bureau of Energy Efficiency (BEE), Bureau of Energy Efficiency (A Statutory body under Ministry of Power, Government of India) (Fourth Edition 2015).

2. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi

3. Henderson, P. D., India - The Energy Sector, University Press, Delhi, 2016. ISBN: 978-0195606539

4. Turner, W. C., Energy Management Handbook, Fairmount Press, 2012, ISBN 9781304520708

5. Sharma, K. V., Venkataseshaiah; P., Energy Management and Conservation, I K International Publishing House Pvt. Ltd; 2011 ISBN 9789381141298

6. Mehta ,V. K., Principles of Power System, S. Chand &Co.New Delhi, 2016, ISBN 9788121905947

7. Singh, Sanjeev; Rathore, Umesh, Energy Management, S K Kataria&Sons,New Delhi ISBN-13: 9789350141014.

8. Desai, B. G.; Rana, J. S.; A. Dinesh, V.; Paraman, R., Efficient Use and Management of Electricity in Industry, Devki Energy Consultancy Pvt. Ltd.

9. Chakrabarti, Aman, Energy Engineering And Management, e-books Kindle Edition

Course Outcomes:

The theory 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 energy conservation policies in India.
b) Know energy conservation techniques in electrical machines & implement it.
c) Know different types of measuring instruments for measuring electric power.
d) Apply energy conservation techniques in electrical installations.
e) Use Co-generation and relevant tariff for reducing losses in facilities.
f) Know energy audit for electrical system and apply it for real cases.

Internal Assessment (40 Marks)		
Mid Semester Class Test:20 Marks	Quizzes, viva-voce, Assignment: 10 Marks	Attendance: 10
External Assessment (End Semester Examination:60 Marks)		
GROUP	UNIT	
A	1,2	
B	3	
C	4,5	

Course Code	:	EEPC304
Course Title	:	**ENERGY CONSERVATION AND AUDIT LABORATORY**
Number of Credits	:	1 (L:0,T:0,P:2)
Prerequisites	:	NIL
Course Category	:	PC

Course Objective

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences –

1. Apply energy conservation in various electrical machines and electrical installation systems.
2. Apply Energy conservation through Cogeneration and Tariff.
3. Apply energy audit in electrical systems.

List of Practicals: (At least EIGHT are to be performed)

1. Experiment to compare power consumption of different types of TL with electromagnetic ballast, electronic ballast and LED lamps by direct measurements and estimate energy saving.
2. Experiment to determine the reduction in power consumption in star mode operation of Induction motor compared to delta mode at different load conditions.
3. Experiment to estimate energy saving by improving power factor using PFC/APFC for an electrical load.
4. Experiment to estimate energy saving by improving load factor for an establishment.
5. Perform experiment to determine the reduction in power consumption by replacement of Fans and regulators in a class room / laboratory.
6. Collect electricity bill of a residential consumer and suggest suitable means for energy conservation and reduce consumption.
7. Prepare an energy audit report (Phase-I, Phase-II, Phase-III) for a Workshop/ Institute.
8. Identify star labeled electrical apparatus and compare the data for various star ratings.
9. Collect electricity bill of a commercial consumer and suggest suitable tariff for energy conservation and reduction of its energy bill.
10. Collect electricity bill of an industrial consumer and suggest suitable tariff for energy conservation and its impact on energy bill.
11. Prepare a sample energy audit questionnaire for the given industrial/Commercial facility.
12. Energy flow diagram (Sankey diagram) through EMS software Web Link : demo.ecostruxure-power-monitoring-expert.se.app/Web ;User ID : demo; Password : demo

Course Outcomes

The theory, practical 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 energy conservation policies in India.
b) Implement energy conservation techniques in electrical machines.
c) Apply energy conservation techniques in electrical installations.

d) Use Co-generation and relevant tariff for reducing losses in facilities.
e) Apply energy audit for electrical system.

E X A M I N A T I O N S C H E M E (SESSIONAL)

1. **Continuous Internal Assessment of 60 marks** is to be carried out by the teachers throughout the fourth Semester. **Distribution of marks:** Continuous evaluation:50 Marks; Class Attendance: 10 Marks
2. **External Assessment (end Semester examination) of 40 marks** shall be held at the end of the sixth Semester on the entire syllabus. Assignment on the day of Viva-voce and practical report submission:20; Viva-voce:20

Course Code	:	EEPE 302/1
Course Title	:	INDUSTRIAL INSTRUMENTATION AND CONDITION MONITORING
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PE

Course Objective

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences –

- Knowledge about different transduces.
- Know about of signal conditioning.
- Know about condition monitoring.

Contents (Theory):		Hrs./Unit
Unit : 1	**Fundamentals of instrumentation** 1.1 Basic purpose of instrumentation. 1.2 Basic block diagram (transduction, signal conditioning, signal presentation) and their functions. 1.3 Construction, working and application of switching devices- Push button, limit switch, float switch, pressure switch, thermostat, electromagnetic relay.	**4**
Unit : 2	**Transducers** 2.1 Concept of Transducers. 2.2 Distinguish between Transducers: 2.2.1 Primary and Secondary Transducers. 2.2.2 Electrical and Mechanical Transducers. 2.2.3 Analog and Digital Transducers. 2.2.4 Active and passive Transducers. 2.3 Advantages of electric transducers. 2.4 Required characteristics of transducers. 2.5 Factors affecting the choice of transducers. 2.6 Construction, working principle and application (with diagram & explanation) of following transducers: 2.6.1 RTD, Thermistor, Thermocouple. 2.6.2 Potentiometer (various types) 2.6.3 Strain gauge (No derivation only formula) Types of strain gauges like unbonded, bonded and semiconductor 2.6.4 LVDT and RVDT, measurement for displacement, Piezoelectric transducer. 2.6.5 Contact and non-contact type tachometer for speed measurement.	**10**

	2.6.6 Construction and Working of Flow measurement by electromagnetic and Turbine Flow meter.	
Unit: 3	**Operational Amplifier** 3.1 Different Parameters of op-amp: Input offset voltage, Input offset current, Input bias current, Differential input resistance, CMRR, SVRR, voltage gain, output voltage, slew rate, gain band- width. Output, short circuit current. 3.2 Use of op-amp (IC-741) as adder, subtractor, integrator, differentiator, comparator. 3.3 Instrumentation Amplifier.	**6**
Unit: 4	**Signal conditioning:** 2.1 Basic Concept of signal conditioning System. 2.2 Block diagram of AC and DC signal conditioning and working. 2.3. V to I converter, I to V converter, V to F converter. 2.4 Filters - Types and frequency response (No derivation) and circuits. 2.5 Multiplexing – Fundamentals, different types. 2.6 Sample and hold circuits - operation and its application	**8**
Unit: 5	**Data Acquisition System** 5.1 Generalized DAS- Block diagram and description of Transducer, signal conditioner, multiplexer, converter and recorder. 5.2 Draw Single Channel and Multi-channel DAS- Block diagram only. Difference between Signal Channel and Multi-Channel DAS. 5.3 Concept of electrical and electronic data transmission- serial, parallel, synchronous, asynchronous. 5.6 Digital display device- operation and its application of seven segment display, dot matrix display and concept of 3½, 4½ digits, LED and LCD applications.	**7**
Unit: 6	**Condition Monitoring and Diagnostic Analysis** 6.1 Definition of condition monitoring 6.2 Condition monitoring of: power transformer, electrical motors, alternators and circuit breakers - purpose and key benefits. 6.3 Test for condition monitoring: Insulation resistance, tan delta test and Polarization index, partial discharge test, transformer oil breakdown voltage test. 6.4 Concept of thermal imaging for condition monitoring.	**10**
	Total	**45**

References:

1. Sawhney, A.K. Electric and Electronic Measurement and instrumentation, Dhanpat Rai and Co.Author, Nineteenth revised edition 2011 reprint, 2014**,** ISBN:10: 8177001000
2. Rangan, C.S. G.R.Sharma. andV.S.V.Mani, Instrumentation devices and system, Pen ram International *Publishing* India Pvt. Ltd. Fifth edition, ISBN:10: 0074633503
3. Mehta, V.K. Electronics and instrumentation, Third edition-S.Chand and company Pvt Ltd Re-print, 2010, ISBN:81-219-2729-3
4. Singh, S.K. Industrial instrumentation and control, Tata McGraw-Hill, 1987. ISBN: 007451914X, 9780074519141.
5. J.G. Joshi, Electronic Measurement and Instrumentation, Khanna Publishing House, New Delhi(ISBN: 978-93-86173-621).

6. Rao, B V S Asia Club House, First Reprint, 2011, Operation and Maintenance of Electrical Equipment Vol-I, ISBN No 8185099022
7. Tarlok Singh; S. K. Kataria and Sons; Installation, Commissioning and Maintenance of Electrical Equipments.

Course outcomes:

The theory and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associatedwith the above mentioned competency:

a) Understand electrical transducers for measurement of electrical quantities and to select relevant transducers according to the applications.

b) Understand non-electrical transducers for measurement of non-electrical quantities and to select relevant transducers according to the applications.

c) Know about operational amplifier and its use in the field of instrumentation.

d) Know about signal conditioning system for their proper functioning.

e) Interpret data acquisition systems in various applications.

f) Undertake condition monitoring for diagnostic analysis of electrical equipment.

Internal Assessment (40 Marks)		
Mid Semester Class Test:20 Marks	Quizzes, viva-voce, Assignment: 10 Marks	Attendance: 10
External Assessment (End Semester Examination:60 Marks)		
GROUP	UNIT	
A	1,2	
B	3,4	
C	5,6	

Course Code	:	EEPE 304/1
Course Title	:	INDUSTRIAL INSTRUMENTATION AND CONDITION MONITORINGLABORATORY
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PE

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Use instrumentation equipment for condition monitoring and control.

Practicals

List of Practical:(at least EIGHT are to be done)	
1.	Identify float, proximity, limit switches, push button, pressure switch, thermostat, electromagnetic relay used in instrumentation system.
2.	Measure linear displacement by L.V.D.T.
3.	Measure the strain with the help of strain gauge.
4.	Measure temperature by PT-100, thermistor, thermocouple along with simple resistance bridge.
5.	Use Thermocouple to control the temperature of a furnace/machine
6.	Measure angular speed of rotating machine using stroboscope and tachometer.
7.	Measure the flow using flow meter (Electromagnetic/ turbine).
8.	Use op-amp(IC -741) as differentiator.
9.	Use op-amp(IC -741) as integrator.
10.	Use op-amp(IC -741) as instrumentation amplifier.
11.	Break Down Voltage test of transformer oil.
12.	Visit to testing center of electrical testing lab for tan delta and diagnostic tests and determine polarization index.
13.	Prepare a Report on various tools and equipment used for condition monitoring of electrical machines.
14.	Use of infrared camera for thermal imaging of electrical equipment.

Course outcomes:

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 associatedwith the above mentioned competency:

a) Select relevant instruments used for measuring electrical and non-electrical quantities.

b) Select relevant transducers/sensors for various applications.

c) Use relevant instruments for measuring non-electrical quantities.

d) Check the signal conditioning system for their proper functioning.

e) Use data acquisition systems in various applications.

f) Undertake condition monitoring for diagnostic analysis of electrical equipment.

Course Code	:	EEPE 302/2
Course Title	:	ELECTRICAL TESTING AND COMMISIONING
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course objective

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Follow standard safety procedures in testing and commissioning of electrical equipments.

Contents (Theory):		Hrs./Unit
Unit : 1	1.1. Do's and don'ts regarding safety in domestic electrical appliances. 1.2. Electrical safety in industry/power stations/ substations at the time of operation/ control/ maintenance. 1.3. Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration (CPR). 1.4. Class of fire; Fire detection alarm, fire-fighting equipments. Precautions to be taken to avoid fire due to electrical reasons.	**04**
Unit : 2	**Installation and Erection** 2.1 Concept of foundation for installation of machinery. Requirements of foundation for static and rotating electrical machinery. 2.2 Concept of leveling and aligning Procedure for leveling and alignment of direct coupled drive, effects of misalignment. 2.3 **Installation of transformer as per** I.S. 10028(part II): 1981 reaffirmed 2021. 2.3.1 INSTALLATION: Precautions, Site Preparation, Cabling, Bushings and Cable Boxes, Connections, Precautions against Risk of Fire, Safety Precautions. 2.3.2. DRYING OF TRANSFORMERS: Precautions When Drying and Methods of Drying. 2.3 **Requirements of installation of induction motor** as per I.S. 900 – 1992: INSTALLATION WORK: Location of Motors and Control Apparatus; Drying Out; Commissioning of motor.	**10**
Unit: 3	**Testing and Commissioning** 3.1 Objectives of testing, Types of tests and concepts: Routine test, type test, supplementary test, special tests. Methods of testing - Direct/Indirect/Regenerative testing. 3.2 Factors affecting life of insulating materials. Classifications of insulating materials as per IS:1271-1985 Reaffirmed 2001. Ageing Factors and Thermal Classes 3.3 Insulating oil - properties of insulating oil: viscosity, purity, acidity, flash point and fire point; causes of deterioration of oil. **3.4 Tests before and after Commissioning**: 3.4.1 Testing of transformer oil: a) dielectric strength test; b) acidity test; c) sludge test; d) moisture test, e) flash point test. 3.4.2. Testing of transformer: Impedance voltage, load losses, Insulation resistance, induced over voltage withstand test, Impulse voltage withstand test, Temperature	**15**

	rise test of oil & winding, Different methods of determining temperature rise- back-to-back test, open delta (delta – delta) test. 3.4.3 Testing of three-phase induction motor as per I.S.4029 -2010: High voltage test; Temperature-Rise Test; No load and locked rotor test. 3.4.4 List of type, routine and acceptance tests of single-phase induction motor as per I.S.996-2009. 3.4.5 Testing methods of synchronous machines as per IS 7132-1973: High voltage tests.	
Unit: 4	**Troubleshooting Plans** 4.1 Internal and external causes for failure / abnormal operation of equipment. 4.2 List of mechanical faults, electrical faults and magnetic faults in the electrical equipment and their remedies. 4.3 Preparation of trouble shooting charts for D.C. Machines, AC Machines and transformers, batteries.	**08**
Unit: 5	**Maintenance** 5.1 Concept of maintenance, types of maintenance, time based and condition based preventive maintenance, breakdown maintenance. 5.2 Preventive maintenance schedules for electrical machines, Factors affecting preventive maintenance schedules 5.3 Concept of Total productive maintenance (TPM), Pillars of TPM 5.4 Maintenance schedules of the following: i. Power and Distribution transformer. ii. Three phase Induction motors. iii. LV and HV switchgear. iv. Station Batteries.	**08**
	Total	**45**

References:

1. Deshpande.M. V. PHI Learning Pvt. Ltd., 2010, Design and Testing of Electrical Machines ISBN No 8120336453, 9788120336452.
2. Rao, B V S Asia Club House, First Reprint, 2011, Operation and Maintenance of Electrical Equipment Vol-I, ISBN No 8185099022
3. Rosenberg. Mc GRAW-HILL, 1st Edition, May 2003, Maintenance and Repairs, ISBN No 9780071396035
4. Sharotri, S.K. Glencoe/ Mcgraw- Hill; 2ndEdition , June 1969; Preventive Maintenance of Electrical Apparatus, ISBN No 10: 007030839X 13: 978-0070308398
5. Tarlok Singh; S. K. Kataria and Sons; Installation, Commissioning and Maintenance of Electrical Equipments.
6. P.P Gupta; Dhanpat Rai Publication Ltd; Installation, Commissioning and Maintenance of Electrical Equipments.

Course outcomes:

The theory 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) Follow safety procedures with respect to earthing and insulation of electrical equipment
b) Select proper tools, equipment, for installation, testing, maintenance of electrical machines and transformers
c) Test and commission electrical equipment in accordance with IS codes
d) Make plans for troubleshooting electrical machines.
e) Undertake regular preventive and breakdown maintenance.

Internal Assessment (40 Marks)		
Mid Semester Class Test:20 Marks	Quizzes, viva-voce, Assignment: 10 Marks	Attendance: 10
External Assessment (End Semester Examination:60 Marks)		
GROUP	UNIT	
A	1,2	
B	3	
C	4,5	

Course Code	:	EEPE304/2
Course Title	:	ELECTRICAL TESTING AND COMMISIONING LABORATORY
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PE

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Follow standard safety procedures in testing and commissioning of electrical equipment.

Practicals:

List of Practical:(at least EIGHT are to be done)	
1.	Determine breakdown strength of transformer oil.
2.	Perform insulation resistance test on any one motor/transformer.
3.	Prepare trouble shooting charts for electrical machines such as Transformer, D.C. machines, Induction motor and Synchronous machines.
4.	Measure impedance voltage and load losses of three-phase transformer.
5.	Find regulation and efficiency of single-phase transformer using back-to-back connection method.
6.	Determine efficiency of D.C. motor by direct loading or by electrical loading.
7.	Determine efficiency of D.C. machine by Hopkinson's test.
8.	Perform reduced voltage running up test on three-phase Induction motor as per I.S.325.
9.	Measure no load power, losses, current of a single-phase transformer upto 110% of rated voltage.
10.	Perform no load test on single phase Induction motor for the measurements of no load current, power input, and speed at rated voltage.
11.	Methods of providing artificial respiration (CPR) and prepare a report.
12.	Study of different types of fire extinguisher.

Course outcomes:

The 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) Select proper tools, equipment, for installation, testing, maintenance of electrical machines and transformers

b) Test the performance of insulating oil and transformers

c) Test the performance of induction machine.

d) Test the performance of dc machines.

e) Make plans for troubleshooting electrical machines.

E X A M I N A T I O N S C H E M E (SESSIONAL)

3. **Continuous Internal Assessment of 60 marks** is to be carried out by the teachers throughout the fourth Semester. **Distribution of marks:** Continuous evaluation:50 Marks; Class Attendance: 10 Marks
4. **External Assessment (end Semester examination) of 40 marks** shall be held at the end of the sixth Semester on the entire syllabus. Assignment on the day of Viva-voce and practical report submission:20; Viva-voce:20.

Course Code	:	EEPE 302/3
Course Title	:	ELECTRIC VEHICLES
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PE

Course objectives:
The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

i. To know the salient features of Hybrid electric vehicles and its auxiliaries.
ii. To explain the working of dc to dc, and dc to ac converter applied in Electric vehicles.
Iii. To know the parameters of battery used in EV and its charging system.

Contents (Theory):		Hrs./Unit
Unit : 1	**Unit – I Introduction to Hybrid Electric Vehicles** 1.1 Evolution of Electric vehicles. 1.2 Advanced Electric drive vehicle technology: 1.2.1 Vehicles-Electric vehicles (EV), 1.2.2 Hybrid Electric drive (HEV), 1.2.3 Plug in Electric vehicle (PIEV). 1.3 Components used Hybrid Electric Vehicle. 1.4 Economic and environmental impacts of Electric hybrid vehicle: i. Parameters affecting Environmental; ii. Comparative study of vehicles for economic, environmental aspects.	**10**
Unit : 2	**Dynamics of hybrid and Electric vehicles** 2.1 General description of vehicle movement. 2.2 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, , need of gear box, electric motor. 2.3 Classification of motors used in Electric vehicles 2.3.1 Basic architecture of hybrid drive trains, types of HEVs ; Energy saving potential of hybrid drive trains. HEV Configurations-Series, parallel, Series-parallel, complex.	**10**
Unit: 3	**DC-DC Converters for EV and HEV Applications** 3.1 EV and HEV configuration based on power converters 3.2 Classification of converters –unidirectional and bidirectional 3.3 Application of Buck, Boost and Buck- Boost converters in EV using block diagram.	**05**

Unit: 4	**DC-AC Inverter & Motors for EV and HEVs** 4.1 Principle, operation and Characteristics of permanent magnet synchronous motors, BLDC and switched reluctance motor. 4.2 Applications of DC-AC Converters in EV. 4.3 Application & control of induction motor, permanent magnet synchronous motors, BLDC and switched reluctance motors used in EVs and HEVs. 4.4 Application of regenerative braking in EV.	**10**
Unit: 5	**Batteries** 5.1 Overview of batteries: Battery Parameters, types of batteries 5.2 Battery Charging and Battery Management System. 5.3 Alternative novel energy sources-solar photovoltaic cells, fuel cells, super capacitors, flywheels. 5.4. Control system for EVs and HEVs, overview, Electronic control unit ECU Schematics of hybrid drive train, control architecture.	**10**
	Total	**45**

References:

1. A.K. Babu, Electric & Hybrid Vehicles, Khanna Publishing House, New Delhi (Ed. 2018)
2. Fuhs, A. E. Hybrid Vehicles and the Future of Personal Transportation, CRC Press,
3. Gianfranco, *Electric and Hybrid Vehicles:* Power Sources, Models, Sustainability, Infrastructure And The Market, Pistoia Consultant, Rome, Italy,
4. Ehsani, M. *Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design*, CRC Press
5. Husain, I. *Electric and Hybrid Electric Vehicles*, CRC Press
6. Chan C. C. and K. T. Chau, *Modern Electric Vehicle Technology*, Oxford Science Publication,
7. Lechner G. and H. Naunheimer, *Automotive Transmissions: Fundamentals, Selection,Design and Application*, Springer
8. Rashid, M. H. *Power Electronics: Circuits, Devices and Applications*, 3rd edition, Pearson,
9. Moorthi, V. R. *Power Electronics: Devices, Circuits and Industrial Applications*, Oxford University Press
10. Krishnan, R. *Electric motor drives: modelling, analysis, and control*, Prentice Hall
11. Krause, O. P. ; C. Wasynczuk, S. D. Sudhoff, *Analysis of electric machinery*, IEEE Press

Course outcomes:

The theory 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) Analyse the DC-DC converters used in EV applications.
d) Analyse and apply the DC-AC converters in EV applications.
e) Select the batteries for EV applications.

Course Code	:	EEPE304/3
Course Title	:	ELECTRIC VEHICLES LABORATORY
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites (Course code)	:	NIL
Course Category	:	PE

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

Maintain electric vehicles

Practicals:

List of Practicals: (At least EIGHT are to be performed)	
1.	Develop block diagram of Electric vehicle and identify parts.
2	State of Charge (SOC) estimation by open circuit voltage.
3	Develop schematic diagram of hybrid electric vehicle and identify the components.
4.	Prepare report on Plug in Electric vehicle by visiting a charging station.
5.	Experiment on inverter connected with lead acid/ lithium-ion battery.
6.	Experiment on Buck Boost converters.
7.	Experiment on bidirectional converter.
8.	Lithium-ion battery modelling and fault detection design.
9.	Prepare test procedure for equipment used in Electric vehicle.
10.	List safety procedures and schedule for handling HEVs and EVs.
11.	Assembly of EV charging point and study of charging modes.

Course outcomes:

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.

Course Code	:	PR302
Course Title	:	Major Project
Number of Credits	:	2 (L: 0, T: 0, P: 4)
Prerequisites	:	Knowledge of subjects up to 5th Semester of Electrical Engineering.
Course Category	:	PR

Course Objective:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Design and development of small electrical and electronics device/equipment.

Project group:
1. Formation of project group: Maximum **6 students per batch**.
2. Each project group should select work by consulting the guide.

Activity (Atleast one):

i. Speed control of stepper motor/ dc motor using microcontroller.

ii. Robotic car using microcontroller.

iii. Over voltage/ over current protection using microcontroller/ static system.

iv. Battery management system using microcontroller.

v. Home automation using microcontroller.

vi. Any topic relevant to Diploma in Electrical Engineering course as suggested by the Department/supervisor(s).

References:

1. A K Sawhney; A course in Electrical Machine Design; Dhanpat Rai & Co.
2. Raina Bhattacharya; Electrical Design, Estimating and Costing; New Age International Publishers
3. V. Rajini and V.S. Nagarajan; Electrical Machine Design; Pearson
4. Bhattacharya Chatterji; Projects in Electrical, Electronics, Instrumentation and computer Engineering.

Course outcome:

i. Develop proper planning to achieve the project goal.
ii. Collect relevant information and resources.
iii. Identify and apply proper techniques.
iv. Analyse the performance of project output.
v. Organize the Written documentation of the project work

E X A M I N A T I O N S C H E M E (SESSIONAL)

1. Continuous Internal Assessment of 60 marks is to be carried out by the teachers throughout the fourth Semester. **Distribution of marks:** Continuous evaluation: 30 Marks; Project report:20 Class Attendance: 10 Marks

2. External Assessment (end Semester examination) of 40 marks shall be held at the end of the sixth Semester on the entire syllabus. Project and project report:20; Viva-voce:20

Course Code	:	SE302
Course Title	:	Seminar
Number of Credits	:	2 (L: 0, T: 0, P: 4)
Prerequisites	:	Knowledge of subjects up to 5th Semester of Electrical Engineering.
Course Category	:	SE

The course 'Seminar' is intended to enable a student to read, understand, prepare and present report about an academic document. The learner shall search in the literature including various journals, books, project reports, online resources etc., and identify an appropriate paper /report in her/his area of interest, in consultation with her/his seminar guide. This course can help the learner to experience how a presentation can be made about a selected academic document and also empower her/him to prepare a technical report.

Course Objectives:

- To do literature survey in a selected area of study.
- To understand an academic document from the literature and to give a presentation about it.
- To prepare a technical report.

General Guidelines: It's advisable to choose topics for the Seminar to be closely linked with following topics.
Seminar1: Based on any theoretical paper/ laboratory/ previous semester project or any other topics as instructed by concerned teacher.
Seminar2 : Based on final semester project . (group/ individual student)

(Every student has to submit report and presentation on Seminar1 and Seminar2.)

The Electrical Engineering Department shall form an Internal Evaluation Committee for the seminar. During the seminar presentation of a student, all members of committee shall be present. Formation of group of students and corresponding guide allotment shall be completed as earlier after completion of 5th semester examination.

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

- Identify academic documents from the literature which are related to her/his areas of interest.
- Read and apprehend an academic document from the literature which is related to her/ his areas of interest.
- Prepare a presentation about an academic document.
- Give a presentation about an academic document.
- Prepare a technical report.

E X A M I N A T I O N S C H E M E (SESSIONAL)

1. Continuous Internal Assessment of 60 marks is to be carried out by the teachers throughout the fourth Semester. **Distribution of marks:** Continuous evaluation: 30 Marks; Presentation report:20 Class Attendance: 10 Marks

2. External Assessment (end Semester examination) of 40 marks shall be held at the end of the sixth Semester: Presentation:20; Viva-voce:20

Course Title	Entrepreneurship and Start-ups
Course Code	HS 302
Number of Credits	3
Pre-Requisites	None
Total Contact Hours	3(L: 2; T: 1)/week = 45 hrs
Course Category	HS

Course Learning Objectives

1. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
2. To motivate and inspire students toward an entrepreneurial career.
3. To understand venture creation process and to develop generic entrepreneurial competences.
4. To introduce students to the basic steps required for planning, starting and running a business.
5. To familiarise students with the different exit strategies available to entrepreneurs.

Course Outcomes:

After completing the course students will able to:

CO 1	Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
CO 2	Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
CO 3	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
CO 4	Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

Detailed Course Content

Unit	Name of the Topic	Hours

1.	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS**
	• Concept, Competencies, Functions and Risks of entrepreneurship
	• Entrepreneurial Values& Attitudes and Skills
	• Mindset of an employee/manager and an entrepreneur
	• Types of Ownership for Small Businesses
	  o Sole proprietorship
	  o Partnerships
	  o Joint Stock company- public limited and private limited companies
	• Difference between entrepreneur and Intrapreneur
		10

2.	**PREPARATION FOR ENTREPRENEURIAL VENTURES** • Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers.	20

	• Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard Feasibility Study Report • Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan • Project Report- Concept, its features and components • Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. <u>They **may not** be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.</u>	
3.	**ESTABLISHING SMALL ENTERPRISES** • Legal Requirements and Compliances needed for establishing a New Unit- o NOC from Local body o Registration of business in DIC o Statutory license or clearance o Tax compliances	03
4.	**START-UP VENTURES** • Concept & Features • Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical • Problems and challenges faced by start-ups. • Start-up Ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. <u>No questions are to be set from the case studies.</u>	04
5.	**FINANCING START-UP VENTURES IN INDIA** • Communication of Ideas to potential investors – Investor Pitch • Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups • Govt Initiatives including incubation centre to boost start-up ventures • MSME Registration for Start-ups –its benefits	06
6.	**EXIT STRATEGIES FOR ENTREPRENEURS** • Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – **<u>Basic Concept only</u>**	02

Examination Scheme

- **End Semester Examination: 60 marks**

Suggested Question Paper Scheme for End Semester Examination

Group A: 20marks

Question Type	umber of questions to be set	umber of questions to be answered
MCQ, Fill in the blanks, True or False (Carrying 1 mark each)	25	20

Group B: 40marks

Question Type	umber of questions to be set	umber of questions to be answered
Subjective Type questions (Carrying 8 marks each)	10	5

- **Internal Assessment: 40 marks**
  - Class test : 20 marks
  - Assignment: 10 marks
  - Class attendance: 10 marks

Suggested Learning Resources

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of IndiaLearning Private Ltd
2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Caseson Entrepreneurship	Anjan Raichaudhuri	Prentice Hall of India Learning Private Ltd
6.	How to Start a Business in India	Simon Daniel	Buuks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development	Abhik Kumar	Oxford University

	and Business Ethics	Mukherjee & Shaunak Roy	Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

Engineering Economics & Project Management

Course Code:	OE302
Course Title:	Engineering Economics & Project Management
No. of Credits:	3 (L:3, T:0,P: 0)
Prerequisites:	NIL
Course Category:	Open Elective (Compulsory for all branches)

Course Objectives:

- To acquire knowledge of basic economics to facilitate the process of economic decision making.
- To acquire knowledge on basic financial management aspects.
- To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

Group-A

Unit-I (INTRODUCTION, THEORY OF DEMAND & SUPPLY) [9 hours]

1.1 Introduction to Engineering Economics, the relationship between Engineering and Economics

1.2 Resources, scarcity of resources, and efficient utilization of resources.

1.3 Opportunity cost, rationality costs, and benefits

1.4 Theory of Demand: the law of demand, different types of demand, determinants of demand, demand function, price elasticity of demand.

1.5 Theory of Supply: determinants of supply, supply function.

1.6 Market mechanism: Equilibrium, basic comparative static analysis (Numerical problems)

Unit-II (THEORY OF PRODUCTION & COSTS) [10 hours]

2.1 Concept of production (goods & services), Different factors of production (fixed and variable factors), Short-run Production function (Graphical illustration), and Long run production function (returns to scale).

2.2 Theory of Cost: Short-run and long-run cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost etc.

2.3 Economic concept of profit, profit maximization (numerical problems)

UNIT-III (DIFFERENT TYPES OF MARKET AND ROLE OF GOVERNMENT) [4 hours]

3.1 Perfect Competition: Features of Perfectly Competitive Market.

3.2 Imperfect Competition: Monopoly, Monopolistic Competition, and Oligopoly.

3.3 Role of government in Socialist, Capitalist and Mixed Economy structure with example.

Group-B

Unit-I (CONCEPT OF PROJECT) [4 hours]

1.1 Definition and classification of projects)

1.2 Importance of Project Management.

1.3 Project life Cycle [Conceptualization→Planning→Execution→Termination]

Unit-II (FEASIBILITY ANALYSIS OF A PROJECT) [10 hours]

2.1 Economic and Market analysis.

2.2 Financial analysis: Basic techniques in capital budgeting– Payback period method, Net Present Value method, Internal Rate of Return method.

2.3 Environmental Impact study–adverse impact of the project on the environment.

2.4 Project risk and uncertainty: Technical, economical, socio-political, and environmental risks.

2.5 Evaluation of the financial health of a project–Understanding the basic concept of Fixed & Working Capital, Debt & Equity, Shares, Debentures etc., and different financial ratios like Liquidity Ratios, Activity Ratios, Debt-equity ratio & Profitability Ratio (Basic concept only).

N.B: Knowledge of financial statements is not required; for the estimation of ratios the values of the relevant variables will be provided.

Unit-III (PROJECT ADMINISTRATION) [8 hours]

3.1 Gantt Chart– a system of bar charts for scheduling and reporting the progress of a project (basic concept).

3.2 Concept of Project Evaluation and Review Technique (PERT) and Critical Path method (CPM): basic concept and application with real-life examples.

Examination Scheme:

A. Semester Examination pattern of 60 marks:

1. Objective type Question (MCQ, Fill in the blanks, and Very Short question-1 mark each): At least five questions from each unit. [Total marks: 20]

2. Subjective questions: Eight questions to be answered taking at least three from each group. (Two questions should be given from each unit). [Total marks: 40]

B. Assignment (10Marks)

Guide line for Assignment (10 Marks)

Students should be instructed to prepare a report on a project (preferably the Major Project they prepare in 6th Semester), using a popular project management software in IT/ Computer Laboratory, under the guidance of the Lecturer in Computer Science & Technology and Lecturer in Humanities.

C. Class Test: Two examinations 20 marks each. Take best of two.

D. Attendance: 10 Marks

Suggested reference books:

1 *Principles of Economics – Case and Fair, Pearson Education Publication*
2 *Principles of Economics – Mankiw, Cengage Learning*
3 *Project planning, analysis, selection, implementation and review – Prasannachandra– Tata McGraw Hill.*
4 *Project Management – Gopala Krishnan – Mcmillan India Ltd*

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Electrical Engineering (Industrial Control) [EEIC]

Part-III (6th Semester)

2023

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Electrical Power Systems [EPS]

Part-III (6th Semester)

2023

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Electronics & Communication Engineering [ECE] & Electronics & Tele-Communication Engineering [ETCE]

Part-III (6th Semester)

2023

Further suggestion may be submitted to the syllabus committee. List of the coordinators for the branch of Diploma in Electronics & Tele Communication Engineering are:

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WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION

TEACHING AND EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES

COURSE NAME:FULL TIME DIPLOMA IN ETCE & ECE

DURATION OF COURSE: 6 SEMESTERS

SEMESTER: SIXTH

BRANCH: ELECTRONICS & TELECOMMUNICATION ENGG. AND ELECTRONICS & COMMUNICATION ENGG.

SR. NO.	SUBJECT	CREDITS	PERIODS		EVALUATION SCHEME						
			L	PR	THEORETICAL				PRACTICAL		Total Marks
					TA	CT	Total	ESE	Internal	External	
1.	Engineering Economics and Project Management	3	3	-	20	20	40	60	-	-	100
2.	Entrepreneurship and Startups	3	3	-	20	20	40	60	-	-	100
3.	Industrial Automation or Control System and PLC	3	3	-	20	20	40	60	-	-	100
4.	Computer Networking and Data Communication	3	3	-	20	20	40	60	-	-	100
5.	Open Elective (Select any one) i) Industrial Management ii) Environmental Engineering & Science i) Renewable Energy Technologies	3	3	-	20	20	40	60	-	-	100
6.	Computer Networking and Data Communication Lab	1	-	2	-	-	-	-	60	40	100
7.	Industrial Automation Lab or Control System and PLC Lab	1	-	2	-	-	-	-	60	40	100
8.	Project	2	-	4	-	-	-	-	60	40	100
9.	Seminar	2	-	1	-	-	-	-	60	40	100
	Total	21	15	9	100	100	200	300	240	160	900

- **STUDENT CONTACT HOURS PER WEEK: 24 hours**
- **ACADEMIC CONTACT WEEKS PER SEMESTER:17 weeks(Teaching-15 weeks +Internal Exam-2 weeks)**
- **THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH**
- **ABBREVIATIONS:L- Lecture, PR-Practical, IA- Internal Assessment, CT- Class Test, ESE-End Semester Exam**
- **IA (Internal Assessment for Theoretical)=40 marks: CT=20 Marks, Attendance=10 marks and Quizzes/Assignment/Student Activity=10 marks.**
- **Minimum qualifying marks for both Theoretical and Sessional subjects (for internal assessment and external assessment separately) are 40%.**
- **IA (Internal Assessment for Practical)=60 marks:50 marks for continuous evaluation and 10 marks for Class attendance.**
- **Seminar topics should be relevant to the corresponding disciplines.**

Name of the course: Industrial Automation	
Course Code: ETCE/DIA/S6	Semester: Sixth
Duration: One Semester (Teaching– 15 weeks + Internal Exam-2weeks)	Maximum Marks:100 Marks
Teaching Scheme:	**Examination Scheme:**
Theory: 3contact hrs./week	Class Test(Internal Examination):20 Marks
Practical:2contact hours/week	Attendance=10 marks and Quizzes/Assignment/Student Activity= 10 marks
	End Semester Examination:60 Marks
Credit:4(TH:3+PR:1)	Practical:100 Marks

Course Outcomes:

After completion of the course students will able to

- Understand the role of control elements in a close (single) loop and open loop control for Industrial Process Automation.
- Identify proper control devices for defined process automation.
- Use ON-OFF and PID controller for a defined process during automation.
- Interface field devices (sensors/actuators) with PLC/SCADA/DCS.
- Develop control loop in PLC by using Ladder logic/block logic program.

Content(Name of the topic)		Periods
Group–A		
Unit 1	**Introduction to Industrial Automation**	**04**
	1.1 Introduction to Industrial process and automation. 1.2 Need of Automation - Quality, Safety, Sustainability and Economic aspect. 1.3 Process Control: Process definition, Process gain, Open Loop Control, Close loop Control. 1.4 Example of open loop control. 1.5 Example of close loop control - Temperature control loop, Level control loop (With their functional explanation).	
Unit 2	**Sensor and Actuators**	**14**
	2.1 Define automation components: Sensor, Transmitter, Controller, Actuator, A/D & D/A conversion, Signal conditioning (Conceptual schematic). 2.2 Working principle and types of i) pressure transmitter, ii) temperature transmitter, iii) level transmitter and iv) flow transmitter v) proximity transmitter. 2.3 Elements and standards of Signal Conditioning and transmitting. 2.4 Actuators: Type and examples of Hydraulic, Pneumatic and Electric actuators. Control Valve –Working principle and functional diagram of Pneumatic, Electric type and Solenoid valve. Motor Drives – Types (VFD, Soft starter) and Functional diagram only. 2.5 Calibration principle- Zero and Span setting with standards, Calibration Chain- Primary reference (National and International Standards), Secondary Reference (Standard Lab) and Working Standard (Only definition).	
Group–B		
Unit 3	**Control Engineering**	**05**

	3.1 Standard Test Signals: Unit Step, Unit ramp, Impulse function and their Laplace transform. 3.2 Transfer function definition – Poles and Zeros, 1st order system and 2nd order system. Example of 1st order and 2nd order system. Characteristics equations. Concept of stability using characteristics equation. 3.3 Time domain analysis of 1st order system by step input signal- Transient response and steady state response with example.	
Unit 4	**Control Actions and Process Controllers**	**10**
	4.1 Process control system – block diagram, elements. Role of Controllers in Process Industry. 4.2 Control actions - discontinuous & continuous modes; On - Off controllers: Neutral zone, Hysteresis Zone. 4.3 Proportional controllers (offset, proportional band); Integral &Derivative controllers - Functional block diagram and Equation. 4.4 Composite controllers -Functional block diagram and Equation of PI, PD, PID controllers. 4.5 Parameters of P, PI, and PID controllers and tuning concept.	
	Group–C	
Unit 5	**Automation and Control System**	**12**
	5.1 Communication Hierarchy in Process Automation- Field level, I/O level, Control level, HMI level, Enterprise level. 5.2 Piping and Instrumentation Diagram: Concept, symbols, reading procedure. 5.3 PLC- Functional Diagram, working principle, Analog I/O module, Digital I/O module- Source and Sink. 5.4 PLC programming basics– Ladder logic, Block logic (identify the problem for three input variables and two output variables both analog and digital). 5.5 DCS- Definition, functional diagram and distributed network and interfacing concept. Comparison between PLC & DCS and applicability. 5.6 SCADA- Introduction, Concept of Supervisory Control, Human-Machine Interface and Alarm handling. 5.7 Industrial Networking: Basic features ofFieldbus, Foundation Fieldbus,Profibus, HART, Ethernet, Modbus, Profinet.	
	Total	**45**

Sl.No.	Suggested List of Laboratory Experiments
1	Water level control using On-Off method.
2	Temperature control using PID controller.
3	Develop ladder/block program using three digital inputs and two digital outputs (combinational logic).
4	Test ladder program for pulse counting by using limit switch/proximity sensor.
5	Temperature control using RTD/Thermocouple, PLC (PID block), heating element.
6	PID control using Electro Pneumatic control valve/cylinder, I/P converter.
7	Use various functions of SCADA simulation editors to develop simple project.
8	Do any other experiment except above using PLC as per availability of sensor and actuators.
9	**Do at least one Mini-Project for automation using sensor, controller and actuators.**

References:

Sl No.	Title of Book	Author	Publication
1.	Process Control Instrumentation Technology	Johnson	Pearson
2.	Process Control	Bela G. Liptak	Elsevier Science (3rd Edition)
3.	Process Control Modeling, Design and Simulation	B. W. Bequette	PHI
4.	ElectronicMeasurementandMeasurementTechnique	Cooper	PrenticeHallofIndia
5.	Modern Electronic Instrumentation & Measurement Techniques	Helfrick & Cooper	Pearson
6.	Modern Control Engineering	Ogata	Pearson
7.	Control System Engg	J.J.Nagrath & M. Gopal	Wiley
8.	Modern Control System	Rameshbabu and R. Anandrajan	SCITECH
9.	Control System	Kumar	Tata McGraw-Hill
10.	Basic Instrumentation System & Programmable Logic Controller	Umesh Rathore	Katson Books
11.	Programable Logic Controller	Jadhav V. R.	Khanna Publisher, New Delhi
12.	SCADA	Boyar B. A.	ISA Publication New Delhi,
13.	Practical SCADA for Industry	Bailey, David; Wright, Edwin	Newnes (an imprint of ElsevierI International edition, 2003, ISBN: 0750658053

Name of the course: Control System and PLC	
Course Code: ETCE/DCSP/S6	Semester: Sixth
Duration: One Semester (Teaching– 15 weeks + Internal Exam-2weeks)	Maximum Marks:100 Marks
Teaching Scheme:	**Examination Scheme:**
Theory: 3contact hrs./week	Class Test(Internal Examination):20 Marks
Practical: 2contact hours/week	Attendance=10 marks and Quizzes/Assignment/Student Activity= 10 marks
	End Semester Examination:60 Marks
Credit:4(TH:3+PR:1)	Practical:100 Marks

Course Outcomes:

After completion of the course students will able to

- Identify different components and types of control systems and their representations.
- Analyze the response of a control system for standard inputs and comment on its stability.
- Evaluate the performance of various types of controllers.
- Identify various components of PLC and its hardware.
- Apply PLC in various control systems by its proper programming.

Content(Name of the topic)		Periods
	Group–A	
Unit 1	**Basics of Control System**	**08**
	1.1 Control Systems: Definition of Control System, Classification of Control Systems with block diagram- open loop and closed loop control system with examples, Comparison between open loop and close loop control system. 1.2 Mathematical Models of Physical systems: Concept of Transfer Function and deduction of transfer function of close loop control system, Block diagram reduction technique using Laplace Transform, Signal Flow Graphs and Messon's Gain formula for block diagram reduction technique with simple problems.	
Unit 2	**Time Domain Stability Analysis**	**16**
	2.1 Time Response: Transient and Steady State Response 2.2 Standard Test Inputs: Unit Step, Unit Ramp, Unit Parabolic, Unit Impulse functions and their corresponding Laplace Transform. 2.3 Analysis of First and Second Order Control System: i) First Order System: Analysis for Unit Step Input, Concept of Time Constant, Steady State Error. ii) Second Order System: Analysis for Unit Step Input, Definition and Effect of Damping. iii) Time Response Specifications: Delay time, Rise time, Peak Time, Peak Overshoot, Settling time, Simple Numerical Problems. iv) Initial value and final value theorems and their use in control systems. v) Types of feedback control systems and error constants. 2.4 Stability: Concept of Poles and Zeroes , Concept of Stability, Root Locations in s-plane and Analysis – Stable System, Unstable System, Critically Stable Systems, Conditionally Stable System. 2.5 Routh's Stability Criteria: Steps and Procedures to find Stability by using Routh's Stability Criteria with simple problems.	
	Group–B	
Unit 3	**Process Controllers**	**06**
	3.1 Process Control System: Block Diagram with example, Functions of Each Block 3.2 Control Actions: i) Discontinuous Mode: ON-OFF Controllers, Neutral Zone. ii) Continuous Modes: a) Proportional Controller – Offset, Proportional Band b) Proportional, Integral and Derivative Controllers – Output Equation, Response, Characteristics c) Composite Controllers: PI, PD, PID Controllers – Output Equation, Response Characteristics	
Unit 4	**Fundamentals of PLC and its Hardware**	**07**
	4.1 Introduction – Advantages of PLC Based Control over Conventional Relay Based Control, Classification of PLC (Fixed and Modular PLCs) 4.2 Architectural Details of PLC: Block Diagram of PLC, CPU and Program Scan, Input Modules (Discrete and Analog), Output Modules (Discrete and Analog), Memory (its organization and addressing), Power Supply and Programming Devices - Function of each block. 4.3 PLC Installation.	
	Group–C	
Unit 5	**Basics of PLC Programming**	**08**

	5.1 PLC Instruction Set: Relay Instructions, Logical Instructions, Program Control instructions, Timer and Counter Instructions, Data Handling Instructions. 5.2 Ladder Logic Diagram: Elements of Ladder Diagram, Evaluation of Rung, Program examples and Problems.	
	Total	**45**

Sl.No.	Suggested List of Laboratory Experiments
1	To study the step response of R-C Circuit (First Order System).
2	To study the step response of R-L-C Circuit (Second Order System).
3	To study the operation of an ON-OFF controller.
4	To study the operation of a Proportional controller.
5	To study the operation of a PI controller.
6	To study the operation of a PD controller.
7	To study the operation of a PID controller.
8	To study MATLAB simulation for different types of Control System.
9	To Identify and test different parts of a PLC.
10	To develop Ladder Diagram to test the functionality of different logic gates.
11	To develop Ladder Diagram for Adder and Subtractor by using PLC
12	To develop Ladder Diagram for ON-OFF control of a lamp using Timer and Counter.
13	To develop Ladder Diagram for Traffic Light Control System
14	To develop Ladder Diagram for Stepper Motor Control

References:

Sl No.	Title of Book	Author	Publication
1.	Control System Engg	J.J.Nagrath & M. Gopal	Wiley
2.	Modern Control Engineering	K. Ogata	Pearson
3.	Modern Control System	Rameshbabu and R Anandrajan	SCITECH
4.	Automatic Control Systems	K Sridhar	Wiley India
5.	Automatic Control System	B.C. Kuo	PHI
6.	Control System	Kumar	Tata McGraw-Hill
7.	Modern Control Theory	Brogan	Pearson
8.	Programmable Logic Control- Principles and Applications	NIIT	PHI
9.	Basic Instrumentation System & Programmable Logic Controller	Umesh Rathore	Katson Books
10.	Programmable Logic Controller	Frank Petruzella	McGraw Hill
11.	Programmable Logic Controller	W Bolton	Newnes

Name of the course: Computer Networking and Data Communication	
Course Code: ETCE/DCNDC/S6	Semester: Sixth
Duration: One Semester (Teaching– 15 weeks + Internal Exam-2weeks)	Maximum Marks:100 Marks
Teaching Scheme:	**Examination Scheme:**
Theory: 3contact hrs./week	Class Test(Internal Examination):20 Marks
Practical: 2contact hours/week	Attendance=10 marks and Quizzes/Assignment/Student Activity= 10 marks
	End Semester Examination:60 Marks
Credit:4(TH:3+PR:1)	Practical:100 Marks

Course Outcomes:

After completion of the course students will able to

- Explain basic concepts of LAN, MAN, WAN, different Network Topologies and concept of different types of switching.
- Analyze the services and role of each layer of OSI model
- Analyze, specify and design the topological and routing strategies for an IP based networking infrastructure
- Explain the different protocols used at application layer i.e. HTTP, SMTP, SNMP, FTP, TELNET and VPN.
- Analyze performance of various communication protocols.
- Explain basic knowledge of the use of cryptography and network security.

	Content(Name of the topic)	Periods
	Group–A	
Unit 1	**NETWORK BASICS: STRUCTURE & REFERENCE MODEL**	**10**
	1.1 **Idea of computer network** – Network components 1.2 **Types of Network** – Classify networks by their Geography- LAN, MAN & WAN; Classify Networks by their Network role: Peer to Peer, Client- Server Model. 1.3 **Network topology**- Bus Topology, Ring Topology, Star Topology, Mesh Topology, Tree Topology, Hybrid Topology. 1.4 **SWITCHING**: Circuit Switching – Message Switching – Packet Switching. 1.5 **Layered architecture of network system** – Seven-layer OSI model – Functions of each OSI layer – Other ISO structure – TCP / IP Layer Structure, Comparison between OSI and TCP/IP models.	
Unit 2	**TRANSMISSION MEDIA AND NETWORKING DEVICES**	**10**
	2.1 **Classification of Transmissions Medium:** Compare between Unguided and Guided medium. Twisted Pair Cable (UTP, STP), Coaxial Cable, Optical Fiber Cable and Wireless Transmission Media (IR, Microwave). 2.2 **Network Hardware Components** – NIC, Hubs, Switches - Layer 2 and Layer 3 Switches, Routers, Bridges, Repeaters, Gateways, Modems. 2.3 **Routing Algorithms**: Concept of Static Routing, Dynamic Routing, Distance Vector Routing Algorithm and Routing Information Protocol.	
	Group–B	
Unit 3	**IP Protocol and Network Applications**	**12**

	3.1 **IP addressing:** IP v4 Classful and Classless addressing, Subnetting and Super netting, Subnet Mask and Default Mask, Class less Inter Domain Routing (CIDR). 3.2 **IPV6:** Types and advantages, Difference between IPV4 with IP V6. 3.3 TCP/IP Protocols, Configuring TCP/IP. 3.4 **Other Network Layer Protocols:** ARP, RARP, ICMP, UDP, Difference between TCP and UDP.	
Unit 4	**Application Layer Services**	**07**
	4.1 Structure and Objectives of Intranet & Internet, Use of Firewall and proxy server. 4.2 Working of Email – POP-3, SMTP, MIME; TELNET, FTP, SNMP, World Wide Web, URL, HTTP, Working of DNS and DHCP Server. 4.3 Working of VoIP, VPN and VSAT.	
	Group–C	
Unit 5	**NETWORK and CYBER SECURITY**	**06**
	5.1 **Different aspects of SECURITY**: Privacy – Authentication – Integrity – Non-Repudiation. 5.2 **ENCRYPTION / DECRYPTION**: Data Encryption System – Secret key method – Public key method (RSA algorithm), Digital signature. 5.3 Define Cyber Security, Types of Cyber Security Threats -Phishing, Ransom ware, Malware, Social Engineering, Emotet, Man in the Middle (MITM), Password Attack, Spyware, Hacking, Viruses, Trojan and Worm.	
	Total	**45**

Sl. No.	Suggested List of Laboratory Experiments
1	Compare and configure different Network Topologies physically or by using CISCO Packet Tracer software.
2	Compare and demonstrate Network directing devices: Repeater, Hub, Switch, Bridge, Router, Gateway.
3	Study of different types of Network cables and practically implement the cross wired cable and straight through cable by using crimping tool and RJ-45 Connector.
4	Connect the Computers in Local Area Network.
5	Study of different types of IP Addressing and Subnetting and Super netting concepts.
6	Configuring TCP/IP Network.
7	Study of basic Network and Network configuration commands.
8	Web page designing by using HTML.

References:

Sl No.	Title of Book	Author	Publication
1.	Computer Networks, 4th edition	A. S. Tanenbaum (2003)	Pearson Education/ PHI, New Delhi, India
2.	Data communication and Networking, 4th Edition	Behrouz A. Forouzan (2006)	Mc Graw-Hill, India
3.	Computer Networking: A top down approach	Kurose, Ross (2010)	Pearson Education, India
4.	Computer Networks	Bhushan Trivedi	Oxford University Press, 2013
5.	Computer Networks and Internets	Comer	Pearson
6.	Computer Networking with Internet Protocols	Stallings	Pearson

7.	A COURSE IN COMPUTER NETWORKS	Dr. Sanjay Sharma	S K Kataria & Sons

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Electronics & Instrumentation Engineering [EIE]

Part-III (6th Semester)

2023

Electronics & Instrumentation Engineering

Semester VI									
Sl No.	**Category**	**Code No.**	**Course Title**	**Hours Per week**			**Total Contact hrs/week**	**Credits**	**Marks**
				L	T	P			
1	Program Core Course	EIEPC302	Microcontroller	2	1		3	3	100
2	Program Core Course	EIEPC304	Microcontroller Lab			3	3	1.5	100
3	Program Core Course	EIEPC306	AutoCAD 2D & Control Simulation Lab			3	3	1.5	100
4	Program Elective Course	EIEPE302	Industrial Buses and Networks Or Process Plant & Instrumentation	2			2	2	100
5	Humanities and Social Science	HS302	Entrepreneurship and Start-ups	3			3	3	100
6	Open Elective Course	EIEOE302	Engineering Economics & Project Management	2	1		3	3	100
7	Open Elective Course	EIEOE304	Electric Vehicle Technology Or Industrial Safety Or Environmental Science & Engineering	2	1		3	3	100
8	Major Project	PR302				4	4	2	100
9	Seminar	SE302				2	2	1	100
	TOTAL						**26**	**20**	**900**

Semester	:	**VI**
Course Code	:	**EIEPC302**
Course Title	:	**Microcontroller**
Number of Credits	:	**3 (L:2, T:1, P:0)**
Prerequisite	:	Basic knowledge on Digital Electronics
Course Category	:	**PC**

Course Objective

Following are the objectives of this course

- To understand 8051 microcontroller, Assembly programming using Port, Timer, Interrupt and Serial communication.
- To understand Interfacing for various application.
- Design and develop microcontroller-based systems.

Course Content			**Hrs/Unit**
Module 1	**Unit 1**	**Registers and Instructions of 8051**	8
		1.1 Difference between microprocessor and microcontroller 1.2 Features of 8051 microcontroller. 1.3 RAM location 1.4 Registers in 8051, Register bank 1.5 PSW, Stack, Stack Pointer (SP), PUSH, POP 1.6 Assembly language structure 1.7 Assembler directive 1.8 Assembly language instructions: a) Arithmetic instructions b) Branch instructions c) Data transfer instructions d) Logic instructions e) Bit oriented instructions 1.9 Machine cycle, time calculation to execute instruction/program	
	Unit II	**8051 Hardware and Port programming**	7
		2.1 8051 Pin diagram explanation 2.2 I/O Port programming 2.3 Addressing mode of 8051 2.4 Oscillator and Reset pin hardware connection	
Module 2	**Unit III**	**8051 Timer Operation**	7
		3.1 Setting of timer operation using TMOD register 3.2 Mode1 and Mode2 operation of Timer 3.3 Programming to generate Time delay, square wave using Timer in Mode1 and Mode2 3.4 Operation of 8051 timer as ‘Counter’ 3.5 TCON register setting for timer operation	

	Unit IV	**8051 Serial communication**	6
		4.1 Features of serial communication, difference of it with parallel communication 4.2 UART communication module Block diagram 4.3 Function of SBUF register for Asynchronous data transfer 4.4 SCON register setting 4.5 Program to receive and send bytes of data serially	
Module 3	**Unit V**	**8051 Interrupt**	9
		5.1 What is interrupt, Advantage of interrupt over polling 5.2 ISR, Interrupt Vector Table 5.3 Steps in executing an interrupt 5.4 Different interrupts in 8051 5.5 IE register for masking or unmasking the interrupts 5.6 Programming using Timer interrupt 5.7 Operation of external hardware interrupt and programming 5.8 TCON register setting for interrupt operation 5.9 Use of serial interrupt	
	Unit VI	**Application**	8
		6.1 Speed/ Position control of dc motor using 8051 6.2 Stepper motor control using 8051	

Suggested Learning resources

Title	**Author**	**Publisher**
The 8051 Microcontroller & Embeded Systems	Mazidi, Mazidi	PHI
The 8051 Microcontroller Architecture, Programming and Application	K J Ayla	Penram Internationa
Microcontroller: Principle & Application	Pal	PHI
The 8051 Microcontroller	I. Scott MacKenzie	
8051 Microcontroller: An Applications Based Introduction	Calcutt, Cowan, Parchizadeh	Newnes, Kindle Edition
Microcontroller Programming: An Introduction	Syed R. Rizvi	CRC Press
Microprocessors And Microcontrollers	Senthil Kumar, Saravanan, Jeevanathan	Oxford University Press
Web Resource:		

- https://www.tutorialspoint.com/microprocessor/microcontrollers_8051_input_output_ports.htm
- https://www.youtube.com/watch?v=6LdZwKfDE_M&list=PLOIeKaPlLnGLUr_1KXfXZC1Pvdy59b1f1
- https://www.geeksforgeeks.org/introduction-to-8051-microcontroller/

Course Outcome	
At the end of the course student will be able to:	1) Understand the internal architecture of 8051 family microcontrollers and gain comprehensive knowledge with programming of 8051 microcontroller 2) Develop and write assembly language program using instruction set of 8051 for various embedded system applications 3) Create and implement IO interfaces with different peripherals in various embedded system projects 4) Apply knowledge and demonstrate programming proficiency using the various addressing modes, timer, counter, interrupts of 8051 microcontroller 5) Evaluate assembly language programs and download the machine code that will provide solutions of real-world control problems

Semester	:	**VI**
Course Code	:	**EIEPC304**
Course Title	:	**Microcontroller Lab**
Number of Credits	:	**1.5 (L:0, T:0, P:3)**
Prerequisite	:	Idea on digital electronics
Course Category	:	**PC**

Course Objective	
Following are the objectives of this course	
	❖ Develop 8051 assembly language programs using instruction set. ❖ Programming using Timer, Counter, Serial communication, Interrupt ❖ Design and develop microcontroller interfacing with different peripheral devices.

List of Practical work/Programming to be performed and check the results. (At least 15 programs to be performed)	
Sl. No.	**Aims:**
1	Introduction to Microcontroller Trainer Kit and identify the different peripheral devices, bus architecture on it.
2	Addition of two numbers and checking status of C, AC, and P in PSW
3	Using PUSH, POP instructions and checking the output in registers.
4	Addition of a number in 10 timers (may use DJNZ operation)

5	Addition of two numbers, result in R0 (low byte), R5 (high byte) and check the result.
6	Alter the logic of alternate bits of P1 with a delay (may use DJNZ instruction)
7	Generation of Square wave of 50% duty cycle on any pin of P1
8	A switch is connected to pin P2.0 and LED to pin P1.0. Write a program to get the status of the switch and send it to the LED
9	Copy the value 55H into RAM memory location 40H to 41H using register indirect addressing mode.
10	Multiple 25H and 69H (may use MUL instruction) and check the result. If the result is E99H, 99H will be stored in reg A and E at reg B
11	Divide any number (say 85) with any number (say 10) and check the result. Quotient will be at A and remainder at B
12	Program to perform logical AND, OR operation of two numbers and verify the result
13	Read and test P1 to see whether it has the value FFH. If it is, glow light on any pin of P2 (Assume logic low makes the light ON)
14	Program to check the number of 1s in a byte of data
15	Program to generate a square wave of 50% duty cycle at any pin of P2 using Timer0 or Timer1
16	LED is connected to any pin at P2. Make it ON for 1 sec and then OFF for 1 sec and repeat it.
17	Program to display digit 0, 1, …9 in seven segment LED
18	Using interrupt, Program to generate a square wave of 200 µS period at any pin of P1.
19	Program to rotate dc motor in left and right direction
20	Program to control stepper motor
	Write any other program suggested by concern subject teacher using different instructions of 8051
	Note: Student may (a) write the programming in assembly language (or C), (b) run the program in Microcontroller training kit and/or any simulation software.
Course Outcome	
At the end of the course student will be able to:	1. Write assembly programs to run on 8051 microcontroller and systems based on it 2. Understand and develop techniques for faster execution of arithmetic and logical operations 3. Understand and realize the Interfacing of memory & various I/O devices with 8051 Microcontroller

	4. Design applications based on 8051 microcontroller using memory chips and peripheral ICs 5. Undergo minor projects based on 8051 assembly language programming

Semester	:	**VI**
Course Code	:	**EIEPC304**
Course Title	:	**AutoCAD 2D and Control Simulation Lab**
Number of Credits	:	**1.5 (L:0, T:0, P:3)**
Prerequisite	:	Nil
Course Category	:	**PC**

Course Objective	
Following are the objectives of this course	
	❖ To enable students to create a basic 2D drawing in the AutoCAD software with a necessary understanding of drafting basic geometry and other skills needed to create 2D drafting and automate complex or tedious drawing tasks ❖ To develop the idea of control system, design of it and verify response with step inputs

List of Practical work/Programming to be performed and check the results. (At least 8 programs to be performed)	
Sl. No.	**Aims:**
	I&C basic Design concept
1	Introduction: Draw lines, circle, rectangles, polygons, ellipse, arcs
2	Modifying commands: Copy, Move, Rotate, Scale, Trim, Extend, Fillet, Chamfer, Mirror, Stretch, Offset
3	Advanced Draw Commands: Polyline, rectangular, polar, object selection, Taking a grip, Object Snaps
4	Advanced Modifying commands: Lengthen, Polyline to Curve, Break & Point style, Divide, Area, Measure Area, Blocks, Block-Edit
5	Drawing enhancement: Object properties, Hatch command, Concept of Layers, Text in AutoCAD
6	Adding Dimension: Adding linear, Radial and Angular dimension
7	Schematic project: Instrument Installation/Hook up diagram, Loop diagram, PLC architecture diagram, Cabinet General Arrangement and Wiring drawing,

	(For above practicals student may use AutoCAD software)
	(For below practicals Students may use Matlab / Scilab or any other similar software)
8	Creation of continuous LTI models: Transfer Function model (TF), Zero-Pole-Gain model (ZPK)
9	To determine Residue (r), Pole (p). and Direct term (k) of a partial fraction expansion of the ratio of two polynomials B(S) and A(S)
10	To find and plot the step response of an open loop system
11	To find and plot the step response of a close loop system. Verify the improvement of rise time, overshoot, steady state error while use P, P+D, P+I, P+I+D controller.
	(Use commands for 8 to 11)
12	To build a close loop system using graphical building blocks and find Step response of that close loop control system with PI or PID controller
Course Outcome	
At the end of the course student will be able to:	1. Understand the AutoCAD workspace and basic 2D drawing in the AutoCAD software 2. Identify and apply basic AutoCAD tools to draw and edit shapes and figures 3. Modify and enhance the drawings 4. Construct different process diagram, wiring and cabinet. 5. Improve understanding of drafting basic geometry and other skill needed to create 2D drafting and automate complex or tedious drawing tasks 6. Design control system and formulate the response with step inputs

Semester	:	**VI**
Course Code	:	**EIEPE302/1**
Course Title	:	**Industrial Buses and Network**
Number of Credits	:	**2 (L:2, T:0, P:0)**
Prerequisite	:	Nil
Course Category	:	**PC**
Course Objective		
Following are the objectives of this course		
	❖ To educate on the basic concepts of data networking in industry ❖ To provide details on HART and Field buses ❖ To introduce industrial Ethernet and wireless communication	

Course Content			Hrs/Unit
Module 1	**Unit 1**	**Fundamentals of Industrial Data Communication**	3
		1.1 Hierarchical levels in Industrial communication network. 1.2 Functional Layered Models: OSI reference model (brief explanation of different layers) 1.3 Different Industrial Protocol 1.4 Limitation of 4-20 mA standard	
	Unit II	**Communication Network**	7
		2.1 Network physical media: Cable, connector, Tees, Terminators, bus Extenders, etc 2.2 Industrial Network Components: Switch, Repeater, Router, Bridge, Gateway, Fiber optic patch, light interface unit, Media converter 2.3 Network Topology: Point to Point, Star, Line/bus, Ring, Tree, Mesh, Hybrid 2.4 Protocol: definition, Proprietary and open protocol, Example of industrial protocol (TCP/ IP, Modbus, UDP, FTP, HTTP, HART etc) 2.5 Communication methods: Peer to Peer, Master-Slave, Publisher subscriber, Token-Ring, Random access.	
Module 2	**Unit III**	**HART**	4
		3.1 What is HART 3.2 How is HART used with analog sensor 3.3 Smart sensor and comparison with conventional senor 3.4 How does HART work 3.5 Point to point and Multidrop mode 3.6 HART networks and components 3.7 HART commands 3.8 HART applications	
	Unit IV	**Fieldbus System**	6
		4.1 What is Fieldbus 4.2 Features of fieldbus (Transmission medium, connectors, speed, Topology, maximum number of components, protocols etc) 4.3 Advantage and Disadvantage of Fieldbus 4.4 Profibus: Basic architecture of Profibus DP and Profibus PA, Profi-net, Features, topology used, and explanation of Profibus PA, 4.5 Foundation Fieldbus: Basic architecture and feature, DCS with FF, segment topology, cable type	

Module 3	**Unit V**	**Ethernet and Modbus**	5
		5.1 Features of ethernet, Advantages and disadvantages 5.2 Basic concept of Modbus, Modbus packet architecture, Different types of Modbus protocol. 5.3 Comparison between Industrial Ethernet and Modbus	
	Unit VI	**Industrial Wireless Network**	5
		6.1 Concept of ISM band 6.2 Difference between wired and wireless communication. 6.3 Difference between WiFi and Industrial Wireless Network (IWN) 6.4 Application of IWN 6.5 Networking standards for IWN: Wireless Hart, GPS, Bluetooth, Wifi 6.6 Components of wireless network.	

Suggested Learning resources

Title	**Author**	**Publisher**
Practical Data Communications for Instrumentations and Control	John Park, Steve Mackay, Edwin Wright,	ELSEVIER
Industrial Data Networks: Design, Installation and Troubleshooting	Mackay, Wright, Reynders, Park	Newnes publication
Computer Buses	Buchanan W.	CRC Press
Data Communications and Networking	Behrouz A Forouzan	Tata McGraw hill
Modern Operating Systems	Andrew S. Tanenbaum	PHI
Process Software and Digital Networks	B.G. Liptak	CRC Press ISA
Wireless communication: Principles & Practice	Theodore S. Rappaport	Prentice Hall of India
Fundamental of industrial instrumentation and process control	William C. Dunn,	Mc Graw-Hill
Computer Control of Process	M Chidambaram	Narosa
Computer Based Industrial Control	Krishna Kant	PHI

Web resource:

- https://www.plctutorialpoint.com/what-are-protocols-used-in-dcs/
- https://www.linkedin.com/pulse/dcs-communication-protocols-vivek-rugale
- https://instrumentationtools.com/overview-communication-protocols/
- https://www.electricaltechnology.org/2016/12/industrial-communication-networks-systems.html

- https://excelautomationsolutions.com/what-are-the-different-types-of-communication-protocol-used-in-plc/
- https://en.wikipedia.org/wiki/Fieldbus
- https://www.fieldcommgroup.org/
- www.profibus.com
- https://www.predig.com/whitepaper/introduction-to-modbus-serial-communication
- https://modbus.org/docs/Modbus_Application_Protocol_V1_1b3/pdf

Course Outcome	
At the end of the course student will be able to:	1. Explain basic concepts of network hierarchy and apply network data communication protocols in industrial network. 2. Evaluate appropriateness of different industrial data networks and develop the various communication networks for industries. 3. Illustrate, compare and explain the working of HART and Field bus used in process digital communication. 4. Explain and adopt the different Industrial Ethernet protocol and usage of wireless communication in process applications. 5. Troubleshoot problems in hardware/software employed in data communication circuit.

Semester	:	**VI**
Course Code	:	**EIEPE302/2**
Course Title	:	**Process Plant & Instrumentation**
Number of Credits	:	**2 (L:2, T:0, P:0)**
Prerequisite	:	Nil
Course Category	:	**PC**

Course Objective	
Following are the objectives of this course	
	❖ To provide ides of different Process plants ❖ To gain knowledge on process and raw materials used and final product of different industries. ❖ To enhance knowledge on features and important control aspect in process Industries.

Course Content			**Hrs/Unit**
Module 1	**Unit 1**	**Steel Making Process Instrumentation**	3
		1.1 Complete overview of steel manufacturing process with flowchart 1.2 What is Coke Oven plant and Blast furnace. 1.3 Moisture measurement of Coal at Coke Oven Plant	

		1.4 RAFT (Raceway Adiabatic Flame Temperature) control in Blast furnace 1.5 Material injection into blast furnace and control using chut 1.6 Technology providers	
	Unit II	**Power Plant Instrumentation**	7
		2.1 Burner management system 2.2 SWAS (Steam Water Analysis System) 2.3 Continuous Emission Monitoring System 2.4 Turbine vibration monitoring system 2.5 Idea different type of power plant (Coal based thermal power plant, Gas/oil fired based power plant, Captive Power plant)	
Module 2	**Unit III**	**Cement Making Process**	4
		3.1 Material composition of cement, various unit operation of cement manufacture, Cement manufacturing process 3.2 Dust control equipment using gravity setting chamber, cyclones, ESP, Bag house filters etc. **3.3** Air pollution control: Measuring equipment of exit gases, SOx, NOx and CO	
	Unit IV	**Water Treatment Plant**	6
		4.1 Types of Water Treatment plant (WWTP, ETP, STP, DM, RO) 4.2 Block diagram explanation of general WWTP and DM process 4.3 Different technologies use to remove impurities and Alkalinity & Acidity balance 4.4 Name and function of different instruments and analysers (pH, Conductivity, Turbidity, Dissolve O2, BOD, COD) used	
Module 3	**Unit V**	**Refinery**	5
		5.1 Idea on Oil Tree 5.2 Flow diagram of typical Refinery (CDU, VDU, ASU, FCCU, DHDT etc) 5.3 Refinery products (LPG, Petrol, Diesel, Kerosene etc) 5.4 Application of FTNIR and MS blending system in Refineries	
	Unit VI	**Petrochemical**	5
		6.1 Flow diagram of typical Petrochemical Process (NCU, NCAU, LLDP, HDPE, PP)	

		6.2 Petrochemical products, different types of plastic and chemicals and their application. 6.3 Flow diagram of a PTA and PET plant 6.4 Technology provider of different type of petrochemicals and refineries 6.5 Application of Gas Chromatography in Petrochemical industry	

Suggested Learning resources

Title	**Author**	**Publisher**
Process Control	Bela G Liptak	Chilton Book Company
Principle of Process Control	D. Patrababis	TMGH
Chemical process control	Stephnopolous, G	PHI
Chemistry of Cement and Concrete	F M Lea	Edward Arnold (Publishers) Ltd
Cement Data Book	W. H Duda	French and Europen Pubns
Environmental Pollution Control Engineering	C S Rao	New Age International (P) Ltd
Iron and Steelmaking Theory and Practice	Ahindra Ghose, Amit Chatterjee	PHI

Web resource:

- https://marinerspointpro.com/steel-making-process-steps-flowchart/#:~:text=The%20commercial%20processes%20for%20making,process%20(6)%20Duplex%20process.
- https://annualreview2015.arcelormittal.com/fact-book/additional-information/steel-making-process
- https://www.researchgate.net/figure/General-flow-diagram-for-the-iron-and-steel-industry_fig1_265886738
- https://steelmuseum.org/steelmaking_exhibit_2016/steelmaking_process.cfm
- https://www.slideshare.net/shreenathmodi/naphtha-cracker-plant
- https://en.citizendium.org/wiki/Process_flow_diagram
- https://www.toshbrocontrols.com/industries/iron-steel
- https://www.slideshare.net/RaviRoy4/cement-plant-process-and-instruments-used
- https://www.cementequipment.org/home/cement-manufacturing-process/
- https://en.wikipedia.org/wiki/Petroleum_refining_processes
- https://www.haldiapetrochemicals.com/manufacturing-process
- https://www.coleparmer.in/tech-article/eight-stages-of-wastewater-treatment-process

- https://www.wika.ca/upload/BR_Ironandsteel_en_co_98404.pdf
- https://blog.jencoi.com/4-instruments-used-in-industrial-wastewater-treatment#:~:text=Examples%20of%20flow%20instruments%20include,%2C%20pumps%2C%20or%20supply%20valves.
- https://control.com/technical-articles/types-of-instrumentation-used-in-wastewater-treatment-facilities/

Course Outcome	
At the end of the course student will be able to:	1. Explain process flow of different industries like Steel, Power, Cement, Refinery etc 2. Identify the raw material used and final product of those industries 3. Locate and improve the Safety procedure maintained in industries. 4. Understand and modify important control system used in those industries. 5. Construct the process flow of the industries.

Semester	:	**VI**
Course Code	:	**HS302**
Course Title	:	**Entrepreneurship and Start-ups**
Number of Credits	:	**3 (L:3, T:0, P:0)**
Prerequisite	:	
Course Category	:	**PC**
Course Objective		

Detailed course content will be provided by the council separately

Semester	:	**VI**
Course Code	:	**EIEOE302**
Course Title	:	**Engineering Economics & Project Management**
Number of Credits	:	**3 (L:2, T:1, P:0)**
Prerequisite	:	
Course Category	:	**PC**
Course Objective		

Detailed course content will be provided by the council separately

Semester	:	**VI**
Course Code	:	**EIEOE304/1**
Course Title	:	**Electric Vehicle Technology**
Number of Credits	:	**3 (L:2, T:1, P:0)**
Prerequisite	:	
Course Category	:	**PC**
Course Objective		

Detailed course content will be provided by the council separately

Semester	:	**VI**
Course Code	:	**EIEOE304/2**
Course Title	:	**Industrial Safety**
Number of Credits	:	**3 (L:2, T:1, P:0)**
Prerequisite	:	
Course Category	:	**PC**
Course Objective		

Detailed course content will be provided by the council separately

Semester	:	**VI**
Course Code	:	**EIEOE304/3**
Course Title	:	**Environmental Science & Engineering**
Number of Credits	:	**3 (L:2, T:1, P:0)**
Prerequisite	:	
Course Category	:	**PC**
Course Objective		

Detailed course content will be provided by the council separately

Semester	:	**VI**
Course Code	:	**PR302**
Course Title	:	**Major Project**
Number of Credits	:	**2 (L:0, T:0, P:4)**
Prerequisite	:	Basic on Electronics & Instrumentation
Course Category	:	**PC**

Course Objective	
Following are the objectives of this course	
	➢ To understand the problem and solution of real-life problem ➢ To achieve the potentiality of doing team work, develop leadership qualities and Innovative ideas. ➢ To fill up the gap between academic knowledge and actual real-life problem-solving knowledge. ➢ To prepare the project repot in a skilful way. ➢ To develop technical skill, presentation skill and enhance creative thinking. ➢ To work in Groups, plan the work and coordinate the work.
Project group	The project shall be undertaken by a group of students as per convenience. Individual student may also perform separate project.
Few suggestive project domain	
	Simple electrical and electronic project Project for process automation (level, Flow, temperature, pressure control) Microcontroller based project Arduino based project Raspberry Pi based project IoT project DTMF cell phone-based project RF and RFID based project Android application-based project Matlab based project LabView based project PC based project Robotic project Fuzzy logic-based project Sensor based project Wireless sensor-based project Bluetooth and Zigbee based Projects GSM based project GPS based project

	Solar system project Project on Irrigation system Robotic project TV remote-control based project PLC based Project Fingerprint based project Traffic density control project Voice control-based project Project on solar system Object detection project Vehicle detection project Obstacle detection project Human health monitoring project Vehicle speed control project Project with night vision camera Project work on women safety Agricultural robotic project Project based on Wireless surveillance Project for Blind hospitality
Note	➢ This project work may be continuation of previous project started in last semester or a new one. ➢ Project topic may be selected having consultation with project guide. ➢ Every student will have to maintain record of individual contribution on project work. ➢ After completion of the project, each student should prepare project report. ➢ The project report should be signed by the guide and / or HOD. ➢ The student will have to submit reports on their assigned projects to the project guide in time. ➢ Student will have to perform a seminar presentation on their assigned project work in front of a Board of Internal Examiners of concern department at the time of end semester internal assessment. ➢ Seminar evaluation should be done on the basis of following points ✓ Quality of content presented ✓ Proper Planning for presentation ✓ Clarity of presentation ✓ Depth of knowledge and skills ✓ Questionnaire
Format of Project Report	1. Title page 2. Acknowledgement 3. Certificate from guide 4. Abstract

	5. Objective 6. Literature review/ background survey/history 7. Present work 8. Methodology 9. Observation 10. Conclusion 11. Future Scope 12. References
Evaluation of Project Report	The project Report will be evaluated on the basis of following criteria ➢ Originality ➢ Awareness about the significance of project topic ➢ Setting and operation of experimental set up ➢ Observations and recording data ➢ Interpretation of result and conclusion ➢ Organizations, format, drawing, sketches, style, language ➢ Submission of report in time ➢ Answer to sample questions
Assessment	**Internal Assessment: Total marks: 60** ➢ Continuous assessment of performance, contribution and in time submission of reports on projects: 30 Marks ➢ Seminar Presentation and Viva Voce at end of semester: 20 Marks ➢ Class Attendance:10 Marks **External Assessment: Total marks: 40** (End Semester Examination) ➢ Performance on exhibition of project work: 20 marks ➢ Evaluation on Project Reports: 10 marks ➢ Viva voce on project work: 10 marks
Course Outcome	
At the end of the course student will be able to:	1. Identify and analyse the problem statement. 2. Develop and design alternative solutions for the identified problem. 3. Adopt new skills and supplement knowledge 4. Build communication and teamwork skills. 5. Improve time management, multi-tasking, real time technical knowledge etc. 6. Apply their knowledge for doing some application-oriented work.

Semester	:	**VI**
Course Code	:	**SE302**
Course Title	:	**Seminar**
Number of Credits	:	**1 (L:0, T:0, P:2)**
Prerequisite	:	Subject knowledge up to 5th Semester
Course Category	:	**PC**

Course Objective

Following are the objectives of this course

- To develop technical skill, presentation skill and enhance creative thinking.
- Prepare a well-organized report employing elements of technical writing and critical thinking.
- To do literature survey in a selected area of study.
- To understand an academic document from the literature and to give a presentation about it.
- To prepare a technical report.

Guideline Features

- The course 'Seminar' is intended to enable a student to search, read, understand, present and prepare report about an academic / research topic. Students should search literature including various journals, books, research papers, online resources etc., and identify an appropriate topic in his/her area of interest, in consultation with his/her seminar guide.

- Student may select recent topic of latest technology in the area of Instrumentation, Control, Electronics for seminar presentation.

- Students have to prepare a PowerPoint presentation of the selected topic of minimum 10 slides and the total presentation will be approximately 10 minutes duration. And also need to submit the report of presentation for evaluation.

- Student need to present individually in front of other students of the class including the faculty members of the dept.

- A student may choose two separate topics for presentation during a semester, one is for internal assessment part and other is for external assessment part.

Note	Along with seminar preparation work, students may get exposure on Personality Development, Resume preparation, Facing Interviews, Group discussion, Stress Release skills etc. during this class period.
Evaluation Features	
	Seminar evaluation should be done on the basis of following points ✓ Originality ✓ Quality of content presented ✓ Significance of topic ✓ Depth of knowledge and skills ✓ Proper Planning for presentation ✓ Clarity of presentation ✓ Organizations, format, drawing, sketches, style, language ✓ Questionnaire
Assessment	
	Internal Assessment: Total marks: 60 ➢ Continuous assessment of performance throughout semester: 30 Marks ➢ Seminar Presentation at end of semester: 20 Marks ➢ Class Attendance:10 Marks **External Assessment: Total marks: 40** (End Semester Examination) ➢ Performance on Seminar Presentation: 30 marks ➢ Questionnaire: 10 marks
Course Outcome	
At the end of the course student will be able to:	1. Identify and analyse the topic from the literature which is related to area of interest. 2. Read, understand and prepare the technical report. 3. Enhance the ability to present skilfully. 4. Improve time management, soft skill, and handling the situation.

Overall Examination Scheme:

(1) Theory courses:

(a) Internal Assessment: **40** marks

- Class test: 20
- Quizzes / Assignment / Student activity: 10
- Class Attendance: 10

(b) End semester Examination: **60** marks

(2) Sessional / Practical courses:

(a) Internal Assessment: Continuous Internal Assessment throughout the Semester: **60** marks

- ✓ Continuous evaluation: 50 Marks;
- ✓ Class Attendance: 10 Marks

(b) External Assessment (end Semester examination): **40** marks

- ✓ Assignment on the day of exam + practical report copy submission: 20
- ✓ Viva-voce: 20

Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Food Processing Technology
[FPT]

Part-III (6th Semester)

2023

PROPOSED DETAILS SYLLABUS FOR THE PART - III (3RD YEARS, 6TH SEMESTER) OF THE FULL TIME DIPLOMA COURSE IN FOOD PROCESSING TECHNOLOGY

WEST BENGAL STATE COUNCIL OF TECHNICAL & VOCATIONAL EDUCATION AND SKILL DEVELOPMENT

TEACHING & EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES

COURSE NAME: FOOD PROCESSING TECHNOLOGY

COURSE CODE: FPT

SEMESTER: SIXTH

DURATION OF COURSE: 6 SEMESTERS

Sl. No.	Category of Course	Code No	Course Title	Hours Per Week		Total Contact Hours Per Week	Credit	Full Marks	Internal	ESE
				L	P					
1	Program Core Course	FPTPC 302	Food Packaging and Labeling	2	0	2	2	100	40	60
2	Program Core Course	FPTPC 304	Food Industry Waste Management	2	0	2	2	100	40	60
3	Program Elective Course	FPTPE 302	**Program Elective-IV** **1)** Food Plant Design and Layout **2)** Food Plant Maintenance and Hygiene **3)** Food Metabolism and Nutrition **4)** Tea processing and Brewing Technology	2	0	2	2	100	40	60
4	Humanities and Social Science	HS302	Entrepreneurship and Start-ups	3	0	3	3	100	40	60
5	Open Elective Course	FPTOE 302	**Open Elective I** Engineering Economics and Project Management	3	0	3	3	100	40	60
6	Open Elective Course	FPTOE 304	**Open Elective II** **1)** Environmental Science and Engineering **2)** Industrial Management **3)** Sustainable Development **4)** Renewable Energy	3	0	3	3	100	40	60
Sessional										
7	Program Core Course	FPTPC 306	Food Industry Waste Management Lab.	0	3	3	1.5	100	60	40
8	Major Project	FPTPR 302	Major Project-II	0	3	3	1.5	100	60	40
9	Seminar	FPTSE 302	Seminar	0	2	2	1	100	60	40
TOTAL				**15**	**08**	**23**	**19***	**900**	**420**	**480**

STUDENT CONTACT HOURS PER WEEK: 23 hours (Lecture-15 hours; Practical-08 hours)
Theory and Practical Period of 60 minutes each.
FULL MARKS-900 (Internal Marks= 420; ESE Marks = 480)
L-Lecture, P-Practical, ESE- End Semester Examination
Two Elective Subjects have to be Selected from List of Program Elective -IV and Open Elective -II
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately in each subject.

WEST BENGAL STATE COUNCIL OF TECHNICAL & VOCATIONAL EDUCATION AND SKILL DEVELOPMENT
[A Statutory Body under West Bengal Act XXVI of 2013]
(Formerly West Bengal State Council of Technical Education)
"Karigori Bhavan", 4th Floor, Plot No. B/7, Action Area-III, New Town, Rajarhat, Kolkata-700160

Name of the Course: Diploma in Food Processing Technology	
Category: Program Core	**Semester: Sixth**
Code No.: FPTPC 302	**Theory: 100 Marks**
Course Title: Food Packaging and Labeling	**Examination Scheme:** External Assessment: **60 Marks** (End Semester Examination) Internal Assessment:**40 Marks** [Class test: 20 Marks Home assignments: 10 Marks Class attendance: 10 Marks]
Duration: 17 weeks (Total hours per week = 2)	
Total lecture class/week: 2 hours	
Credit: 2	
Pass Criterion: Students have to obtain at least 40% marks (**pass marks**) in both internal assessment and end semester examination separately.	

1. Objective:

To provide basic knowledge of packaging, its types and components, package developments.
To provide knowledge of different types of packaging materials & their forms used in food packaging.
To provide knowledge of package developments and packaging laws and regulations in food industries.
To provide knowledge about package performance and various testing of packaging materials.

2. Theory Components:

Unit	Unit Name	Topics and Sub-topics	Teaching Hours
Unit 1	**Introduction to Food Packaging**	1.1 Definition and basic functions of packaging; Different forms of packaging - Rigid, semirigid and flexible, Primary, secondary and tertiary; Primary Packaging Materials (Paper and paper based packaging materials, Plastic as packaging materials); Secondary Packaging Material (Folding carton); Transport packaging materials (corrugated fiber board boxes, wooden boxes). 1.2 Ancillary Packaging Materials (Printing inks, varnishes, lacquers and adhesives); Glass packaging materials (Composition, properties), Aluminium foil, Metal packaging materials. (Manufacture of tin plate, TFS, fabrication, corrosion and remedial measures). 1.3 Different types of packaging materials used – Polymer, paper, metal, glass – Fundamental properties (Barrier, mechanical, thermal and optical), merits and demerits and uses. 1.4 Cellulosic and Polymeric packaging materials and forms: Food grade polymeric packaging materials, Rigid plastic packages. Films: Multilayer films, Oriented, Co-extruded films, Laminates and Metalized 1.5 Polymeric materials, their mechanical sealing and barrier properties: Cellophane, Olefins, Polyamides, Polyesters, PVC, PVDC, PVA, Inomers, Copolymers, Polycarbonates, Phenoxy, Acrylic and Polyurethane.	**06**

Unit 2	**Special Packaging Materials and Packaging Equipments**	2.1 Laminates, metalized films, composite material, biodegradable material (biocomposites); Manufacturing of paper as packaging material (Schematic diagram). 2.2 Glass containers: Composition, Properties, manufacturing of glass bottles container (Schematic diagram), Bottle making and Closures for glass containers. 2.3 Metal containers: Manufacturing of Bulk containers, Tin-plate containers, Tin free steel containers, Aluminum containers, manufacturing of metal cans (Schematic diagram). 2.4 Packaging equipments – Form-fill-seal machine (Horizontal and vertical), Filling equipments, Sealing machine. Bottle filling machine, capping machine, labelling equipments, strapping, cartooning machineries. 2.5 Green plastics for food packaging (Problems of plastic packaging wastes, range of biopolymers, developing biodegradable plastic materials, bio composite)	**06**
Unit 3	**Food Packaging Interactions**	3.1 Selection of packaging materials and formats for different food sectors – Dehydrated foods, Frozen foods, Dairy products, bakery and confectionary products, cereal and pulses, Edible oils and Fats, ground and whole spices, Fresh fruits, Vegetables, Meat, fish, Poultry, Sea foods, Dry premixes, Instant foods, extruded foods, snack foods, alcoholic and non-alcoholic beverage, carbonated beverages, fruits and vegetable products.	**04**
Unit-4	**Different Methods of Packaging**	4.1 Vacuum packaging, Modified and control atmosphere packaging, shrink packaging, aseptic packaging. 4.2 Advanced packaging techniques (nanopackaging, active and intelligent packaging), Active Packaging Techniques and intelligent Packaging Techniques, 4.3 Oxygen, ethylene and other scavengers (Oxygen scavenging technology, selecting right types of oxygen scavenger, ethylene scavenging technology, carbon dioxide and other scavengers), 4.4 Antimicrobial food packaging (Antimicrobial agents, constructing antimicrobial packaging systems, factors affecting the effectiveness of antimicrobial packaging), 4.5 Non-migratory bioactive polymers (NMBP) in food packaging (Advantages of NMBP, Inherently bioactive synthetic polymers: types and application, Polymers with immobilized bioactive compounds and their applications).	**05**
Unit 5	**Testing and Regulation of Packaging Materials**	5.1 Package Evaluation: evaluation of mechanical, optical and barrier properties like WVTR, GTR, bursting strength, tensile strength, tearing strength, drop test. 5.2 Time Temperature indicators (Defining and classifying TTIs, Requirements for TTIs, development of TTIs, Maximizing the effectiveness of TTIs, Using TTIs to monitor shelf life during distribution). 5.3 The use of freshness indicator in packaging (Compounds indicating the quality of packaged food products, freshness indicators, pathogen indicators, other methods for spoilage detection). 5.4 Packaging-flavour interaction (Factors affecting flavour absorpstion, role of food matrix, role of differing packaging	**05**

		materials, flavour modification and sensory quality). 5.5 Moisture regulation (Silica gel, clay, molecular sieve, humectants, salts, irreversible adsorption) 5.6 Packaging regulations as per FSSAI, The Standards of Weights and Measures Act, 1976 and the Standards of Weights and Measures (Packaged Commodities) Rules, 1977 (SWMA).The Prevention of Food Adulteration Act, 1954 and the Prevention of Food Adulteration Rules, 1955 and its first amendment, 2003 (PFA).The Fruit Products Order, 1955 (FPO), The Meat Food Products Order, 1973 (MFPO), The Edible Oil Packaging Order, 1998, The Agmark Rules, The Solvent Extraction Oil. Deoiled Meat and Edible Flour (control) Order 1967, The Milk & Milk Products Order 1992, Infant milk substitute, Feeding Bottles and Infant Foods Act 1992.	
Unit 6	**Labeling, Storage, Transport and Distribution of Packaging Materials**	6.1 Printing on packaging material, barcodes, RFID, QR codes, Labelling, Objective of labeling, Three Kinds of Labels-rand Label, Description Label, Grade Label, Declarations on Labelling, Contents in a food label, food safety and standards (packaging and labeling) regulations, 2011. 6.2 Environment and cost considerations of packaging materials –transport of packaging material to industry, transport of packaged foods. Storage and shelf-life study of packaged foods. 6.3 Integrating intelligent packaging, storage and distribution (supply chain for perishable foods, role of packaging in the supply chain, creating integrated packaging, storage and distribution).	**04**
Sub Total: Total Lecture Classes			**30**
No. of classes required for conducting Internal Assessment examination			**04**
Grand Total:			**34**

Course Outcome: The students of the course should be able to

CO1: Define fundamentals of packaging technology and packaging materials.
CO2: Interpret different processes related to manufacturing of packaging material, methods of packaging, packaging technique and equipments.
CO3: Explain interaction between package-flavour, gas storage systems for food storage, scavengers and emitters for improving the food quality and use of various indicators for checking the quality of packaged food products.
CO4: Outline Labeling, storage, transport and distribution of Packaging materials
CO5: Identify suitable packaging materials by test-analysis and through legal specifications.

3. Suggested Home Assignment/Student Activities: (At least Two assignments)

Other than practice work in classroom, students should conduct the following suggested activities in group or individual, which are suitable for this subject as per instruction of the subject teacher.

Sl. No.	Topics for Home Assignment	Marks
1.	Explain Function of Rigid, semirigid and flexible, Primary, secondary and tertiary; Primary Packaging Materials.	5
2.	Explain Function of Ancillary Packaging Materials (Printing inks, varnishes, lacquers and adhesives).	5
3.	Classify Polymeric types of packaging materials.	5
4.	Illustrate Fundamental properties (Barrier, mechanical, thermal and optical) of Polymer, paper, metal, glass.	5
5.	Illustrate working principle of Form-fill-seal machine (Horizontal and vertical).	5
6.	Explain the method of manufacturing of glass bottles and container.	5
7.	Explain the method of manufacturing metal cans.	5
8.	Explain basic principle of Modified and control atmosphere packaging.	5
9.	Explain basic principle of aseptic packaging.	5
10.	Explain basic principle of intelligent Packaging Techniques.	5
11.	Explain basic principle of Oxygen, ethylene and other scavenging technology.	5
12.	Explain basic principle of antimicrobial food packaging technology.	5
13.	Explain basic principle of Non-migratory bioactive polymers (NMBP) technology in food packaging.	5
14.	Evaluate mechanical, optical and barrier properties of packaging materials.	5
15.	Outline system of Time Temperature indicators for monitor shelf life of packed food during distribution.	5
16.	Outline system of freshness indicator for monitor shelf life of packed food during distribution.	5
17.	Illustrate Packaging-flavour interaction for different types of packaging materials	5
18.	Illustrate Packaging rules and regulations.	5
19.	Explain need of barcodes, RFID, QR codes Printing on packaging material.	5
20.	Explain Objective and function of labeling on packaging materials.	5
21.	Illustrate role of packaging in the supply chain.	5
22.	Interpret Green plastics for food packaging.	5

4. Suggested scheme for question paper design for conducting internal assessment (Full Marks = 20)

Questions to be set as per Bloom's Taxonomy				
	Distribution of internal questions			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	**Total**
Class Test - 1				**20**
Class Test - 2				**20**

5. Suggested Learning Resources:

i) Gordon L. Robertson, Food Packaging: Principles and Practice, Third Edition,2013.
ii) Gordon L. Robertson, Food Packaging and Shelf Life: A Practical Guide,2010.
iii) Ruben Hernandez, Susan E. MSelke, John Culter, John D. Culter, Plastics Packaging: Properties,Processing, Applications, and Regulations,2000.
iv) Walter Soroka, Fundamentals of Packaging Technology-Fourth Edition.
v) M. Mahadeviah and R.V. Gowramma, " Food Packaging Materials", Tata. Mc Graw Hill co. Ltd. New Delhi.
vi) Stanley Sacharow and R.C. Griffin, "Principles of Food Packaging" , AVI Publishing Company.
vii) Coles R., McDowell D. and Kirwan, M.J.," Food Packaging Technology", Blackwell Publishing Co.
viii) Principal of Food Packaging by Sacharow & Griffin, Van Nastrand Rainhold Company, New York.
ix) Food Packaging Materials by Mahadeviah & Growramma
x) A Handbook of Food Packaging by Frank A. Paine
xi) Food Packaging Materials by N.T.Crosby
xii) Canning and Aseptic Packaging by Ranganna, TMH.
xiii) Food Packaging: Priciples and Practices by Gordon L.Robertson.
xiv) Food Science and Processing Technology Vol. II by Mridula Mirajkar and Sreelata Menon.

Name of the Course: Diploma in Food Processing Technology	
Category: Program Core	**Semester: Sixth**
Code No.: FPTPC304	**Theory: 100 Marks**
Course Title: Food Industry Waste Management	**Examination Scheme:** i) External Assessment: **60 Marks** (End Semester Examination) ii) Internal Assessment: **40 Marks** [Class test: 20 Marks Home assignments: 10 Marks Class attendance: 10 Marks]
Duration: 17 weeks (Total hours per week = 2)	
Total lecture class/week: 2 hours	
Credit: 2	
Pass Criterion: Students have to obtain at least 40% marks (**pass marks**) in both internal assessment and end semester examination separately.	

1. Objective:

Waste management term indicates how to minimize the load of waste generated in the environment. From different food industries different types of wastes are produced which needs to be treated in order to save our environment. This course helps gain knowledge about the several treatment (physical, chemical, biological) methods applied based on the parameters of waste load. Reuse and recycling of waste from the industries produce new products as well as it is environment friendly and cos effective.

2. Theory Components:

Unit	Unit Name	Topics and Sub-topics	Teaching Hours
Unit 1	**Waste Treatment Parameters**	1.1 Constituents of suspended solids, volatile suspended solids, MLVSS, BOD, COD, Dissolve oxygen, Temperature, pH, Oxygen demands (BOD, COD, TOD), fat, oil and grease content, metal content, forms of nitrogen, forms of phosphorous and sulphur in waste waters, microbiology of waste, other ingredients like insecticide, pesticides and fungicides residues. 1.2 Standards for disposal, measurement of organic content. 1.3 Analytical determination of BOD, COD, DO, acidity, alkalinity, TKN, phosphorous, sulphate, chloride, TSS, TDS, turbidity, conductivity. 1.4 Mathematical model for BOD, BOD curve.	**04**
Unit 2	**Stream Pollution and Measurement**	2.1 Nature of stream pollution, Self-purification of natural stream 2.2 Oxygen sag curve, Oxygen sag equation.	**02**

Unit 3	**Fundamental of Physical and Chemical Treatment**	3.1 **Fundamental of physical treatment** Objective of physical treatments, screening, flow equalization, mixing and flocculation, gravity separation, grit removal, skimming tank, sedimentation, Ideal sedimentation tank concept, high-rate clarification, flotation, aeration system. (No design principle only). 3.2 **Fundamental of Chemical treatment** Objective of chemical treatments, chemical coagulation, chemical precipitation, chemical oxidation, chemical neutralization and stabilization. (No design principle only)	**05**
Unit 4	**Fundamentals of Biological Treatment**	4.1 Objective of biological treatment, Types of biological process, Microbial growth kinetics, Substrate utilization kinetics. 4.2 Aerobic biological carbon oxidation, biological nitrification and denitrification, Biological phosphorous removal, Anaerobic biological oxidation.	**04**
Unit 5	**Biological Treatment Unit**	5.1 Types of Sewage filters (Intermittent sand filters, contact beds, trickling filters (only name, No description). 5.2 Trickling filters (construction of conventional trickling filter, loading, efficiency and performance of conventional trickling filter, merits and demerits of conventional trickling filter, high-rate filtration). 5.3 Biological treatment unit- Activated sludge process. 5.4 Biological treatment unit (Miscellaneous methods)- Oxidation ditch, stabilization pond (Oxidation Pond), Aerobic Pond, Anaerobic Pond, Facultative Pond, Aerated lagoons, Rotating biological contractors. (Only principle and application). 5.5 Anaerobic suspended and attached growth biological treatment process- Anaerobic contact process, anaerobic sludge blanket process, attached growth anaerobic process (only principle and application).	**08**
Unit 6	**Solid Waste Treatment**	6.1 Source and characteristics of solid wastes, Preliminary operation, thickening, stabilization, anaerobic digestion, aerobic digestion, conditioning, dewatering, sludge drying, incineration, disposal and landfilling (Only principle and application). 6.2 Composting, Vermicomposting. (Only principle and application)	**03**
Unit-7	**Industrial Waste Treatment**	7.1 Fruits and vegetable industry waste management (Types of waste generated of fruits and vegetable processing industry, treatment methods (physical, chemical, biological) applied to minimize waste load, by product utilization from fruits and vegetable processing industry). 7.2 Beverage and Distillery industry waste management (types of waste generated from beverage and distillery industry, treatment methods (physical, chemical, biological) applied to minimize waste load, by product utilization from beverage and distillery industry). 7.3 Meat, Fish and Poultry industry (type and characteristics of waste generated from meat and poultry industry, treatment methods (physical, chemical, biological) applied to minimize waste load, by product utilization from Meat , Fish and Poultry industry industry).	**04**

		7.4 Sugar industry waste management (type and characteristics of waste generated from Sugar industry, treatment methods (physical, chemical, biological) applied to minimize waste load, by product utilization from Sugar industry. 7.5 Dairy industry waste management (type and characteristics of waste generated from Dairy industry, treatment methods (physical, chemical, biological) applied to minimize waste load, by product utilization from Dairy industry).	
Sub Total: Total Lecture Classes			**30**
No. of classes required for conducting Internal Assessment examination			**04**
Grand Total:			**34**

3. Course Outcome: The students of the course should be able to

CO1: Explain fundamental concepts of waste treatment parameters and their measurement technique.
CO2: Interpret the mathematical model of BOD, Oxygen sag equation using the concept of waste treatment parameters.
CO3: Select between aerobic and anaerobic treatment method considering their working principle, application area, advantages and disadvantages
CO4: Identify the applicability of using different treatment methods (physical, chemical, biological) for specific food industries based on pollution characteristics and their economic aspects.
CO5: Illustrate the principles and the application area of various solid waste treatment methods.

4. Suggested Home Assignment/Student Activities:(At least two assignments)

Other than practice work in classroom, students should conduct the following suggested activities in group or individual, which are suitable for this subject as per instruction of the subject teacher:

Sl. No.	Topics for Home Assignment	Marks
1.	List down the parameters of waste water (physical, chemical, biological).	5
2.	Outline the methods of determining BOD, COD and DO of water.	5
3.	Interpret the significance of BOD curve.	5
4.	Describe the process of self-purification of natural stream.	5
5.	Explain the oxygen sag curve and its importance.	5
6.	Describe the various physical treatment methods applied to waste water treatment.	5
7.	Explain the chemical treatment methods applied to waste water.	5
8.	Write short notes on- nitrification and denitrification.	5
9.	Outline the objectives of biological treatments.	5
10.	Discuss the working principle of trickling filter with advantages and disadvantages.	5
11.	Outline the working principle of RBC.	5
12.	Compare between Aerobic, anaerobic and facultative pond.	5
13.	Describe anaerobic contact process and anaerobic sludge blanket process.	5
14.	Describe the process of vermicomposting, incineration, dewatering.	5
15.	Describe the methods applied to minimize waste load from dairy industry.	5
16.	Describe the methods applied to minimize waste load from meat and poultry industry.	5
17.	Describe the methods applied to minimize waste load from fruits and vegetable industry.	5
18.	Describe the methods applied to minimize waste load from beverage industry.	5
19.	Discuss the working principle of activated sludge process.	5
20.	Discuss the working principle of aerobic and anaerobic pond.	5
21.	Discuss the working principle of facultative pond.	5

5. Suggested scheme for question paper design for conducting internal assessment: (Full Marks = 20)

Questions to be set as per Bloom's Taxonomy				
	Distribution of internal questions			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	**Total**
Class Test - 1				**20**
Class Test - 2				**20**

6. Suggested Learning Resources:

i. Water and waste water Tech. 5th Ed. By Mark & Hammer, PHI.
ii. Industrial microbiology by L.E.Casida, New Age Publication.
iii. Environmental pollution by K.C.Agrawal.
iv. Environmental pollution control engireering by C.S. Rao.
v. Food processing waste management by green and Kramer (AVI)
vi. By- products from food industries: utilization and disposal by AFSI(I)
vii. Environmental Studies- By N.N.Basak
viii. Environmental Studies-By D .Srivastava
ix. Introduction to Environmental Engineering— By Dr.Manindra Nath Patra.
x. Environmental Engineering- By A.K.Jain
xi. Environmental Engineering---By G.Killy
xii. Environmental Engineering--- By Peavy, Rowe
xiii. Water and Waste Water Engineering— By S.Garg
xiv. Waste Water Engineering--By –Panmia
xv. The complete book on managing food processing industry waste- H. Panda, Asia Pacific Business Press Inc.2011.
xvi. Food Processing Waste Management : Treatment and Utilization Technology- V.K. Joshi and S.K. Sharma, New India Publishing Agency, 2011.

Name of the Course: Diploma in Food Processing Technology	
Category: Program Elective-IV	**Semester: Fifth**
Code No.: FPTPE302 (1)	**Theory: 100 Marks**
Course Title: Food Plant Design and Layout	**Examination Scheme:** External Assessment: **60 Marks** (End Semester Examination) Internal Assessment:**40 Marks** [Class test: 20 Marks Home assignments: 10 Marks Class attendance: 10 Marks]
Duration: 17 weeks (Total hours per week = 2)	
Total lecture class/week: 2 hours	
Credit: 2	
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

1. Objective:

To get an idea about project design – Its problem and solution
To understand concept of Cost analysis, cost indexes and market potential
To know about plant layout of different food processing units including their machineries and working process
To understand concept of instrumentation control, maintenance and computer aided design required for running a food plant.

2. Theory Components:

Unit	Unit Name	Topics and Sub-topics	Teaching Hours
Unit 1	**Project Design**	1.1 Project design –Process design development, Types of designs, literature survey, cost estimation, factors affecting profitability of investments, 1.2 Optimum design (economic and operation), practical considerations in design, approach, feasibility survey, process development, possible problems that may arise and their solution, final design, construction and operation, design information from the literature. 1.3 Differences in the design of Food Processing and Non-Food Processing Plants 1.4 Need of different regulatory license required for establishing Food Industry	**06**

Unit 2	**Cost Analysis**	2.1 Cost analysis and cost indexes -Cash flow for industrial operations, factors affecting investment and production costs, cost factors in capital investment, and estimation of capital investment. 2.2 Comparative rating of product ideas: present market, market growth potential, costs, risks. Salient features of sales planning required for plant design.	**05**
Unit 3	**Food Plant Layout**	3.1 Plant layout –Definition, and principles, factors in planning layouts. Finding a product, preliminary screening of ideas Methods of layout planning –Unit areas concept, two –dimensional layouts, scale models. 3.2 Principles of plant layout –Storage layout, equipment layout, safety, plant expansion, floor space, utilities servicing, building, materials handling equipment, roads. Layout installations. 3.3 Types of plant layout –Salient features (explain by flow chart symbol of different equipments such as storage vessel, conveyors, feeders, separators, blender, grinder along with process control) of horticultural, rice, maize, pulses, oil seeds, poultry, fish, meat, spice, beverages, alcoholic beverage, milk and milk product and bakery plants. 3.4 Location selection criteria –Plant location, factors in selecting a plant, selection of the plant site, preparation of the layout.	**09**
Unit 4	**Flow Diagrams**	4.1 Flow diagrams -qualitative and quantitative flow diagrams. Selection of equipments and processes - Plant capacity – Equipment design and specifications, Comparison of different processes, batch versus continuous operation. 4.2 Flow Chart for plant design, problem statement (identification stage and looking for a need), materials of construction and energy balance, equipment design and selection, scaleup in design, safety factors, specifications, problems, economics.	**05**
Unit-5	**Process Control and Handling**	5.1 Process and controls-Control systems, instrumentation control, maintenance, computer aided design. 5.2 Handling equipments -Selection, factors, pumps, piping, fittings, solid feeders, plant layout. 5.3 Plant elevation -Requirement of plant building and its components, foundation for equipment and dynamic loading, flooring, walls, roof, illumination, air-conditioning. 5.4 Labour requirement for processing plant -Labour costs, Labour handling, maintenance and repairs, common denominator, plant installation, power and power transmission systems.	**05**
Sub Total: Total Lecture Classes			**30**
No. of classes required for conducting Internal Assessment examination			**4**
Grand Total:			**34**

3. **Course Outcome**: The students of the course should be able to

CO1: Define project design – Its problem and solution.
CO2: Explain concept of cost analysis, cost indexes and market potential.
CO3: Illustrate plant layout of different food processing units including their machineries and working process.
CO4: Outline instrumentation control, maintenance and computer aided design required for running a food plant.
CO5: Develop idea about equipments handling and manpower handling.

4. Suggested Home Assignment/Student Activities:(At least Two assignments)

Other than practice work in classroom, students should conduct the following suggested activities in group or individual, which are suitable for this subject as per instruction of the subject teacher.

Sl. No.	Topics for Home Assignment	Marks
1.	Prepare feasibility survey report of a bakery unit.	5
2.	Prepare cost analysis report of a pulse and cereal plant.	5
3.	Design a plant layout using symbol only of horticultural unit.	5
4.	Design a plant layout using symbol only of edible oil unit.	5
5.	Design a plant layout using symbol only of poultry unit.	5
6.	Design a plant layout using symbol only of fish unit.	5
7.	Design a plant layout using symbol only of bakery unit.	5
8.	Write differences between batch versus continuous operation with example.	5
9.	Write Note on scaleup in a project design.	5
10.	Write differences between design of Food Processing and Non-Food Processing Plants.	5
11.	Design a plant layout using symbol only of Milk processing unit.	5
12.	Design a plant layout using symbol only of soft drinks beverage unit.	5
13.	Design a plant layout using symbol only of alcoholic beverage unit.	5
14.	Design a plant layout using symbol only of ice cream unit.	5
15.	Design a plant layout using symbol only of spice production unit.	5
16.	Design a plant layout using symbol only of meat processing unit.	5
17.	Prepare feasibility survey report of a Dairy unit.	5
18.	Prepare feasibility survey report of an alcoholic beverage unit.	5
19.	Prepare feasibility survey report of soft drinks beverage unit.	5
20.	Prepare feasibility survey report of meat and fish unit.	5

5. Suggested scheme for question paper design for conducting internal assessment: (Full Marks = 20)

Questions to be set as per Bloom's Taxonomy				
	Distribution of internal questions			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	**Total**
Class Test - 1				**20**
Class Test - 2				**20**

6. Suggested Learning Resources:

i. Food Plant Design, by Antonio Lopez-Geomez and Gustavo V. Barbosa-Canovas, CRC press, Taylor & Francis, New York.
ii. Food Plant Economics, by Zacharias B. Maroulis and George D. Saravacos, CRC press, Taylor & Francis, New York.
iii. Plant Design and Economics for Chemical Engineers by Peter, M.S. and Timmerhaus, K.D. McGraw Hill.

Name of the Course: Diploma in Food Processing Technology	
Category: Program Elective-IV	**Semester: Fifth**
Code No.: FPTPE302 (2)	**Theory: 100 Marks**
Course Title: Food Plant Maintenance and Hygiene	**Examination Scheme:** External Assessment: **60 Marks** (End Semester Examination) Internal Assessment: **40 Marks** [Class test: 20 Marks Home assignments: 10 Marks Class attendance: 10 Marks]
Duration: 17 weeks (Total hours per week = 2)	
Total lecture class/week: 2 hours	
Credit: 2	
Pass Criterion: Students have to obtain at least 40% marks (**pass marks**) in both internal assessment and end semester examination separately.	

1. Objective:

To know about standard operating procedure of different food processing units.
To get Knowledge to control different emergency situations during running a food plant.
To acquire Knowledge of Food Safety Management System, traceability and product recall.
To get an extensive idea about Food plant sanitation – Its general requirements and cleaning procedures.
To get Idea about personal hygiene and operational hygiene required in a food industry.

2. Theory Components:

Unit	Unit Name	Topics and Sub-topics	Teaching Hours
Unit 1	**Food Plant Maintenance**	1.1 Prepare standard operating procedure for different unit operation of rice, maize, pulses, bakery, oil seeds, poultry, fish, meat, spice, beverages, milk plant. 1.2 Develop precautionary method to control emergency situation such as Accident or sudden illness of worker, Power supply failure, Machine failure, Pollution and suffocation due to contamination, Waterlog condition, Fire outbreak, Disturbance by external public. 1.3 Development of Food Safety Team and FSMS system. Validation, verification and improvement required for the FSMS system. Role of Quality control department in Food Industry. 1.4 Define procedure to control the non-conformity, correction of non-conformity. 1.5 Concept of traceability and product recall.	**08**

Unit 2	**Food plant Sanitation**	2.1 Food contamination by microorganisms, effective control of micro-organisms, importance in food sanitation, micro-organisms as indicator of sanitary quality. 2.2 Food plant sanitation-Environmental protection, regulations, pollution control, air pollution abatement, particulate removal, noxious gas removal, thermal pollution control, recycling, CIP. 2.3 Effective detergency and cleaning practices: Importance of cleaning technology, physical and chemical factors in cleaning, classification and formulation of detergents and sanitizers, cleaning practices. Role of sanitation, general sanitary consideration and sanitary evaluation of food plants. 2.4 Develop Pre-requisite program for the following operations: Facility cleaning, Cleaning of equipments and surrounding area, Water management (Source of water, quality of water, purification and disinfection of water preventing contamination), Waste management (different types of waste and there disposal), Pest and Rodent control 2.5 Mention the sanitary requirements of Diary industry, Fruits and vegetable industry, soft drink beverage industry, Alcoholic beverage industry, bakery and confectionary industry and Slaughter house.	**09**
Unit 3	**Personal Hygiene**	3.1 General principle of food hygiene, Hygiene in rural and urban areas in relation to food preparation, personal hygiene and food handling habits. Establishing and maintaining sanitary practices in food plants. Prepare Food Safety objectives of an organization. 3.2 Develop policies by FBO to maintain Hygiene: Visitor's policy, Glass, brittle plastic, metal and wood policy, Jewelry policy, Personal hygiene policy, Allergen and GMO policy, Discard policy. 3.3 Mention facilities required in a FBO to maintain proper hygiene of the worker. 3.4 Training program required to maintain proper personal hygiene.	**06**
Unit 4	**Operational Hygiene**	Food hygiene and safety requirement for: 4.1 Procurement of the raw materials, ingredients, chemicals and packaging materials. 4.2 Food contact surface area such as vessels, reactor, utensils tables –and prevention of cross contamination. 4.3 Production house - Standard sanitation operating procedures of the production unit during processing activity and control measures to prevent the risks.	**07**

		4.4 Warehouse- Aerated, refrigerated and controlled atmospheric storage, Conventional & Modern control measures, storage structures for fruits, vegetables, meat and marine products. 4.5 Transportation- Cross contamination, Time and temperature effect on the sanitation of the transporting vehicle. Handling practices and Personal hygiene affects the sanitation during transportation. 4.6 Cold Chain- Personal hygiene practices that effects the sanitation during cold chain management of the food products	
Sub Total: Total Lecture Classes			**30**
No. of classes required for conducting Internal Assessment examination			**04**
Grand Total:			**34**

3. Course Outcome: The students of the course should be able to

CO1: Explain standard operating procedure of different food processing units and different emergency situations during running a food plant.
CO2: Explain concept of Food Safety Management System, traceability and product recall.
CO3: Illustrate Food plant sanitation – Its general requirements and cleaning procedures.
CO4: Discuss different policies maintained in food industries.
CO5: Develop knowledge of personal hygiene and operational hygiene required in a food industry.

4. Suggested Home Assignment/Student Activities:(At least two assignments)

Other than practice work in classroom, students should conduct the following suggested activities in group or individual, which are suitable for this subject as per instruction of the subject teacher:

Unit No.	Topics for Home Assignment	Marks
1.	Draw a flow diagram of a traceability plan.	5
2.	Write personal hygiene policy of a food plant.	5
3.	Write visitor's policy of a food plant.	5
4.	Write operational hygiene required for slaughter house	5
5.	Write operational hygiene required for warehouse.	5
6.	Write Food hygiene and safety requirement for Procurement of the raw materials, ingredients, chemicals and packaging materials.	5
7.	Write Food hygiene and safety requirement for Food contact surface area such as vessels, reactor, utensils tables –and prevention of cross contamination.	5
8.	Write Food hygiene and safety requirement for Production house.	5
9.	Write Food hygiene and safety requirement in Cold Chain system.	5
10.	Develop Pre-requisite program for Facility cleaning, Cleaning of equipments and surrounding area.	5
11.	Develop Pre-requisite program for Water management.	5
12.	Develop Pre-requisite program for Waste management.	5
13.	Write sanitary requirement of different unit operation in a bakery unit.	5
14.	Write sanitary requirement of different unit operation in a fish and meat unit	5
15.	Write sanitary requirement of different unit operation in a spice unit.	5
16.	Write sanitary requirement of different unit operation in a dairy unit.	5

17.	Write sanitary requirement of different unit operation in cereal and pulse unit.	5
18.	Write sanitary requirement of different unit operation in soft drink unit.	5
19.	Write sanitary requirement of different unit operation in alcoholic beverage unit.	5
20.	Write sanitary requirement of different unit operation in canning unit.	5
21.	Write standard operating procedure for different unit operation of rice, maize, pulses unit.	5
22.	Write standard operating procedure for different unit operation of bakery unit.	5
23.	Write standard operating procedure for different unit operation of poultry, fish, meat unit.	5
24.	Write standard operating procedure for different unit operation of dairy unit.	5
25.	Write standard operating procedure for different unit operation of soft drink beverage unit.	5
26.	Write standard operating procedure for different unit operation of spice unit.	5
27.	Write standard operating procedure for different unit operation of alcoholic beverage unit.	5

5. Suggested scheme for question paper design for conducting internal assessment: (Full Marks = 20)

Questions to be set as per Bloom's Taxonomy				
	Distribution of internal questions			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	**Total**
Class Test - 1				**20**
Class Test - 2				**20**

6. Suggested Learning Resources:

i. Principles of Food Sanitation by Marriott and Norman, G.
ii. Hygiene and Sanitation in Food Industry by S. Roday, TMH
iii. Guide to Improve Food Hygiene by Gaston and Tiffney, TMH.
iv. Practical Food Microbiology & Technology by Harry H. Weiser, Mountney, J. and Gord, W.W.
v. Food Poisoning and Food Hygiene by Betty C. Hobbs, London publication.

Name of the Course: Diploma in Food Processing Technology	
Category: Program Elective-IV	**Semester: Sixth**
Code No.: FPTPE 302 (3)	**Theory: 100 Marks**
Course Title: Food Metabolism and Nutrition	**Examination Scheme:**
Duration: 17 weeks (Total hours per week = 2)	External Assessment: **60 Marks** (End Semester Examination)
Total lecture class/week: 2 hours	Internal Assessment:**40 Marks**
Credit: 2	[Class test: 20 Marks Home assignments: 10 Marks Class attendance: 10 Marks]
Pass Criterion: Students have to obtain at least 40% marks (**pass marks**) in both internal assessment and end semester examination separately.	

1. Objective:

To develop the knowledge of metabolism of carbohydrate, protein and lipid.
To understand function of minerals and vitamins in maintaining the body metabolism.
To know the energy content of foods and measurement methods of energy expenditure.

2. Theory Components:

Unit	Unit Name	Topics and Sub-topics	Teaching Hours
Unit 1	**Energy**	1.1 Energy content of foods. Measurement of Energy Expenditure: BMR, RMR, Thermic effect of feeding and physical activity. 1.2 RDA Estimating energy requirement for individuals and groups, Food groups, Balanced diet.	**05**
Unit 2	**Concept of Metabolism**	2.1 Transport process across cell membranes. Introduction, Classification and Nutritional importance of nutrients- Carbohydrate, Protein and Lipids.	**03**
Unit 3	**Carbohydrates**	3.1 Type, Source, Function, Dietary requirements and physiological significance. Glycemic index of foods. 3.2 Glycolysis, TCA cycle, Glycogenesis, Glycogenolysis (in brief), Citric acid cycle & its significance, Gluconeogenesis (in brief), Regulation of blood glucose level.	**06**
Unit 4	**Proteins**	4.1 Type, Source, Function, Protein Quality (BV, PER, NPU), 4.2 Digestion and Absorption, Factors affecting protein bio-availability including Anti nutritional factors.	**06**

		4.3 Evaluation methods and improvement of protein quality. PEM. Transamination, Deamination, Oxidation of amino acid, Ammonia formation & transport. 4.4 Urea cycle. synthesis and breakdown of body protein.	
Unit 5	**Lipids**	5.1 Type, Source, Function, Dietary requirements, EFA. 5.2 Transport of lipoprotein, Prostaglandins. Beta oxidation of fatty acids, Ketosis, Cholesterol & it's clinical significance.	**06**
Unit 6	**Minerals and Vitamins**	6.1 Bioavailability, metabolism, function, RDI, deficiency and toxicity, interactions with other nutrients. 6.2 Macro minerals: calcium, magnesium, sodium, potassium. Micro minerals: Iron, copper, zinc, iodine. Trace minerals: selenium, cobalt, chromium. 6.3 Type, Source, Function, Dietary requirements, Deficiency and Toxicity of Fat soluble and Water-soluble vitamins.	**04**
Sub Total: Total Lecture Classes			**30**
No. of classes required for conducting Internal Assessment examination			**04**
Grand Total:			**34**

3. Course Outcome: The students of the course should be able to

CO1: Discuss the energy content of foods and measurement methods of energy expenditure.
CO2: Interpret the concept of metabolism
CO3: Illustrate the metabolism of carbohydrate, protein and lipid.
CO4: Explain the function of minerals and vitamins in maintaining the body metabolism.

4. Suggested Home Assignment/Student Activities: (At least Two assignments)

Other than practice work in classroom, students should conduct the following suggested activities in group or individual, which are suitable for this subject as per instruction of the subject teacher:

Unit No.	Topics for Home Assignment	Marks
1.	Describe the method of measurement of energy content of food.	5
2.	Describe the method of estimating energy requirement for individuals and groups.	5
3.	Explain the transport process across the cell membrane.	5
4.	Classify carbohydrates, proteins and lipids.	5
5.	Explain glycaemic index of food.	5
6.	Differentiate between Glycogenesis and Glycogenolysis.	5
7.	Illustrate the method of regulation of blood glucose level.	5
8.	Explain the role of anti-nutritional factors.	5
9.	Differentiate between transamination and deamination process.	5
10.	Explain the function of essential fatty acids.	5
11.	Illustrate the process of beta oxidation of fatty acids.	5
12.	Explain the clinical significance of cholesterol.	5

13.	Describe the toxicity of fat-soluble vitamins.	5
14.	Describe the toxicity of water-soluble vitamins.	5
15.	Explain the role of trace minerals.	5
16.	Illustrate the synthesis of protein in human body.	5
17.	Describe the factors that affect bioavailability of protein.	5
18.	Describe the methods of improvement of protein quality.	5
19.	Explain the evaluation method of protein quality.	5
20.	Differentiate between micro mineral and trace mineral.	5

5. Suggested scheme for question paper design for conducting internal assessment: (Full Marks = 20)

Questions to be set as per Bloom's Taxonomy				
	Distribution of internal questions			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	**Total**
Class Test - 1				**20**
Class Test - 2				**20**

6. Suggested Learning Resources:

i. Principles of Biochemistry by Albert L. Leninger, CBS Publishers & Distributors, New Delhi.

ii. Biochemistry Laboratory Techniques by Sterling Chaykin, Wiley Eastern Pvt. Ltd.

iii. Foods Facts & Principles by N. Shakuntala Manay & M. Shadaksharaswamy, New Age International.

iv. Food Science by N.N. Potter, CBS Publishers & Distributors Pvt Ltd, India.

v. Food Chemistry by L. H. Meyer, Publisher: Reinhold.

vi. Food Analysis & Practice by Y. Pamaranz, Publisher: AVI.

vii. Text Book of Biochemistry by Webb, Todd, Mason, Macmillan Publishing Company.

viii. Principles of Food Science Vol. I by Fennema, Karrel.

ix. Food Science by B. Srilaxmi, New Age international.

x. Principles of Food Science / Karek & L.M. Delker.

Name of the Course: Diploma in Food Processing Technology	
Category: Program Elective-IV	**Semester: Sixth**
Code No.: FPTPE 302 (4)	**Theory: 100 Marks**
Course Title: Tea processing and Brewing Technology	**Examination Scheme:**
Duration: 17 weeks (Total hours per week = 2)	External Assessment: **60 Marks** (End Semester Examination)
Total lecture class/week: 2 hours	Internal Assessment: **40 Marks**
Credit: 2	[Class test: 20 Marks Home assignments: 10 Marks Class attendance: 10 Marks]
Pass Criterion: Students have to obtain at least 40% marks (**pass marks**) in both internal assessment and end semester examination separately.	

1. Objective:

To enhance practical knowledge on improved techniques of varieties of tea processing method and tea brewing technology.

To demonstrate the tea analysis, tea testing and Regulatory Standards and Requirements of tea and tea products.

To understand Tea Garden economics, plantation labour act, industrial dispute act, minimum wage act, tea act, worker welfare and labour laws, various schemes of Tea Board and other govt. agencies.

2. Theory Components:

Unit	Unit Name	Topics and Sub-topics	Teaching Hours
Unit 1	**Tea Biochemistry and Manufacturing**	1.1 Biochemical aspects of tea production, quality parameters, leaf handling and transportation, post-harvest management, transportation, causes of leaf damage. 1.2 Tea processing machineries, tea manufacturing methods, different types of tea, new development in tea processing, sorting, grading and packaging of tea, packaging material and keeping quality of tea. 1.3 Manufacturing process of CTC tea, Orthodox tea, Oolong tea, green tea, -ingredients, process flow-sheet, process description, machineries.	**10**
Unit 2	**Regulatory Standards and Requirements**	2.1 MRL problem in tea and its global implications, HACCP, ISO, Trustea, Fairtrade, RA, PPC and its implication in tea industry.	**04**

Unit 3	**Tea Tasting and Analysis**	3.1 Organoleptic and chemical principles, terminologies in tea tasting. 3.2 Analysis and quality evaluation of tea (moisture, ash, crude fiber, iron fillings)	**04**
Unit 4	**Brewing Technology**	4.1 Tea brewing method and process, Blended Brewing of tea with botanical ingredients, Tea to Spice Drinks, Cold Brewing of tea, tea brewing equipments. 4.2 Nonconventional tea products (Cold- and hot-soluble instant tea, flavored tea, decaffeinated tea, tea concentrate, herbal tea, tea bag). 4.3 Value addition of teas – addition of other botanical parts in tea / blending with Indian herbs like aswagandha , mulethi , adrak and tulsi . Medicinal value of tea, Health benefits of Tea.	**06**
Unit 5	**Human Resource Management and Accounting**	5.1 Use of computer for data storage and transfer, industrial relations and labour management, accounting procedures, material management, fixed and variable expenses, cost benefit, break even yield, pay back, 5.2 Tea Garden economics, plantation labour act, industrial dispute act, minimum wage act, tea act, worker welfare and labour laws, various schemes of Tea Board and other govt. agencies.	**06**
Sub Total: Total Lecture Classes			**30**
No. of classes required for conducting Internal Assessment examination			**04**
Grand Total:			**34**

3. Course outcome: The students of the course should be able to

CO1: Explain the techniques of varieties of tea processing method from tea leafs.
CO2: Illustrate the method of production and quality analysis of different tea products.
CO3: Illustrate the method of tea brewing technology and application.
CO4: Develop basic knowledge and idea about tea garden economics, tea act, worker welfare and labour laws and various schemes of Tea Board and other govt. agencies.

4. Suggested Home Assignment/Student Activities: (At least two assignments)

Other than practice work in classroom, students should conduct the following suggested activities in group or individual, which are suitable for this subject as per instruction of the subject teacher:

Unit No.	Topics for Home Assignment	Marks
1.	Explain Biochemical aspects of tea production.	5
2.	Explain post-harvest management transportation of tea leafs.	5
3.	Illustrate Tea processing machineries.	5
4.	Discuss Manufacturing process of CTC tea.	5
5.	Discuss Manufacturing process of Orthodox tea.	5
6.	Discuss Manufacturing process of Oolong tea.	5
7.	Discuss Manufacturing process of Green tea.	5

8.	Illustrate Regulatory Standards and Requirements for tea.	5
9.	Explain Blended Brewing of tea with botanical ingredients.	5
10.	Discuss Manufacturing process of Cold- and hot-soluble instant tea.	5
11.	Discuss Manufacturing process of decaffeinated tea.	5
12.	Discuss Manufacturing process of tea concentrate.	5
13.	Discuss Manufacturing process of herbal tea and flavored tea.	5
14.	Discuss Manufacturing process of tea bag.	5
15.	Discuss Tea Garden economics.	5

5. Suggested scheme for question paper design for conducting internal assessment: (Full Marks = 20)

Questions to be set as per Bloom's Taxonomy				
	Distribution of internal questions			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	**Total**
Class Test - 1				**20**
Class Test - 2				**20**

6. Suggested Learning Resources:

i Tea: Production and Processing, Barundeb Banerjee, Oxford & IBH Publishing Company.
ii. Foods Facts & Principles by N. Shakuntala Manay & M. Shadaksharaswamy, New Age International.
iii. Food Science by N.N. Potter, CBS Publishers & Distributors Pvt Ltd, India.

Name of the Course: Diploma in Food Processing Technology	
Category: Humanities and Social Science	**Semester: Sixth**
Code No.: HS302	**Theory: 100 Marks**
Course Title: Entrepreneurship and Start-ups	**Examination Scheme:**
Duration: 17 weeks (Total hours per week = 3)	External Assessment: **60 Marks** (End Semester Examination)
Total lecture class/week: 3 hours	Internal Assessment: **40 Marks**
Credit: 3	[Class test: 20 Marks Home assignments: 10 Marks Class attendance: 10 Marks]
Pass Criterion: Students have to obtain at least 40% marks (**pass marks**) in both internal assessment and end semester examination separately.	

1. Objective:

To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
To motivate and inspire students toward an entrepreneurial career.
To understand venture creation process and to develop generic entrepreneurial competences.
To introduce students to the basic steps required for planning, starting and running a business.
To familiarise students with the different exit strategies available to entrepreneurs.

2. Theory Components:

Unit	Unit Name	Topics and Sub-topics	Teaching Hours
Unit 1	**Entrepreneurship – Introduction and process**	1.1 Concept, Competencies, Functions and Risks of entrepreneurship 1.2 Entrepreneurial Values& Attitudes and Skills 1.3 Mindset of an employee/manager and an entrepreneur 1.4 Types of Ownership for Small Businesses o Sole proprietorship o Partnerships o Joint Stock company- public limited and private limited companies 1.5 Difference between entrepreneur and Intrapreneur	**10**

Unit 2	**Preparation for Entrepreneurial Ventures**	2.1 Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. 2.2 Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard Feasibility Study Report. 2.3 Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan. 2.4 Project Report- Concept, its features and components. 2.5 Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. They **may not** be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.	**20**
Unit 3	**Establishing Small Enterprises**	3.1 Legal Requirements and Compliances needed for establishing a New Unit- o NOC from Local body o Registration of business in DIC o Statutory license or clearance o Tax compliances	**03**
Unit 4	**Start-up Ventures**	4.1 Concept & Features. 4.2 Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical. 4.3 Problems and challenges faced by start-ups. 4.4 Start-up Ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. **No questions are to be set from the case studies.**	**04**
Unit 5	**Financing Start-up Ventures in India**	5.1 Communication of Ideas to potential investors – Investor Pitch. 5.2 Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups. 5.3 Govt Initiatives including incubation centre to boost start-up ventures. 5.4 MSME Registration for Start-ups –its benefits.	**06**

Unit 6	**Exit Strategies for Entrepreneurs**	6.1 Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – **Basic Concept only**	**02**
Sub Total: Total Lecture Classes			**45**
No. of classes required for conducting Internal Assessment examination			**06**
Grand Total:			**51**

3. Course Outcome: After completing the course students will able to:

CO 1	Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
CO 2	Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
CO 3	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
CO 4	Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

4. Suggested scheme for question paper design for conducting internal assessment: (Full Marks = 20)

Questions to be set as per Bloom's Taxonomy				
	Distribution of internal questions			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	**Total**
Class Test - 1				**20**
Class Test - 2				**20**

5. Suggested Learning Resources:

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of IndiaLearning Private Ltd
2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Caseson Entrepreneurship	Anjan Raichaudhuri	Prentice Hall of India Learning Private Ltd
6.	How to Start a Business in India	Simon Daniel	Buuks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development and Business Ethics	Abhik Kumar Mukherjee & Shaunak Roy	Oxford University Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

Name of the Course: Diploma in Food Processing Technology	
Category: Open Elective Course-I	**Semester: Sixth**
Code No.: FPTOE302	**Theory: 100 Marks**
Course Title: Engineering Economics and Project Management	**Examination Scheme:** External Assessment: **60 Marks** (End Semester Examination) Internal Assessment: **40 Marks** [Class test: 20 Marks Home assignments: 10 Marks Class attendance: 10 Marks]
Duration: 17 weeks (Total hours per week = 3)	
Total lecture class/week: 3 hours	
Credit: 3	
Pass Criterion: Students have to obtain at least 40% marks (**pass marks**) in both internal assessment and end semester examination separately.	

1. Objective: To acquire knowledge of basic economics to facilitate the process of economic decision making.
To acquire knowledge on basic financial management aspects.
To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
To develop an understanding of key project management skills and strategies.

2. Theory Components:

Unit	Unit Name	Topics and Sub-topics	Teaching Hours
Unit 1	**Introduction, Theory of Demand and Supply**	1.1 Introduction to Engineering Economics, the relationship between Engineering and Economics 1.2 Resources, scarcity of resources, and efficient utilization of resources. 1.3 Opportunity cost, rationality costs, and benefits 1.4 Theory of Demand: the law of demand, different types of demand, determinants of demand, demand function, price elasticity of demand. 1.5 Theory of Supply: determinants of supply, supply function. 1.6 Market mechanism: Equilibrium, basic comparative static analysis (Numerical problems)	**09**

Unit 2	**Theory of Production and Costs**	2.1 Concept of production (goods & services), Different factors of production (fixed and variable factors), Short-run Production function (Graphical illustration), and long run production function (returns to scale). 2.2 Theory of Cost: Short-run and long-run cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost etc. 2.3 Economic concept of profit, profit maximization (numerical problems)	**10**
Unit 3	**Different Types of Market and Role of Government**	3.1 Perfect Competition: Features of Perfectly Competitive Market. 3.2 Imperfect Competition: Monopoly, Monopolistic Competition, and Oligopoly. 3.3 Role of government in Socialist, Capitalist and Mixed Economy structure with example.	**04**
Unit 4	**Concept of Project**	4.1 Definition and classification of projects) 4.2 Importance of Project Management. 4.3 Project life Cycle [Conceptualization→Planning→Execution→Termination]	**04**
Unit 5	**Feasibility Analysis of a Project**	5.1 Economic and Market analysis. 5.2 Financial analysis: Basic techniques in capital budgeting– Payback period method, Net Present Value method, Internal Rate of Return method. 5.3 Environmental Impact study–adverse impact of the project on the environment. 5.4 Project risk and uncertainty: Technical, economical, socio-political, and environmental risks. 5.5 Evaluation of the financial health of a project–Understanding the basic concept of Fixed & Working Capital, Debt & Equity, Shares, Debentures etc., and different financial ratios like Liquidity Ratios, Activity Ratios, Debt-equity ratio & Profitability Ratio (Basic concept only). N.B: Knowledge of financial statements is not required; for the estimation of ratios the values of the relevant variables will be provided.	**10**
Unit 6	**Project Administration**	6.1 Gantt Chart– a system of bar charts for scheduling and reporting the progress of a project (basic concept). 6.2 Concept of Project Evaluation and Review Technique (PERT) and Critical Path method (CPM): basic concept and application with real-life examples.	**08**
Sub Total: Total Lecture Classes			**45**
No. of classes required for conducting Internal Assessment examination			**06**
Grand Total:			**51**

3. Course outcome: The students of the course should be able to

CO1: Explain basic economics to facilitate the process of economic decision making.
CO2: Illustrate basic financial management aspects.
CO3: Develop the idea of project plan from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
CO4: Develop key project management skills and strategies.

4. Suggested scheme for question paper design for conducting internal assessment: (Full Marks = 20)

Questions to be set as per Bloom's Taxonomy				
	Distribution of internal questions			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	**Total**
Class Test - 1				**20**
Class Test - 2				**20**

5. Suggested Learning Resources:

i. Principles of Economics – Case and Fair, Pearson Education Publication
ii. Principles of Economics – Mankiw, Cengage Learning
iii. Project planning, analysis, selection, implementation and review – Prasannachandra–Tata McGraw Hill.
iv. Project Management – Gopala Krishnan – Mcmillan India Ltd

Name of the Course: Diploma in Food Processing Technology	
Category: Open Elective II	**Semester: Sixth**
Code No.: FPTOE304 (1)	**Theory: 100 Marks**
Course Title: Environmental Science and Engineering	**Examination Scheme:**
Duration: 17 weeks (Total hours per week = 3)	External Assessment: **60 Marks** (End Semester Examination)
Total lecture class/week: 3 hours	Internal Assessment: **40 Marks**
Credit: 3	[Class test: 20 Marks Home assignments: 10 Marks Class attendance: 10 Marks]
Pass Criterion: Students have to obtain at least 40% marks (**pass marks**) in both internal assessment and end semester examination separately.	

1. **Objective:** To increase the awareness towards Environmental Science and Engineering.
   To recognize and apply the role of technology towards Environmental Science and Engineering.
   To know the method and tools used for Environmental Science and Engineering.
   To know about the environmental pollution management act.

2. **Theory Components:**

Unit	Unit Name	Topics and Sub-topics	Teaching Hours
Unit 1	**Environment and Ecology**	1.1 Classification of Environment 1.2 Environmental descriptors 1.3 Environmental quality and descriptive parameters 1.4 Ecology: Definition and classification 1.5 Environmental impact on ecology	**08**
Unit 2	**Water pollution and Pollutants (Natural and Anthropogenic)**	2.1 Ground water: Sources and quality analysis 2.2 Surface water: Sources and quality analysis 2.3 Quality parameters in water treatment along with flow-sheets 2.4 Basic processes for potable water supply (Detailed technology not necessary) 2.5 Water pollution: Surface and ground water pollution, types of pollutants 2.6 Mode of water pollution 2.7 Parameters to be assessed for water pollution (Turbidity, pH, total suspended solids, total solids, BOD and COD: Definition, calculation) 2.8 Chemistry aspect for water pollution 2.9 Control of water pollution (Description only) 2.10 Fundamental of water treatment techniques.	**10**

Unit 3	**Air quality, Air Pollution and Control, Noise Pollution**	3.1 Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler) 3.2 Air Pollutants: Types, Units of air pollutants 3.3 Atmospheric physics for air pollution 3.4 Particulate Pollutants: Effects and control strategies (Bag filter, Cyclone separator, Electrostatic Precipitator) 3.5 Advanced air pollution control methods 3.6 Noise pollution: sources of pollution, measurement of noise pollution 3.7 Noise measuring devices and their demonstration	**10**
Unit 4	**Solid Waste and Soil Pollution**	4.1 Definition of solid waste 4.2 Classification of solid waste 4.3 Overview on municipal, industrial, hazardous, hospital, plastic, E-waste etc. 4.4 Solid waste management and disposal process. 4.5 Soil pollution, Poor Fertility, Septicity, Concentration of Infecting Agents in Soil 4.6 Leaching and its impact on soil pollution.	**06**
Unit 5	**Renewable Sources of Energy**	5.1 Energy Resources: Energy scenario, national and international status. 5.2 Solar Photovoltaics: Solar radiation and types, basic working principle of solar PV, solar cells and types, water pumping and applications of solar PV. 5.3 Solar Thermal system: basic working principle and applications of solar thermal energy, solar water heater and types, solar cooking, solar pond, Solar still etc. 5.4 Wind energy systems: basic principle, types of wind turbines, application of wind energy, 5.5 Bio-energy systems: bio thermal and chemical basic principle, gasifier and digesters. 5.6 Hydro energy systems: small and micro hydro systems and its basic working. 5.7 Geothermal energy: Basic working principle, types and application of geothermal energy. 5.8 Ocean & Tidal Energy: Basic working principle, applications and types of different types of energy generation through ocean and tidal systems.	**09**
Unit 6	**Environment Legislation System and Rules**	6.1 Environmental protection rules. 6.2 Sustainable environmental management.	**02**
Sub Total: Total Lecture Classes			**45**
No. of classes required for conducting Internal Assessment examination			**06**
Grand Total:			**51**

3. **Course Outcome:** The students of the course should be able to

CO1	Recognize the relevance and the concept of Environmental Science and Engineering and different world-wide activities on this area.
CO2	Illuminate the different types of environmental pollutant, their effects and their sustainable solutions.
CO3	Discuss the environmental regulations act. and standards.
CO4	Gather basic idea about conventional and non-conventional energy resources.
CO5	Demonstrate the broad perspective of Environmental Science practices by utilizing engineering knowledge and principles.

4. Suggested scheme for question paper design for conducting internal assessment: (Full Marks = 20)

Questions to be set as per Bloom's Taxonomy				
	Distribution of internal questions			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	**Total**
Class Test - 1				**20**
Class Test - 2				**20**

5. Suggested Learning Resources:

Text Books:

i. Environmental Studies- By N.N.Basak
ii. Environmental Studies-By D .Srivastava
iii. Introduction to Environmental Engineering— By Dr.Manindra Nath Patra.
iv. Environmental Engineering- By A.K.Jain

Reference Books:

i. Environmental Engineering---By G.Killy
ii. Environmental Engineering--- By Peavy, Rowe
iii. Water and Waste Water Engineering— By S.Garg
iv. Waste Water Engineering--By -Panmia
v. Non-conventional Energy Sources-4th Edition, By Prasad Rajesh K and Ojha
vi. Non-conventional Energy Resources—By Chauhan and Srevastava
vii. Non-conventional Energy Sources---By G.D.Rai (Khanna Publisher)
viii. Ecology --By -Odum
ix. Ecology---By -Das & Das
x. Environmental Law ---By -Gurdip Sing
xi. Environmental Law----By Jaiswal Jaiswal Jaiswal
xii. Environmental Law in India ---By -P.Leela Krishnan
xiii. Environment Impact Assessment Guidelines, Notification of Government of India, 2006
xiv. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998
xv. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency
Publications-Rating System, TERI Publications - GRIHA Rating System

Name of the Course: Diploma in Food Processing Technology	
Category: Open Elective II	**Semester: Sixth**
Code No.: FPTOE304 (2)	**Theory: 100 Marks**
Course Title: Industrial Management	**Examination Scheme:** External Assessment: **60 Marks** (End Semester Examination) Internal Assessment: **40 Marks** [Class test: 20 Marks Home assignments: 10 Marks Class attendance: 10 Marks]
Duration: 17 weeks (Total hours per week = 3)	
Total lecture class/week: 3 hours	
Credit: 3	
Pass Criterion: Students have to obtain at least 40% marks (**pass marks**) in both internal assessment and end semester examination separately.	

1. **Objective:** This subject provides the students of polytechnics with an exposure to the art and science of management principles, functions, techniques and skills that are essential for maximizing attainment of the organizational goals with the available manpower and resources. Upon successful completion of this subject, the students shall be equipped with the fundamental knowledge of management which should make them confident in facing the challenges of their responsibilities in the different organizational scenarios.

2. **Theory Components:**

Unit	Unit Name	Topics and Sub-topics	Teaching Hours
Unit 1	**Overview Of Business**	1.1. Types of Business -Service -Manufacturing -Trade 1.2. Industrial sectors Introduction to: -Engineering industry -Process industry -Textile industry -Chemical industry -Agro industry 1.3 Globalization Introduction - Advantages & disadvantages w.r.t. India 1.4 Intellectual Property Rights (I.P.R.)	**04**

Unit 2	**Management Process**	2.1 What is Management? -Evolution - Various definitions - Concept of management -Management is the combination of art and science - Levels of management -Administration & management - Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management -Planning -Organizing -Directing -Controlling 2.4 Social responsibility and Environmental dimension of management.	**05**
Unit 3	**Organizational Management**	3.1 Organization:- - Definition -Steps in organization 3.2 Types of organization - Line - Line & staff - Functional - Project 3.3 Departmentation - Centralized & Decentralized -Authority & Responsibility - Span of Control 3.4 Forms of ownership - Proprietorship -Partnership - Joint stock - Co-operative Society - Govt. Sector	**06**
Unit 4	**Human Resource Management**	4.1 Personnel Management - Introduction - Definition -Objectives -Functions 4.2 Staffing - Introduction to HR Planning -Recruitment Procedure 4.3 Personnel– Training & Development - Types of training - Induction -Skill Enhancement 4.4 Grievance handling 4.5 Leadership, Leadership quality, Leadership style -Motivation - Maslow's Theory of Motivation 4.6 Introduction to -ESI Act -Workmen Compensation Act	**08**

Unit 5	**Financial Management**	5.1. Financial Management - Objectives & Functions 5.2. Break Even Analysis -Introduction -Graphical representation -Significance -Limitations 5.3. Introduction to – -Excise Tax - Income Tax -GST -Custom Duty	**06**
Unit 6	**Materials Management**	6.1 Objectives and function of Materials Management 6.2. Purchase Procedure - Objects of Purchasing - Functions of Purchase Dept. - Steps in Purchasing 6.2 Economic Order Quantity (EOQ) - Introduction & Graphical Representation 6.3 Inventory Management. -Meaning & Objectives 6.4 ABC Analysis, VED Analysis 6.5 Stores function, -BIN card, -Pricing of materials -Store verifications	**08**
Unit 7	**Sales and Marketing Management**	7.1 Introduction 7.2 Difference between Selling and Marketing 7.3 Functions of Marketing 7.4 Market Survey 7.5 Sales promotions 7.6 Recent trends	**04**
Unit 8	**Safety Engineering**	8.1 Accidents -causes of accidents 8.2 Need for safety 8.3 Organization for safety 8.4 Safety committee 8.5 Safety programs 8.6 Safety measures	**04**
Sub Total: Total Lecture Classes			**45**
No. of classes required for conducting Internal Assessment examination			**06**
Grand Total:			**51**

3. **Course Outcome:** The students of the course should be able to

CO1	Explain the importance of management process in Business.
CO2	Understand different types of organization, Objectives and functions of management.
CO3	Understand the functional areas of management relating human resources, Materials, Finance.
CO4	Apply various rules and regulations concerned with Business & Social Responsibilities of the Technician.
CO5	Identify various components of management.
CO6	Find the economic order quantity (EOQ) for given situation.
CO7	Apply beak even analysis for optimum production.
CO8	Apply principles of safety in industrial activities.

4. Suggested scheme for question paper design for conducting internal assessment: (Full Marks = 20)

Questions to be set as per Bloom's Taxonomy				
	Distribution of internal questions			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	**Total**
Class Test - 1				**20**
Class Test - 2				**20**

5. Suggested Assignments:

Assignments: (any five)-

1. Preparation of chart for fire safety.
2. Preparation of chart for personal, Tools & Equipment and products safety.
3. Preparation of chart to avoid accident.
4. Preparation of chart to show the different financial ratios.
5. Preparation of chart to show the different types of organization.
6. Preparation of EOQ model.
7. Preparation of beak even analysis model.
8. Prepare charts for showing steps of recruitment, training and performance appraisal.

6. Suggested Learning Resources:

Sl. No.	**Title of Book**	**Author**	**Publication**
1.	Industrial Engineering and Management	O.P. Khanna	Dhanpat Rai & Sons
2.	Management Principles, Processes & Practices	A.Bhattaraya & A.Kumar	Oxford University Press
3.	The process of Management	W.H. Newman E.Kirby Warren Andrew R. McGill	Prentice-Hall of India, New Delhi 2004.
4.	Industrial Engineering & Management,	V.Arun Viswanath, Anoop. S. Nair, S.L.Sabu	SCITECH Publication(s) Pvt. Ltd
5.	Industrial Management	Rustom S. Davar	Khanna Publication
6.	Industrial Engg & Management	N V S Raju	Cengage
7.	Industrial Management	Jhamb & Bokil	Everest Publication, Pune

Name of the Course: Diploma in Food Processing Technology	
Category: Open Elective II	**Semester: Sixth**
Code No.: FPTOE304 (3)	**Theory: 100 Marks**
Course Title: Sustainable Development	**Examination Scheme:**
Duration: 17 weeks (Total hours per week = 3)	External Assessment: **60 Marks** (End Semester Examination)
Total lecture class/week: 3 hours	Internal Assessment: **40 Marks**
Credit: 3	[Class test: 20 Marks Home assignments: 10 Marks Class attendance: 10 Marks]
Pass Criterion: Students have to obtain at least 40% marks (**pass marks**) in both internal assessment and end semester examination separately.	

1. **Objective:** To increase the awareness towards sustainability.
   To recognize and apply the role of technology towards sustainable development.
   To know the method and tools used for sustainability.
   To know about the environmental pollution management act.

2. **Theory Components:**

Unit	Unit Name	Topics and Sub-topics	Teaching Hours
Unit 1	**Sustainability**	1.1 Sustainability – introduction – concept – application of this concept 1.2 Social, Economic and environmental Sustainability (Concept only) 1.3 Relation between Technology and Sustainable development. 1.4 Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs)- 17th goals of sustainable development by UN. (Name and concept). 1.5 REACH (Registration, evaluation, authorization and restriction of chemicals) – Definition – Application – Aim. 1.6 Clean Development Mechanism (CDM) National Action Plan on Climate Change (NAPCC).	**15**

Unit 2	**Environmental Pollution**	2.1. Introduction of environment- basic elements of environment. 2.2. Environmental pollution – Type of Environment pollution (definition and concept). 2.3. Air Pollution and its sources and effects, - reducing process. 2.4. Water pollution and its sources and effect, - reducing process. 2.5. Soil pollution – cause –effect – reducing process. 2.6. Noise pollution – causes –effect- reducing process. 2.7. Radioactive Pollution- cause –effect and controlling mechanism. 2.8. Solid waste and its causes and effect - Zero waste concept and 3 R concepts in solid waste management. 2.9. Greenhouse effect, Global warming, Climate change, Ozone layer depletion, Carbon credits, carbon trading, carbon foot print, water footprint, legal provisions for environmental protection.	**10**
Unit 3	**Environmental Pollution Management**	3.1. ISO 14001:2015 frame work and benefits, Scope and goal of Life Cycle Analysis (LCA). 3.2. Circular economy, Bio-mimicking, Environment Impact Assessment (EIA). 3.3. Industrial ecology and industrial symbiosis.	**08**
Unit 4	**Non-Conventional Recourse Management**	4.1. Basic concepts of Renewable energy sources. 4.2. Working principle, advantages, disadvantages about solar photovoltaic, solar thermal energy, bio-energy, Fuel cells, Wind energy, hydro energy, geothermal energy, ocean and tidal energy. 4.3. Worldwide and national progress in renewable energy. 4.4. Environmental aspects of renewable energy projects.	**06**
Unit 5	**Sustainability Practices**	5.1. Basic concept of sustainable habitat, Methods for increasing energy efficiency in buildings. 5.2. Green Engineering, Sustainable Urbanization, Sustainable cities, Sustainable transport and other sustainable concepts based on technology up gradation.	**06**
Sub Total: Total Lecture Classes			**45**
No. of classes required for conducting Internal Assessment examination			**06**
Grand Total:			**51**

3. **Course Outcome:** The students of the course should be able to

CO1	Recognize the relevance and the concept of sustainability and different world-wide activities on this direction.
CO2	Illuminate the different types of environmental pollutant, their effects and their sustainable solutions
CO3	Discuss the environmental regulations act. and standards
CO4	Gather basic idea about conventional and non-conventional energy resources
CO5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

4. **Suggested scheme for question paper design for conducting internal assessment: (Full Marks = 20)**

Questions to be set as per Bloom's Taxonomy				
	Distribution of internal questions			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	**Total**
Class Test - 1				**20**
Class Test - 2				**20**

5. **Suggested Learning Resources:**

Text Books:

i. M.C. Dash, Concepts of Environmental Management for Sustainable Development, Dreamtech Press
ii. Deb Prasanna Choudhury, Sustainability Management, Zorba Books

Reference Books:

iii. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
iv. Bradley. A.S; Adebayo,A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning
v. Environment Impact Assessment Guidelines, Notification of Government of India, 2006
vi. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998
vii. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System
viii. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
ix. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).
x. Purohit, S. S., Green Technology - An approach for sustainable environment, Agrobios Publication

Name of the Course: Diploma in Food Processing Technology	
Category: Open Elective II	**Semester: Sixth**
Code No.: FPTOE304 (4)	**Theory: 100 Marks**
Course Title: Renewable Energy	**Examination Scheme:**
Duration: 17 weeks (Total hours per week = 3)	External Assessment: **60 Marks** (End Semester Examination)
Total lecture class/week: 3 hours	Internal Assessment: **40 Marks**
Credit: 3	[Class test: 20 Marks Home assignments: 10 Marks Class attendance: 10 Marks]
Pass Criterion: Students have to obtain at least 40% marks (**pass marks**) in both internal assessment and end semester examination separately.	

1. **Objective:** To provide basic knowledge of different sources of renewable energy and Renewable energy plants.

2. **Theory Components:**

Unit	Unit Name	Topics and Sub-topics	Teaching Hours
Unit 1	**Introduction**	1.1 Classification of energy: Primary and secondary energy, Commercial and non-commercial energy, Renewable and Non-renewable energy, Conventional and Non-conventional energy. 1.2 Advantage of Renewable energy 1.3 Sources of Renewable Energy: Solar Energy, Wind Energy, Biomass Energy, Hydro Energy, Geothermal Energy, Tidel and Ocean energy (only brief idea on all these)	**06**
Unit 2	**Solar Energy**	2.1 Units of solar power and solar energy 2.2 Essential subsystem in solar energy plant: Solar collector or concentrator, energy transport medium, energy storage, energy conversion plant, power conditioning control and protection system, alternative or standby power supply. 2.3 Solar Electric System: Solar water Heater, Solar lighting system, Solar cooker, Electric vehicle charging station (Working principle only) 2.4 Idea on Photovoltaic Technology	**09**

Unit 3	**Bioenergy**	3.1 Introduction on Biogas, Sources of Bioenergy 3.2 Different forms of Biomass, their composition & fuel properties 3.3 Production of Biogas: working principle of fixed- dome type and floating gas holder type biogas plant 3.4 Idea of gasifier, digester 3.5 Use of Biogas	**09**
Unit 4	**Wind Energy**	4.1 Basic working principle of Wind energy production 4.2 Speed and power relation, Average power of the wind 4.3 System components of wind Energy (e.g. Tower, Turbine, Blades etc). 4.4 Control of rotor speed	**06**
Unit 5	**Hydropower**	5.1 How hydropower plant works 5.2 Main components of Hydropower plant: Gate, penstock, surge tank, turbine, transformer etc. 5.3 Types of hydropower: Run-of-River power plant (no active storage), Plant with significance storage, Pumped storage, Tidal plant (Only basic idea)	**05**
Unit 6	**Measuring Instruments**	6.1 Basic principle of Pyranometer for solar radiation measurement. 6.2 Idea on different instrument used in Hydroelectric power plant, Solar thermal plant, Wind power plant, Biogas plant (name of instruments and where to use in that plant.)	**10**
Sub Total: Total Lecture Classes			**45**
No. of classes required for conducting Internal Assessment examination			**06**
Grand Total:			**51**

3. **Course outcome:** The students of the course should be able to

CO1	Classify different energy sources.
CO2	Understand basics on solar energy, bioenergy, wind energy, and hydropower.
CO3	Identify different parts of solar energy plant.
CO4	Know various sources of biomass, and construction of biogas production plant.
CO5	Understand concepts of wind energy, components and functions of it.
CO6	Grow critical thinking and problem-solving skills to overcome obstacles to use renewable energy system.
CO7	Identify different measuring instruments related to specific renewable energy plant.

4. **Suggested scheme for question paper design for conducting internal assessment: (Full Marks = 20)**

Questions to be set as per Bloom's Taxonomy				
	Distribution of internal questions			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	**Total**
Class Test - 1				**20**
Class Test - 2				**20**

5. **Suggested Learning Resources:**

Title	**Author**	**Publisher**
Non-Conventional Energy	Shobh Nath Singh	Pearson
Renewable and Efficient Electric Power Systems	Gilbert M. Masters	Wiley
Alternative Energy Systems & Applications	B.K.Hodge	Wiley
Renewable Energy Technologies,	J.C.Sabonnadiere,	Wiley
Introduction to Renewable Energy	Vaughn Nelson	CRC Press
Renewable Energy: Power for a Sustainable Future	Godfrey Boyle	
Renewable Energy Technology	Jha, Sen, Tiwari, Kothari	New Age International
Renewable Energy Technology	Chetan Singh Solanki	PHI
Non-Conventional Energy Resources	S.H.Saeed, D.K.Sharma	S.K.Kataria& Sons
Energy Techonology: Nonconventional, Renewable & conventional	Rao, Parulekar	Khanna Publisher
Non-conventional Energy Sources	G.D. Rai	Khanna Publisher
Non-Conventional Energy Resources	B. H. Khan	McGraw Hill Publications.
Solar Energy – Principles of Thermal Collection and Storage	S. P. Sukhatme, J.K. Nayak	Tata McGraw-Hill, New Delhi
Solar Energy, Fundamentals and Applications	Garg, Prakash	Pearson

<table>
<tr><td colspan="2">Name of the Course: Diploma in Food Processing Technology</td></tr>
<tr><td>Category: Program Core</td><td>Semester: Sixth</td></tr>
<tr><td>Code No.: FPTPC 306</td><td>Total Marks: 100</td></tr>
<tr><td>Course Title: Food Industry Waste Management Lab.</td><td rowspan="4">Examination Scheme:
Internal Assessment: 60 marks
[Continuous Evaluation: 50 marks
Class Attendance: 10 marks]

External Assessment: 40 Marks (End Semester Examination)
[Assignment on the day of viva voce
and practical report submission: 20 marks
Viva voce (Board of External Examiner): 20 marks]</td></tr>
<tr><td>Duration: 17 weeks (3 hours per week)</td></tr>
<tr><td>Total Practical Class /week: 3 hours</td></tr>
<tr><td>Credit: 1.5</td></tr>
<tr><td colspan="2">Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.</td></tr>
<tr><td colspan="2">Pre-requisite:
Knowledge in Food Industry Waste Management [Code No. – FPTPC304]</td></tr>
</table>

1. Objective:

To provide knowledge of Food Processing Industry Waste Management.
To provide knowledge of the various aspects and methods adopted for Waste Management.
To provide knowledge regarding testing of various wastewater parameters.

2. Practical Components: (At least conduct 09 experiments excluding site visit)

Sl. No.	List of Practical
1.	Familiarization with equipments for wastewater sample collation and analysis.
2.	Determination of physical parameters of waste water Temperature, Colour, Odour, pH.
3.	Determination of total solids , volatile solids and fixed solids of waste water.
4.	Determination of Total Kjeldhal Nitrogen (TKN) from waste water.
5.	Determination of total phosphorus from wastewater.
6.	Determination of electrical conductivity and turbidity of wastewater.
7.	Determination of quality of lime or alum used as a coagulant by Jar test.

8.	Determination of chlorides and sulphates of wastewater.
9.	Determination of phosphorus from wastewater
10.	Determination of acidity and alkalinity of wastewater.
11.	Determination of dissolved oxygen from wastewater.
12.	Determination of biological oxygen demand (BOD) of wastewater.
13.	Determination of chemical oxygen demand (COD) of wastewater.
14.	Determination of oil and grease from wastewater.
15.	Determination of faecal contamination of water- qualitative and quantitative.
16.	16.1 Visit to Composting sites. 16.2 Visit to Vermiculture sites. 16.3 Visit to sewage treatment plants. 16.4 Visit to Common effluent treatment plants. 16.5 Visit to effluent treatment plants of- Sugar industries. 16.6 Visit to effluent treatment plants of- Fruit and vegetable processing industries. 16.7 Visit to effluent treatment plants of- Distillary industries. 16.8 Visit to effluent treatment plants of- Dairy industries. 16.9 Visit to effluent treatment plants of- Fish, meat industries and slaughter houses. 16.10 Visit to effluent treatment plants of-Soft drinks beverage industries.

3. Course outcome: The students of the course should be able to

CO1: Apply the principles of analysis of various wastewater parameters.
CO2: Demonstrate equipments used for wastewater sample collation and analysis.
CO3: Develop ideas on different types of effluent treatment plants and Composting area through site visit.

4. Suggested Scheme for Internal Assessment and End Semester Examination: (Full Marks = 100)

Food Industry Waste Management Lab.			
Practical / Sessional = 100 Marks			
Internal Assessment = 60 Marks		**End Semester Assessment = 40 Marks**	
Continuous Evaluation [Assignments in practical Classes = 30 Marks Class Performance = 20 Marks]	50	Assignment on the day of viva- voce and practical repot submission.	20
Class Attendance	10	Viva voce (Board of External Examiner)	20
Total	**60**	**Total**	**40**

5. Suggested Rubrics for the Internal Continuous Evaluation of Food Industry Waste Management Lab. [50 marks]:

Sl No.	Performance Indicators/ Criteria
1	Awareness about the significance of particular experiment.
2	Understanding working principle of equipment and instruments.
3	Preparation of reagents and experimental set up.
4	Performance and operation.
5	Observations and recording.
6	Interpretation of result and conclusion.
7	Answer to sample questions.
8	Submission of report in time.
9	Safety precautions and good housekeeping.
10	Idea on effluent treatment plants and Composting site.

Name of the Course: Diploma in Food Processing Technology	
Category: Major Project	**Semester: Sixth**
Code No.: FPTPR302	**Total Marks: 100**
Course Title: Major Project-II **Duration: 17 weeks** (3 hours per week) **Total Practical Class /week: 3 hours** **Credit: 1.5**	**Examination Scheme:** Internal Assessment: **60 marks** [Continuous assessment of performance, contribution and in time submission of reports on major projects: 30 Marks Seminar Presentation and Viva Voce: 20 Marks Class Attendance:10 Marks] External Assessment: **40 Marks** (End Semester Examination) [Evaluation of Major Project Reports: 20 marks Viva voce (Board of External Examiner): 20 marks]
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	
Pre-requisite: Basic Knowledge in Semester-3, Semester-4, Semester- 5 and Semester-6 Subjects.	

1. **Objective:** To have overall grasp on engineering principles in the area of food science, technology, and allied areas. To have knowledge and skills to apply these principles in practical problem-solving in food technology and relevant fields. Ability to verbally communicate with professional organizations and scientific community with reasonable clarity on topics within food science, engineering, technology, and allied areas. Ability to correlate the skills and knowledge acquired over the diploma program with a particular job function as a professional. Ability to handle exposure to professional responsibilities with appropriate level of accountability

2. **Course Outcomes:**

In order to cultivate the systematic methodology for problem solving using acquired technical knowledge and skills, the student should be able to demonstrate the following course outcomes:

CO1: Identify and analyze the problem statement.

CO2: Develop and design alternative solutions for the identified problem.

CO3: Compare and select feasible solutions from alternatives generated.

CO4: Interpret on final results.

CO5: Summarize the conclusion to the problem statement.

3. Scheme of Major Projects-II for Continuous Assessment:

Each student shall undertake project work assigned to him/her related to design/R&D /industrial problem solving in the area of food science and technology under the supervision of a faculty member or a group of faculty member. In principle, the design/development of the project work has to be carried out by a group of student(s)/an individual taking advice/guidance from respective supervisor(s) to address the specific problem identified. The work will be allotted at the beginning of the fifth semester specifying the different aspects to be carried out by the student. The duration of major projects should not be less 10 weeks student engagement hours during the course. The project work shall yield outcome based meaningful results. The student will have to maintain dated work diary consisting of individual contribution in assigned major project works. The student will have to submit reports on their assigned major projects to the concern faculty in time and will give a seminar presentation on their assigned **major projects in front of a Board of Internal Examiners of concern department** at the time of end semester internal assessment.

4. Brief Project Outline

1. Brief introduction, objectives & probable outcomes of the projects.
2. Literature survey/secondary search/market survey.
3. Manufacturing/prototyping/designing process/products, optimization of processes and characterization through analytical techniques.
4. Collection and analysis of data through statistical tools.
5. Conclusion of the project and report preparation.
6. Project defense and viva-voce.

5. Suggested Scheme for Internal Assessment: [Total Marks: 60]

Involvement	Total Marks
Continuous assessment of performance, contribution and in time submission of major projects.	30
Seminar Presentation and Viva Voce on to the major projects at the end of the semester.	20
Class attendance.	10
Total Internal Assessment:	**60**
Pass criterion for Internal Assessment = 24 Marks [Minimum]	

6. Suggested Scheme for End Semester Examination: [Total Marks: 40]

Involvement	Total Marks
Evaluation of major project reports on the day of End Semester Exam.	20
Viva Voce on to the major projects on the day of End Semester Exam.	20
Total External Assessment:	**40**
Pass criterion for Internal Assessment = 16 Marks [Minimum]	

7. Rubrics for the Internal Assessment of Major Projects-II:

The 'Process and Product' related skills associated with each major project work are to be assessed according to a suggested sample as given below:

Sl. No.	Performance Indicators
01	Identify and analyze the problem statement.
02	Develop and design alternative solutions for the identified problem.
03	Interpret on final results.
04	Summarize the conclusion to the problem statement.
05	Submission of major projects reports in time.
06	Viva voce

WEST BENGAL STATE COUNCIL OF TECHNICAL & VOCATIONAL EDUCATION AND SKILL DEVELOPMENT
[A Statutory Body under West Bengal Act XXVI of 2013]
(Formerly West Bengal State Council of Technical Education)
"Karigori Bhavan", 4th Floor, Plot No. B/7, Action Area-III, New Town, Rajarhat, Kolkata-700160

Name of the Course: Diploma in Food Processing Technology	
Category: Seminar	**Semester: Sixth**
Code No.: FPTSE 302	**Total Marks: 100**
Course Title: Seminar **Time: 17 weeks (2 hours per week)** **Total Practical Class /week: 2** **Credit: 1**	**Examination Scheme:** **Internal Assessment: 60 marks** **[Seminar Report = 60 marks]** **External Assessment: 40 Marks** **[**Seminar Presentation **= 40** marks] [Students will give a seminar presentation on their assigned seminar topic in front of a Board of Internal Examiners of concern department at the time of end semester internal assessment.]
Pass Criterion: Students have to obtain at least 40% marks **(pass marks)** in internal assessment examination.	
Pre-requisite: • Basic Knowledge in Food Technology subjects.	

1. **Objective:** To provide opportunity for students to present the seminar on general topic related to course content of diploma in food processing technology in front of a technical gathering with the help of different oral. Aural and visual communication.

2. Scheme of Seminar for Continuous Assessment:

Each student shall undertake seminar topic assigned to him/her related to the area of food science and technology under the supervision of a faculty member or a group of faculty member. In principle, the preparation of the seminar has to be carried out by a group of student(s)/an individual taking advice/guidance from respective supervisor(s) to address the specific problem identified. The work will be allotted at the beginning of the sixth semester specifying the different aspects to be carried out by the student. The duration of seminar should not be less 10 weeks student engagement hours during the course. The student will have to submit reports on their assigned seminar topic to the concern faculty in time and will give a seminar presentation on their assigned seminar topic in front of a **Board of Internal Examiners of concern department** at the time of end semester internal assessment.

3. **Criteria of Evaluation of Seminar Report:** The seminar report will be evaluated on the basis of following criteria **(as applicable):**

Sl. No.	Criteria of Evaluation of Seminar Report
1.	Originality.
2.	Adequacy and purposeful write-up.
3.	Organization, format, drawings, sketches, style, picture, diagram, language.
4.	Concepts taught in the course outcome.
5.	Practical applications, relationships with basic theory and concepts taught in the course.
6.	Attendance record, daily progress, quality of the seminar report.

4. **Criteria of Evaluation of Seminar Presentation:** The student will give a seminar based on his/her seminar topic, before an internal committee constituted by the concerned department of the institute. The evaluation will be based on the following criteria **(as applicable):**

Sl. No.	Criteria of Evaluation of Seminar Presentation
1.	Quality of content presented.
2.	Proper planning for presentation.
3.	Effectiveness of presentation.
4.	Depth of knowledge and skills.
5.	Viva voce.

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Footwear Technology [FWT]

Part-III (6th Semester)

2023

CURRICULAR STRUCTURE OF DIPLOMA IN FOOTWEAR TECHNOLOGY

WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION & VOCATIONAL EDUCATION AND SKILL DEVELOPMENT

TEACHING AND EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES

SIXTH SEMESTER

S.L No	Course Category	Code	Course Title	Hours Per Week			Total Contact Hours/Week	Credits	Marks	EXAMINATION SCHEME			
										External Assessment	Internal Assessment		
				L	T	P				End Semester Examination	Mid Semester Test	Quizzes/ Viva Voce/ Assignment	Class Attendance
THEORETICAL SUBJECTS													
1.	Humanities & Social Science	HS 302	Entrepreneurship & Start-Ups	2	1	0	3	3	100	60	20	10	10
2.	Programme Elective Course	FWTPE IV	Programe Elective IV [Leather Goods Technology II/Footwear Marketting & E-Commerce]	2	1	0	3	3	100	60	20	10	10
3.	Open Elective	FWTOE I	Open Elective I Engineering Economics and Project Management	3	0	0	3	3	100	60	20	10	10
4.	Open Elective	FWTOE II	Open Elective II [Occupational Health & Safety Engineering / Industrial Hazards & Modern Waste Management]	3	0	0	3	3	100	60	20	10	10

PRACTICAL SUBJECTS

S.L No	Course Category	Code	Course Title	Hours Per Week			Total Contact Hours/Week	Credits	Marks	EXAMINATION SCHEME	
				L	T	P				Practical Internal Assessment	Practical External Assessment
5.	Programme Core Course	FWTPC 602	Advance Footwear Designing II	0	0	4	4	2	100	60	20
6.	Seminar	FWT Sem.604	Seminar Presentation	0	0	4	4	2	100	60	40
7.	Programme Core Course	FWTPC 606	Port Folio Preparation & Course Viva	0	0	2	2	1	100	60	40
8.	Major Project	FWT Proj.608	Project (Major) on Advance Footwear Manufacture II	0	0	4	4	2	100	60	40
			TOTAL	**10**	**02**	**14**	**26**	**19**	**800**		

LIST OF PROGRAMME ELECTIVE COURSES [PE] OF 6TH SEMESTER

Sl No	Code No	Course Title	Hours Per Week			Semester	Credits	Marks
			L	T	P			
1.	FWTPE II (Any One)	Leather Goods Technology II	2	1	0	Sixth	3	100
		Footwear Marketting & E-Commerce						

LIST OF PROGRAMME OPEN ELECTIVE COURSES [OE] OF 6TH SEMESTER

Sl No	Code No	Course Title	Hours Per Week			Semester	Credits	Marks
			L	T	P			
1.	FWTOE I (Mandatory)	Engineering Economics and Project Management	3	0	0	Sixth	3	100
2.	FWTOE II (Any One)	Occupational Health and Safety Engineering	3	0	0		3	100
		Industrial Hazards and Modern Waste Management						

CREDIT AND MARKS DISTRIBUTION OF 6TH SEMESTER		
Course Category	**Credit Distribution**	**Marks Distribution**
Programme Core	04	200
Programme Elective	03	100
Open Elective	06	200
Project + Internship + Seminar	03	200
Humanities & Social Science	03	100
GRAND TOTAL	**19**	**800**

EXAMINATION EVALUATION SCHEME			
THEORY (100 MARKS)			
External Assessment (60 Marks)	**Internal Assessment (40 Marks)**		
End Semester Examination	**Mid Semester Test**	**Quizzes/Viva Voce/Assignment**	**Class Attendance**
60	20	10	10
Pass Criterion Students have to obtain at least **40% marks (Pass marks)** in both Internal Assessment and External Assessment separately.			

EXAMINATION EVALUATION SCHEME				
PRACTICAL (100 MARKS)				
Practical Internal Assessment (60 Marks)			**Practical External Assessment (40 Marks)**	
Class Assignments	**Class Performance**	**Class Attendance**	**Exam Day Assignment**	**Exam Day Viva**
30	20	10	20	20
Pass Criterion: Students have to obtain at least **40% marks (Pass marks)** in both Internal Assessment and External Assessment separately.				

***** ACADEMIC CONTACT WEEKS 17 WEEKS [TEACHING 15 WEEKS & INTERNAL EXAMINATION 2 WEEKS] *****

ENTREPRENEURSHIP & START-UPS
(HS302)

Course Code	:	**HS302**
Course Title	:	**ENTREPRENEURSHIP & START-UPS**
Course Category	:	**Humanities & Social Science**
Number of Credits	:	**3**
Contact	:	**2 lectures & 1 tutorial/week, 1hr/lecture or tutorial, Total 30 lectures and 15 tutorials**
Offered to	:	**6th Semester, FWT students**
Pre Requisite	:	**NIL**

Course Objectives

HS 302 Entrepreneurship & Start-Ups The course aims at providing exposure to the students

- To raise awareness, knowledge and understanding of enterprise/entrepreneurship;
- To motivate and inspire students toward an entrepreneural carrier;
- To understand venture creation process and to develop generic entrepreneurial competences;
- To introduce the students to the basic steps required for planning, starting and running a business;
- To familiarize the students with the different exit startegies available to entrepreneurs.

Course Content

UNIT I	**ENTREPRENEURSHIP-INTRODUCTION AND PROCESS** ***Duration: 10 Periods (L: 7.0; T: 3.0)*** • Concept, competencies, Functions and Risks of entrepreneurship. • Entrepreneurship Values, Attitude and Skills. • Mindset of an employee/manager and entrepreneur. • Types of ownership for small business. ➢ Sole proprietorship. ➢ Partnerships. ➢ Joint Stock company-public limited and private limited companies. ➢ Difference between Entrepreneur and Intrapreneur
UNIT II	**PREPARATION FOR ENTREPRENEURAL VENTURES** ***Duration: 20 Periods (L: 15.0; T:5.0)*** • Business idea-Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. • Feasibility Study – Concept - Locational, Economic, Technical and Environmental Fesibility, Structre and contents of a Standard

	Feasibility study report. • Business Plan – Concept, Rationale, for developing a Business Plan, Structure and Content of a standard typical Business Plan. • Project Report – Concept, its features and components. • Business components of Financial Statements – Revenue, Expenses (Revenue & Capital Exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, Working Capital, Inventory. Funding methods – Equity or Debt. Students are just expected to know about the features and key inclusions under Business Plan and Project Report. They may not be asked to prepare a Business Plan/Project Report/Project Feasibility Report in the End of Semester Examination.
UNIT III	**ESTABLISING SMALL ENTERPRISES** ***Duration: 03 Periods (L: 2.0; T: 1.0)*** • Legal requirements and compliances needed for establising a New Unit. ➢ NOC from Local Body. ➢ Registration of Business in DIC. ➢ Statutory Licence or clearance. ➢ Tax compliances.
UNIT IV	**START-UP VENTURES** ***Duration: 04 Periods (L: 2.0: T:2.0)*** • Concept & Features. • Mobilisation of resources by start-ups; Financial, Human, Intellectual and Physical. • Problems and challenges faced by start-ups. • Start-Up ventures in India – Contemporary success stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students towards an entrepreneurial career from the success stories. <u>No questions are to be set from case studies</u>.
UNIT V	**FINANCING START-UP VENTURES IN INDIA** ***Duration: 06 Periods (L: 3.0; T:3.0)*** • Communication of Ideas to potential Investors- Investor Pitch. • Equity funding, Debt funding- by Angel investors, Venture Capital Funds, Bank loans to start-ups. • Govt. Iniciatives inclusing incubation centre to boost start-up ventures. • MSME Registration for Start-Ups-Its benefits.

UNIT VI	**EXIT STRATEGIES FOR ENTREPRENEURS** *Duration: 02 Periods (L: 1.0;T:1.0)*
	• Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy-**Basic Concept only**.

Suggested E-Learning Resources

1. https://youtu.be/MdNNGfoxrqA
2. https://youtu.be/BN2cQNNvg_4
3. https://youtu.be/YxqAXTwGrPs
4. https://youtu.be/12u7Bui7n9g
5. https://youtu.be/81VRieCm2Q0
6. https://youtu.be/uNjMufgd-jA
7. https://youtu.be/1WYvDD_IzKk
8. https://youtu.be/BgKsYDz0dbA
9. https://youtu.be/w5AnvwgF3pI
10. https://youtu.be/eNG2SQvuuG4

Evaluation Scheme

THEORY
(100 MARKS)

External Assessment (60 Marks)	**Internal Assessment (40 Marks)**		
End Semester Examination	**Mid Semester Test**	**Quizzes/ Viva voce/ Assignment**	**Class Attendance**
60	20	10	10

Pass Criterion: Students have to obtain at least **40% marks (Pass marks)** in both Internal Assessment and External Assessment separately.

References/Suggested Learning Resources :

1. Entrepreneurship Development - Sangeeta Sharma- *Prantice Hall of India Learning Private Ltd*.
2. Entrepreneurship Development - S Anil Kumar- *New Age International.*
3. Fundamentals of Entrepreneurship - Sangram Keshari Mohanty- *Prantice Hall of India Learning Private Ltd*.
4. Fundamentals of Entrepreneurship – Dr. G.K Varshney – *Sahitya Bhawan Publication*.
5. Managing New Ventures: Concept & Cases on Entrepreneurship – Anjan Raichaudhuri - *Prantice Hall of India Learning Private Ltd*.
6. How to Start a Business in India – Simon Daniel – *Buuks, Chennai*.
7. Entrepreneurship and Small Business Management – S.S Khanka – *S. Chand & Sins, New Delhi*.
8. Entrepreneurship Development and Business Ethics – Abhik Kumar Mukherjee & Shaunak Roy – *Oxford University Press*.
9. Entrepreneurship Development and Business Ethics – Dr. B Chandra & Dr B Biswas – *Tee Dee Publications*.
10. Entrepreneurship Development Small Business Entreprenuership – Poornima Charantimath – *Pearson Education India.*

Course Outcomes

At the successful completion of this course, students will be able to learn the :

CO I	Identify qualities of entrepreneurs, develop awareness about entrepreneural skill and mindset and express knoeledge about the suitable forms of ownership for small business.
CO II	Comprehend the basics of Business idea, Business plan, Feasilbility study report, Project report & Project Proposal.

CO III	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business..
CO IV	Make a growth plan and pitch it to all stakeholders and compare the various sources of funds available for start-up business.

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LEATHER GOODS TECHNOLOGY II
(FWTPE IV)

Course Code	:	**FWTPE IV**
Course Title	:	**LEATHER GOODS TECHNOLOGY II**
Course Category	:	**Programme Elective IV**
Number of Credits	:	**3**
Contact	:	**2 lecture and 1 Tutorial/week, 1hr/lecture, Total 30 lectures and 15 tutorials**
Offered to	:	**6th Semester, FWT students**
Pre Requisite	:	**Elementary knowledge of patterns, fabrication procedure of Leather Products.**

Course Objectives

FWTPE IV Leather Goods Technology II The course aims at providing exposure to make the students

- To introduce about the various types of constructions associated with leather goods fabrications.
- To learn about the techniques of Guesset, Handle & Pocket preparation;
- To learn about the properties of suitable materials used for medium leather goods manufacturing;
- To familiar with the hand tools and machinery used for fabricating medium leather goods fabrication;
- To design and develop patterns for shantineketan leather goods.

Course Content

UNIT I	**LEATHER GOODS MANUFACTURING PROCESSES** ***Duration: 07 Periods (L: 5.0-T:2.0)***

- ***Pre-Operative Processes***
  - Assorting;
  - Cutting/Clicking;
  - Edge Finishing – Bevelling, Burnishing, Creasing, Turn-Edge, Bound Edge, French binding, Turnover binding, Piping etc.
  - Splitting;
  - Skiving – Manual & Machine, Parallel, Channel, Bevel or Taper, Fine-edge or feather edge skiving.
  - Channeling;
  - Embossing;
- ***Bench Work Processes***
  - Staining;
  - Creasing;
  - Punching & Rivetting;
  - Eyeletting & Buttoning;

	➢ Zip Fastening – Slot seam, Lapped seam & Invisible seam; ➢ Gluing – Types of Adhesive used & method applications; ➢ Lining attaching – Edge lining, Full lining and Drop-in lining; ➢ Edge folding; ➢ Fittings attachment; ➢ Stitching.
UNIT II	**COMPONENT PREPARATION** ***Duration: 05 Periods (L: 3.0 -T: 2.0)*** • ***Gusset Preparation*** ➢ Definition and its Utility; ➢ Types of Gusset – Running, Side wide, Continuous, Folded, One and Three-piece cut edge, U-shaped, cut edge, U-shaped bound edge gusset and their preparation. • ***Handle Preparation*** ➢ Definition and its Utility; ➢ Types of Pockets – Flat, Gusseted, Hanging and its preparation. • ***Straps & Handle Preparation*** ➢ Definition and its Utility; ➢ Types of Straps and Handles – Shoulder, Round, Flat handles and its preparation.
UNIT III	**LEATHER GOODS CONSTRUCTIONS** ***Duration: 05 Periods (L: 3.0 -T: 2.0)*** • Definition of Construction; • Construction Types ➢ Cut-edge construction; ➢ Turn-edge construction; ➢ Stitch and Turn construction; ➢ Butt edge construction; ➢ Moulded construction; ➢ Built-up construction; ➢ Box-work construction; ➢ Limp Construction; ➢ Semi-Limp constrcution; ➢ Stiffened Leather construction.
UNIT IV	**PRINCIPLES INVOLVED IN FABRICATION OF LADIES BAGS** ***Duration: 07 Periods (L: 5.0 – T:2.0)***

	• Sketching and rendering of Flap over Ladies bag; • Replicate the Technical Drawing for Flapover Ladies bag; • Describe the patterns of Flap-over ladies bag; • List the materials used in manufacturing of the Flap-over ladies bag; • Explain the manufacturing of Flap-over ladies bag.
UNIT V	**PRINCIPLES INVOLVED IN FABRICATION OF OFFICE BAGS** ***Duration: 07 Periods (L: 5.0 -T: 2.0)*** • Sketching and rendering of Office bag; • Replicate the Technical Drawing for Office bag; • Describe the patterns of Office bag; • List the materials used in manufacturing of the Office bag; • Explain the manufacturing of Office bag.
UNIT VI	**SAFETY LEATHER GLOVES** ***Duration: 5 Periods (L: 3.0 -T: 2.0)*** • Introduction; • Classification of Leather Gloves; • Sketching and rendering of Leather Gloves; • Replicate the Technical Drawing for Leather Gloves; • Describe the patterns of Leather Gloves; • List the materials used and its utility in manufacturing of the Leather Gloves; • Explain the manufacturing of Leather Gloves; • Testing of materials as well as the finished product.
UNIT VII	**PRINCIPLES INVOLVED IN FABRICATION OF LEATHER APPRONS** ***Duration: 05 Periods (L: 3.0 -T: 2.0)*** • Introduction; • Classification of Apron; • Sketching and rendering of Leather Apron; • Replicate the Technical Drawing for Leather Apron; • Describe the patterns of Leather Apron; • List the materials used and its utility in manufacturing of the Leather Apron; • Explain the manufacturing of Leather Apron. • Testing of materials as well as the finished product.

UNIT VIII	**SHANTINEKETAN LEATHER GOODS** *Duration: 04 Periods (L: 3.0 -T: 1.0)*

- Introduction;
- Region of Production;
- Raw materials;
- Tools and equipments;
- Fabrication of Shantineketan products;
- Product range;
- Marketting of shanteneketan leather products.

Suggested Students Assignment

Each student should do any one of the following assignment or any other similar assignment related to the course and before conducting, gets it approved from concerned Teachers and HOD.

- List the materials required and write the sequence of operation for fabrication of Office Bags.
- List the materials required and write the sequence of operation for fabrication of Ladies Bags.
- List the materials required and write the sequence of operation for fabrication of Safety Leather Gloves.

Evaluation Scheme

THEORY
(100 MARKS)

External Assessment (60 Marks)	**Internal Assessment (40 Marks)**		
End Semester Examination	**Mid Semester Test**	**Quizzes/ Viva voce/ Assignment**	**Class Attendance**
60	20	10	10

Pass Criterion: Students have to obtain at least **40% marks (Pass marks)** in both Internal Assessment and External Assessment separately.

References/Suggested Learning Resources

1. Manual for Leather Accessories and Leather Goods by Subhramanian Natesan-*CLRI, Chennai*.
2. Leather Work- A Manual of Techniques by Geoffrey West-*The Crowood Press Ltd.*
3. The Leather Working Handbook-A Practical Illustrated Source Book of Techniques & Projects by Valarie Mitchael.
4. Get Started in Leather Crafting: Step by Step Techniques and Tips for Crafting Process by Tony Laier and Kate Laier- *Design Originals*.
5. The Complete Handbook of Leather Crafting by Jame Co. Gramed and Robert E. Krieges-*Malabar Floride.*

Suggested E-Learning Resources

1. https:/youtu.be/89P1D5UBcyQ
2. http://youtu.be/f7sQIVkiDeA
3. http://youtu.be/n_inqZPznz4
4. http://youtu.be/NgNSAcY03qY
5. http://youtu.be/xmi0a-eN6og
6. http://youtu.be/mFliZdo_v18

Course Outcomes

At the successful completion of this course, students will be able to

CO I	Explain the various type of construction associated with leather goods fabrication.
CO II	Explain the fabication of medium type of Leather Goods.
CO III	Gain the knowledge in selecting materials for medium leather goods manufacture.
CO IV	Grasp the knowledge of draw and developing the Technical drawing for medium leather products.
CO V	Apply skills in fabricating shantineketan leather items.

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FOOTWEAR MARKETTING & E-COMMERCE
(FWTPE IV)

Course Code	:	**FWTPE IV**
Course Title	:	**FOOTWEAR MARKETING & E-COMMERCE**
Course Category	:	**Programme Elective Course.**
Number of Credits	:	**3**
Contact	:	**2 lecture/week & 1tutorial/week**
Offered to	:	**6th Semester, FWT students**
Pre Requisite	:	**Basic knowledge in marketing & online shopping.**

Course Objectives:

1) The objective of this course is to introduce students to the concepts, analysis, and activities that comprise basic marketing concept. The course also aims to develop footwear marketing ideas.
2) To understand the promotional process.
3) To familiar students with the concept of Modern Marketing.
4) To understand increasing significance of E-Commerce and its applications in business sectors.
5) To make the students to devise marketing strategies for concerns engaged in e-commerce.
6) To provide an insight on Digital Marketing Process on various Social Media platforms and its emerging significance in business.

Course Content

UNIT I	**Introduction to Marketing** ➢ Concept of Market; ➢ Concept of Footwear Marketing; ➢ Global Footwear Market; ➢ The Modern Concept of Marketing in India; ➢ Nature and Scope of Marketing ; ➢ Functions of Marketing; ➢ Recent Trends in Footwear Marketing; ➢ Role of Marketing in Indian Economy; ➢ Marketing Environment; ➢ Market Segmentation– Market Segmentation of Footwear Industry; ➢ Marketing Mix.
UNIT II	**Product** ➢ Introduction to Product; ➢ Essential Features of Product; ➢ Product Line; ➢ New Product Development; ➢ Stages of New Product Development; ➢ Product Life Cycle (PLC); ➢ Causes for Failure of New Product; ➢ Branding; ➢ Packaging.

UNIT III	**Pricing** ➢ Meaning & Definition of Pricing; ➢ Objectives of Pricing; ➢ Pricing Policy; ➢ Factors Influencing Pricing Policy.
UNIT IV	**Channels of Distribution** ➢ Meaning and Definition; ➢ Functions of Distribution Channels; ➢ Types of Distribution Channels: Consumer Channels & Industrial Channels; ➢ Factors Affecting Choice of Channels of Distribution.
UNIT V	**Promotion** ➢ Meaning & Definition of Promotion; ➢ Promotion Mix; ➢ Sales Promotion: Meaning; ➢ Tools of Sales promotion; ➢ Advertising: Meaning; ➢ Importance of Advertising; ➢ Advertisement campaign for footwear; ➢ Publicity: Meaning & Types; ➢ Importance of Publicity; ➢ Personal Selling: Meaning; ➢ Importance of Personal Selling.
UNIT VI	**Introduction to E-Commerce** ➢ What is E-Commerce – An Overview; ➢ Features of E-Commerce; ➢ Categories of E-Commerce; ➢ Advantages and Limitations of E-Commerce; ➢ Factors Responsible for Growth of E-Commerce; ➢ Issues in Implementing E-Commerce; ➢ Impact of E-Commerce on Business; ➢ Leading E-commerce sites in India; ➢ Mobile Commerce – Meaning;

	➢ Benefits of M-Commerce; ➢ Services and Applications of M-Commerce.
UNIT VII	**E-commerce Technology** ➢ Introduction; ➢ Internet; ➢ Intranet; ➢ Extranet; ➢ VPN; ➢ Firewall; ➢ Digital Signatures; ➢ Digital Certificates.
UNIT VIII	**Electronic Payment (E-Pay) Systems** ➢ Introduction; ➢ Electronic Payment Mechanism; ➢ Electronic Fund Transfer; ➢ Internet Banking; ➢ Payment Gateway; ➢ Risks associated with E- Payment Systems; ➢ Security requirements for E- Payment Systems; ➢ SSL & TLS; ➢ Biometrics.
UNIT IX	**Cyber Laws** ➢ Introduction; ➢ Cyber Laws in India; ➢ Salient Provisions of Cyber Law; ➢ Prevention of Cyber Crimes; ➢ Information Technology Act, 2000 (India); ➢ Jurisprudence of Indian Cyber Law; ➢ Salient features of the Information Technology (Amendment) Act, 2008.

Assignment:

- Research on any one leading footwear brands and submit a full report on its successful marketing strategy.
- Select one footwear type that a retailer might sell. What sort of details about this product could an online store provides to their customers? Make a comparative analysis report on it.
- Visit any two online shopping stores for footwear items and make a comparison between them

and present the details in a PPT form.

- Assume that, you are the owner of an online footwear shop; you can decide whether your customers have to pay before delivery or after delivery. If you have to select any one method out of these two methods. Which one would you select? Why?

Evaluation Scheme

THEORY
(100 MARKS)

External Assessment (60 Marks)	**Internal Assessment (40 Marks)**		
End Semester Examination	**Mid Semester Test**	**Quizzes/ Viva voce/ Assignment**	**Class Attendance**
60	20	10	10

Pass Criterion: Students have to obtain at least **40% marks (Pass marks)** in both Internal Assessment and External Assessment separately.

References/Suggested Learning Resources :

1. Principles of Marketing by Philip Kotler- *Pearson Education Limited*
2. Marketing Management by Rajan Nair-*Sultan Chand & Sons*
3. Modern Marketing Principles and Practice by R.S.N. Pillai and Bhagavathi- *S. Chand Publishing, 1987*
4. Marketing by Jayasankar-*Margham Publications.*
5. E-commerce by C.S.V. Murthy-*Himalaya Publishing House*
6. E-commerce by David Whiteley-*McGraw Hill*
7. E-commerce by P. Joseph, *PHI Learning*
8. E-commerce-The cutting edge of business by K. Bajaj and Debjani Nag- *McGraw Hill Education*

Course Outcomes

At the successful completion of this course, students will be able to learn the :

CO I	They will be able to analyze markets and design customer driven strategies and will be able to communicate the decisions towards business development with superior customer value
CO II	Students shall understand the fundamental principles of e-business and e-commerce.
CO III	The learners shall understand the impact of information and communicationtechnologies on business.
CO IV	Students shall understand the tools and services used by virtual e-commerce sites.

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ENGINEERING ECONOMICS & PROJECT MANAGEMENT

(FWTOE I)

Course Code	:	**OE 301 (FWTOE I)**
Course Title	:	**ENGINEERING ECONOMICS & PROJECT MANAGEMENT**
Course Category	:	**Open Elective**
Number of Credits	:	**3**
Contact	:	**3 lecture/week, 1hr/lecture, Total 45 lecture**
Offered to	:	**6th Semester, FWT students**
Pre Requisite	:	**NIL**

Course Objectives

OE 301 Engineering Economics & Project Mangement The course aims at providing exposure to the students

- To acquire knowledge of basic economics to facilitate the process of economic decision making;
- To acquire knowledge on basic financila management aspects;
- To develop the idea of project plan, from defining and cnfirming the project goals and objectives, identifying tasks and how goals will be achieved;
- To develop an understanding of key project management skills and strategies.

Course Content

GROUP A

UNIT I	**INTRODUCTION, THEORY OF DEMAND & SUPPLY** ***Duration: 09 Period (L: 9.0)*** • Introduction to Engineering Economics, the relationship between Engineering and Economics • Resources, scarcity of resources and efficient utilization of resources. • Opportunity cost, rationality costs and benefits. • Theory of Demand: The law of demand, different types of demand, determinants of demand, demand function, price elasticity of demand. • Theory of Supply: determinants of supply, supply function. • Market mechanism: Equillibrium, basic comparative static analysis (Numerical problems).
UNIT II	**THEORY OF PRODUCTION & COSTS** ***Duration: 10 Periods (L: 10.0)*** • Concept of Production (Goods & Services), Different factors of production (Fixed & Variable factors), Short-run Production function (Graphical Illustration) and Long Run Product Function (Returns of Scale). • Theory of Cost: Short-run and Long-run Cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost etc.

	• Economic concept of profit, profit maximization (numerical problems).
UNIT III	**DIFFERENT TYPES OF MARKET AND ROLE OF GOVERNMENT** ***Duration: 04 Periods (L: 4.0)*** • Perfect Competition: Features of perfectly competitive market. • Imperfect Competition: Monopoly, Monopolistic competition and Oligopoly. • Role of Government in Socialist, Capitalist and Mixed Economy structure with example.
GROUP B	
UNIT I	**CONCEPT OF PROJECT** ***Duration: 04 Periods (L: 4.0)*** • Definition and classification of Projects. • Importance of Project Management. • Project Life Cycle [Conceptualization > Planning > Execution > Termination].
UNIT II	**FEASIBILITY ANALYSIS OF A PROJECT** ***Duration: 10 Periods (L: 10.0)*** • Economic and Market Analysis. • Financial Analysis: Basic techniques in Capital Budgeting - Payback Period method, Net Present Value method, Internal Rate of Return period. • Environmental Impact Study: Adverse Impact of the Project on the Environment. • Project Risk & Uncertainty: Technical, Economical, Socio-Political and Environmental Risks. • Evaluation of the Financial Health of a Project: Understanding the basic concept of Fixed & Working Capital, Debt & Equity Shares, Debentures etc, and different financial ratios like Liquidity Ratios, Activity Ratios, Debt-Equity ratio & Profitability Ratio (Basic Concept only). **N.B:** *Knowledge of Financial statements is not required for the estimation of ratios the values of the relevant variables will be provided.*
UNIT III	**PROJECT ADMINISTRATION** ***Duration: 08 Periods (L: 8.0)*** • Gantt chart – A system of bar charts for scheduling and reporting the progress of aprojecty (basic concept). • Concept of Project Evaluation and Review Technique (PERT) and Critical Path method (CPM): Basic concept and applications with real-life examples.

Suggested Students Assignment

Students should be instructed to prepare A Report on a Project (preferably the Major Project they prepare in 6th Semester), using a popular project management software in IT/Computer Laboratory, under the guidance of the Lecturer in Computer Science & Technology and Lecturer in Humanities.

Evaluation Scheme

THEORY
(100 MARKS)

End Semester Examination (60 Marks)	**Internal Assessment (40 Marks)**		
	Mid Semester Test	**Quizzes/ Viva voce/ Assignment**	**Class Attendance**
60	20	10	10

Pass Criterion: Students have to obtain at least **40% marks (Pass marks)** in both Internal Assessment and End Semester Examination separately.

References/Suggested Learning Resources

1. Principles of Economics – *Case and Fair, Pearson Education Publication*.
2. Principles of Economics – *Mankiw, Cengage Learning*.
3. Project Planning, Analysis & Selection, Implementation and Review by Prasanna Chandra – *Tata McGraw Hill*.
4. Project Management by Gapala Krishnan-*Mcmillan India Ltd.*

Suggested E-Learning Resources

1. https://youtu.be/OE92w2IDAOK
2. https://youtu.be/VZaFTMzuvX8
3. https://youtu.be/y1x_PtmBJGg
4. https://youtu.be/LTRKAANHo-U
5. https://youtu.be/N6ZZ51QCPU
6. https://youtu.be/ByimCyYnl2Y
7. https://youtu.be/dFTG3ohAcso

Course Outcomes

At the successful completion of this course, students will be able to

CO I	Describe and determine the effect of financial analysis and its impact on budgeting of projects and their outcomes.
CO II	Identify the characteristics of various methods used for the generation of financial management decisions.
CO III	Understand the nature of perfect and imperfect competition and role of Government on various economic structures.
CO IV	Apply the concepts of financial management for project appraisal.
CO V	Understand the market structures and integration concepts, impact of inflation, taxation, environmental risks, economic basis for replacement, project scheduling and legal and regulatory issues are introduced and applied to economic investment and project management problems.

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OCCUPATIONAL HEALTH & SAFETY ENGINEERING

(FWTOE II)

Course Code	:	**FWT OE II**
Course Title	:	**OCCUPATIONAL HEALTH & SAFETY ENGINEERING**
Course Category	:	**Open Elective II**
Number of Credits	:	**3**
Contact	:	**2 lecture and 1 Tutorial/week, 1hr/lecture, Total 30 lecture and 15 tutorial**
Offered to	:	**6th Semester, FWT students**
Pre Requisite	:	**Elementary knowledge on Safety Engineering at Industries**

Course Objectives

FWT OE II OCCUPATIONAL HEALTH AND SAFETY ENGINEERING The course aims at providing exposure to make the students

- To learn about the basics of hazard, risk and acciedents in various industries and their management;
- To learn about the principles of Industrial hyegiene their permissible limits and controlling measures;
- To learn about the various hazards in industries and the impact of damages in these areas;
- To understand the safety procedures involved in the footwear and allied industries;
- To learn about the statutory requirements mentioned in factories act for prevention of acciedents.

Course Content

UNIT I	**OCCUPATIONAL HEALTH** ***Duration: 05 Periods (L: 4.0-T:1.0)*** • History of occupational health; • Concept of occupational health; • Occupational and work related diseases; • Levels of prevention; • Health examination (Initial & Periodic); • Essentials of occupational health services (OHS); • Personal protective equipment (PPE-Respiratory & Non-Respiratory); • Ergonomic Controls; • Risk Assessment; • Risk Management & Risk Tolerance.
UNIT II	**INTRODUCTION TO INDUSTRIAL SAFETY** ***Duration: 05 Periods (L: 3.0 -T: 2.0)*** • History and development of Safety movement; • Importance of safety and safety conciousness in Indian Footwear and allied Industries;

	• Safety policy; • Safety organizations and its responsibilities; • Industrial Acciedents; • Acciedents sequence theory; • Causes of accidents; • Identification of vulnerable areas of acciedents; • Acciedent prevention and control techniques including near misses, risk, hazards and dangerous occurances; • First Aid; • Financial Cost – Direct & Indirect cost of accidents.
UNIT III	**INDUSTRIAL HYEGIENE** ***Duration: 05 Periods (L: 3.0 -T: 2.0)*** • Principles and its control measures; • Permissible limits; • Stress; • Exposure to Heat; • Heat balance; • Effects of heat stress; • Chemical agents; • Flammables; • Explosives – Types, Water Sensitive chemicals, Oxidants, Gases under pressure; • Chemicals causing Health Hazards – Irritants, Asphyxiates, Anaesthetics, Poisons and Carcinogens. • Air Sampling. • Types of Air Borne contaminants and their evaluation methods. • House keeping and its importance.
UNIT IV	**WORKPLACE HAZARDS AND ITS CONTROL** ***Duration: 10 Periods (L: 8.0 – T: 2.0)*** • ***Physical Hazards*** ➢ Illumination - Principles and Purpose of good illumination, Standards of Illumination; ➢ Ventilation – Principle and Purpose of ventilation, Classification of ventlation (Natural & Artificial); ➢ Thermal Stress – Various indexes, its impact & control (including air conditioning);

	➢ Impact & Control of Vibration; ➢ Noise Pollution, its impact and control; ➢ Imoact & control of radiation; ➢ Personal Protective Aids; ➢ Safe weight lifting procedure; ➢ Safe Start Up; ➢ Shut down and emergency shut down procedures; ➢ Permit to work system. • ***Chemical Hazards*** ➢ Definition of various chemical hazards, properties and preventive measures; ➢ Routes of entry of chemicals into human body; ➢ Concentration & type of exposure in the industry; ➢ General toxic effects of chemicals for the environment; ➢ Common safety in transportation and bulk storage of hazadous materials; ➢ Corrosion prevension and preventive maintainance of vulnerable equipment; ➢ Safe entry into confined spaces; ➢ Permit to work system; • ***Electrical Hazards*** ➢ Dangers from electricity; ➢ Safe limits of voltage and amperage; ➢ Safe distance from LT and HT Lines; ➢ Means of cutting of Power overload and short circuit protection; ➢ Methods and importance of Earthing, earth fault protection, earth insulation and continuity tests; ➢ Control of hazards due to Static electricity permit to work system. • ***Fire Hazards*** ➢ Chemistry of fire; ➢ Classification of fire; ➢ Common causes of industrial fire statutory;

	➢ Provisions regarding fire safety; ➢ Factors contributing towards fire; ➢ Determination of Fire Load; ➢ Fire resistance of building materials; ➢ Design of Industrial Plant for Safety; ➢ Prevention of Fire - Portable Fire extinguishers –Water/Carbon di-oxide/Foam/Dry Chemical; ➢ Fire Prevention System – Sprinkle/CO_2 Flooding/ Foam System; ➢ Industrial Fire Detection and Alarms; ➢ Special precautionary measures in handling/Processing flammable liquids, Gases, Vapours, Mists and Dusts; ➢ Emergency Action Plan. • ***Biological Hazards*** ➢ Description of bacterial agents; ➢ Description of viral agents; ➢ Explanation the transmission and prevention of water borne diseases; ➢ Outline vector borne diseases; ➢ Explanation of vector control in the factory.
UNIT V	**POLLUTION** ***Duration: 03 Periods (L: 2.0 -T: 1.0)*** • Atmospheric pollution; • Waste and dust; • Toxic materials and gases; • Environmental pollution by Footwear Industry.
UNIT VI	**IDENTIFICATION OF RISK ASSESSMENT AND HAZARD PREVENTION IN FOOTWEAR INDUSTRY** ***Duration: 07 Periods (L: 5.0 -T: 2.0)*** • Explanation of Associated Hazards and Its Effects in ➢ Raw material handling; ➢ Logistics; ➢ R & D and Quality Control; ➢ Rubber Section; ➢ Leather Section; ➢ Assembly Section; ➢ Engineering; ➢ Packing and handling of finished products;

	➢ HR Administration and Accounts; ➢ Stores & Purchases; ➢ Projects; ➢ Environment, Health, Safety & Fire. • Effective steps to implement safety procedures of the associated hazard and its effect; • Periodic inspection and preventive maintainance of Footwear machines & equipments.
UNIT VII	**SAFETY MANAGEMENT IN FOOTWEAR INDUSTRY** ***Duration: 05 Periods (L: 3.0 -T: 2.0)*** • Principles of safety management; • Safety policy; • Benefits of zero incident safety policy; • Importance of incident free working environment; • Incident investigation; • Root cause analysis; • Medical evaluation; • Preventive action; • Safety awareness programme at workplace; ➢ Motivation; ➢ Education; ➢ Training at various levels of production & operation. ➢ Appraisal of Industrial Safety; ➢ Measurement of Safety performance; • Machineries safety; • Standard operating procedures (SOP) of modern equipment's; • Personal protection equipment's (PPE); • PPE Compliance; • Emergency drill for worker; • Effective communication; • Safety Standards; • Role of Government, Management & Trade Unions in promoting industrial safety; • Safety Organisation – Role of safety Committee and its formation.

UNIT VIII	**INDUSTRIAL SAFETY REGULATIONS** *Duration: 05 Periods (L: 2.0 -T: 2.0)*

- The Factory Rules;
- Functions of Safety Management;
- Legislative Measures in Industrial Safety: Factory Act 1948, Workmen's Compensation Act 1943, Employees Sattate Insurance Act 1948; Water (Prevention & Control) Pollution Act 1974, Boiler Vessels Act, Child Labour and Women Employee Act;
- ILO Convention and Recommendations in the furtherance of Safety, Health & Welfare;
- Occupational Safety;
- Health & Environment Mangement: Bereau of Indian Standards on Safety Health 14489 – 1998 and 15001 – 2000 OSHA (Occupational Safety and Health Administration).

Suggested Students Assignment (Any One)

Each student should do any one of the following assignment or any other similar assignment related to the course and before conducting, gets it approved from concerned Teachers and HOD.

- Draw an emergency response action plan case of fire broke out at Footwear industry.
- Briefly describe Factories Act, 1948 and Employees State Insurance Act, 1948.
- Briefly describe about the various types of hazardous risks associated with footwear industry and therby suggest the possible remedial measures.

Expert Lecture

It is mandatory to organize an **Expert Lecture** on the aforesaid subject by inviting resource persons from the domain specific i.e Footwear Industry.

Evaluation Scheme

THEORY
(100 MARKS)

External Assessment (60 Marks)	**Internal Assessment (40 Marks)**		
End Semester Examination	**Mid Semester Test**	**Quizzes/ Viva voce/ Assignment**	**Class Attendance**
60	20	10	10

Pass Criterion: Students have to obtain at least **40% marks (Pass marks)** in both Internal Assessment and External Assessment separately.

References/Suggested Learning Resources

1. Industrial Safety Handbook (2nd Edition) by William Handley-*McGraw Hill Book Company, 1969*.
2. Industrial Safety (3rd Edition) by R.P Blaka-*Prentice Hall inc., New Jersy, 1963*.
3. Industrial Safety, Health and Environment Management System by R.K Jain and Sunil S. Rao-*Kanna Publishers*.
4. Principles of industrial Safety Management by Akhil Kumar Das-*PHI Learning Pvt. Ltd*.
5. Industrial Safety Management by LM Deshmukh-*McGraw Hill Education.*
6. Fundamentals of Occupational Safety & Health By Mark A Friend and James P Kohn-*Government Institutes An imprint of the Scarecrow Press Inc*.

7. Safety in Industry by Brij Mohan Bansal-*Woodhead Publishing India Pvt. Ltd*.
8. Physical and Biological Hazards in the Workplace by Wald, Peter and Gregg M. Steve-*New York, NY: Van Nostrand Reinhold, 2001*.

Suggested E-Learning Resources

1. https:/youtu.be/8nbOl-0U9Co
2. http://youtu.be/55p7hJqb13s
3. http://youtu.be/rxVzm)ixNtY
4. http://youtu.be/y3dQj1mYlOw
5. http://youtu.be/VhOTDJVC8uM
6. http://youtu.be/vb9QFjkEmAU

Course Outcomes

At the successful completion of this course, students will be able to

CO I	Identify the components needed to provide a safe and healthiful work environment through case studies and review of injury statistics provided in the course.
CO II	Analyze safety and health issues resulting from worker complaints or OSHA violations and suggest potential remedies.
CO III	Identify potential workplace safety and health hazards and determine how to mitigate the hazards through engineering controle, administrative controls and personal protective equipment.
CO IV	Conduct basic safety inspections using strategies that they have developed through hazard identification and job hazard analysis.
CO V	Review the principles for developing and implementing a successful occupational health and safety program and evaluation of a work site.

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INDUSTRIAL HAZARDS AND MODERN WASTE MANAGEMENT

(FWTOE II)

Course Code	:	**FWTOE II**
Course Title	:	**INDUSTRIAL HAZARDS AND MODERN WASTE MANAGEMENT**
Course Category	:	**Open Elective II**
Number of Credits	:	**3**
Contact	:	**2 lecture and 1 Tutorial/week, 1hr/lecture, Total 30 lecture and 15 tutorial**
Offered to	:	**6th Semester, FWT students**
Pre Requisite	:	**Basic knowledge about the various types of Environmental Pollutants**

Course Objectives

FWTOE II INDUSTRIAL HAZARDS AND MODERN WASTE MANAGEMENT The course aims at providing exposure to the students

- To learn about the sources, categories, composition and general methods of disposal and management of solid waste;
- To provide comprehensive overview of solid and hazardous waste management;
- To provide knowledge on solid waste management design aspects;
- To learn about the different methods of solid waste management.

Course Content

UNIT I	**WASTE GENERATION & DISPOSAL** ***Duration: 08 Periods (L: 6.0 -T: 2.0)*** • Introduction; • Sources and Categories of waste; • Bio Degradable and Non Bio Degradable waste; • Solid wastes and their classification; • Chemical composition of solid wastes; • General methods of Disposal and Management of Solid waste;
UNIT II	**INDUSTRIAL WASTE** ***Duration: 08 Periods (L:6.0 -T: 2.0)*** • Introduction; • Types of Industrial waste; • Identification of Industrial waste; • Hazardous waste management sites in India; • Route of industrial hazard entry into human body-Inhalation;
UNIT III	**SOLID WASTE GENERATION IN FOOTWEAR AND LEATHER PRODUCTS INDUSTRY** ***Duration: 08 Periods (L: 6.0 -T: 2.0)*** • Introduction; • Generation ➢ Leather cut-off; ➢ Natural Rubber/Poly-Isoprene waste;

	➢ Reaction Injection Moulded (RIM); ➢ Polyurethane (PU) blends; ➢ Poly Vinyl Chloride (PVC) and blends; ➢ Ethyl Vinyl Acetate (EVA) and blends; ➢ Styrene butadiene rubber (SBR) wastes; ➢ Thermoplastic Polyurethane (PU) waste; ➢ Thermoplastic Rubber (TR); ➢ Textiles; ➢ Cotton excess; ➢ Polyester; ➢ Nylon; • Materials used in Assembling Operations: Adhesive, Solvent, Finishing materials etc.
UNIT IV	**SOLID WASTE GENERATION IN LEATHER INDUSTRY** ***Duration: 08 Periods (L: 4.0 -T: 4.0)*** • Introduction; • Generation ➢ Skin Collagen waste; ➢ Fleshing waste; ➢ Wet Blue; ➢ Trimming; ➢ Buffing; ➢ Chrome shaving; ➢ Chrome Split; ➢ Trimming from crust and finished leather; • Description on possible utilization of the leather wastes.
UNIT V	**SOLID WASTE MANAGEMENT OF FOOTWEAR INDUSTRIES.** ***Duration: 06 Periods (L: 4.0 -T: 2.0)*** ***A. STORAGE, COLLECTION AND TRANSPORTATION OF FOOTWEAR INDUSTRY WASTE*** • Collection; • Engineering classification; • Characterization; • Generation and Quantification. • Transportation

	➢ Collection systems; ➢ Collection equipments; ➢ Transfer stations; ➢ Collection route optimization; ***B. TREATMENT METHODS*** • Various methods of refuse processing; • Recovery, Recycle & Reuse; • ***Composting*** ➢ Concept, Principles and Factors affecting the composting process; ➢ Methods of composting – Aerobic and Anaerobic, Incineration, Pyrolysis, Energy recovery, Bangalore and Indore model etc. • ***Disposal methods*** ➢ Impact of Open dumping; ➢ Site Selection; ➢ Sanitary land filling – Design criteria and design examples; ➢ Leachate and Gas collection systems; ➢ Leachate treatment. • ***Hazardous & Non-Hazardous Waste Management*** ➢ Introduction; ➢ Sources; ➢ Classification; ➢ Physico-chemical, Chemical and Biological treatment; ➢ Regulations; ➢ Procedure for the management of hazardous and other industrial waste; ➢ Procedure for the management of Non-Hazardous Industrial waste. • ***Thermal Treatment*** ➢ Incineration and Pyrolysis; • ***Soil contamination and site remediation*** – Bioremediation processes, monitoring of disposal sites.
UNIT VI	**ADVANCED WASTE MANAGEMENT METHOD** ***A. Removal of Refractory Organic Compounds***

	Duration: 07 Periods (L: 4.0 -T: 3.0) • Advanced Oxidation Process ➢ Photocatalytic treatment; ➢ Membrene seperation; ➢ Homogeneous catalysis system; ➢ Heterocatalytic systems; ***B. Removal of Inorganic Compounds*** ➢ Electrodyalysis; ➢ Reverse Osmosis; ➢ Multiple effect evaporator; ➢ Ion-exchange;

Suggested Students Assignment

Each student should do any one of the following assignment or any other similar assignment related to the course and before conducting, gets it approved from concerned Teachers and HOD.

- Write a short essay on possible utilization of Waste generated from Leather Industry.
- Briefly describe about the various types of solid waste generated from a footwear manufacturing industry.
- Describe in brief about the various solid waste management techniques associated with hazardous and non-hazardous industry wastes.

Evaluation Scheme

THEORY
(100 MARKS)

External Assessment (60 Marks)	**Internal Assessment (40 Marks)**		
End Semester Examination	**Mid Semester Test**	**Quizzes/ Viva voce/ Assignment**	**Class Attendance**
60	20	10	10

Pass Criterion: Students have to obtain at least **40% marks (Pass marks)** in both Internal Assessment and External Assessment separately.

References/Suggested Learning Resources

1. Elements of Solid Hazardous Waste Management by O.P Gupta-*Khanna Book Publishing Co*.
2. Solid Waste Mangement by A. Bhide - *Indian national Scientific Documentation Centre, New Delhi.*
3. Solid Waste by George Techobanoglous, Keith Frank – *McGraw Hill Publication, New Delhi*.
4. Solid Waste Engineering by A. Vesiland – *Thompson Books*.
5. The Treatment of Industrial Waste 92nd edi.) by B.E Bessellieve and M. Schwartz- *McGraw Hill*.
6. Hazardous Waste (Management and Handling) Rules, 2001.

Suggested E-Learning Resources

1. https://youtu.be/aS-U8xsvZ-4
2. http://youtu.be/GjKXTjLs020
3. http://youtu.be/rAbCMM0WjLi
4. http://youtu.be/BbLIJPwMBKQ
5. http://youtu.be/hj3w4UUElal
6. http://youtu.be/PJBRqespiOA
7. http://youtu.be/Had2dwmyhE

8. http://youtu.be/qsfr_HNdHZo	
Course Outcomes	
At the successful completion of this course, students will be able to	
CO I	Explore their knowledge on Industrial of various treatment options for solid waste management;
CO II	Learn adverse impact of industrial hazard on the environment as well as on human body;
CO III	Evaluate the regulations of industrial wastes and to be able to recognize the environmentally friendly utilization methods;
CO IV	Convert footwear solid waste into valuable product;
CO V	Explore utilization benefits of tannery wastes.

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ADVANCE FOOTWEAR DESIGNING II
(FWTPC 602)

Course Code	:	**FWTPC 602**
Course Title	:	**ADVANCE FOOTWEAR DESIGNING II**
Course Category	:	**Programme Core Course**
Number of Credits	:	**2**
Contact	:	**4 Practical/week, 1hr/Practical, Total 60 Practical**
Offered to	:	**6th Semester, FWT Students**
Pre Requisite	:	**Elementary knowledge on basic footwear designing**

Course Objectives:

FWTPC 602 Advance Footwear Designing II The course aims at providing exposure to the students

- To improve students' confidence in sketching and coloring's various advanced footwear styles;
- To impart skills and knowledge for the development of the mean formes, base standards, and component patterns of various advanced footwear styles;
- To impart skills and knowledge for the development of prototypes of various advanced footwear styles;
- To build confidence in pattern grading and pattern trials of various advanced footwear styles.

Course Content

UNIT I — **SKETICHING AND RENDERING** ***Duration: 04 Periods (P: 4.0)***

- *Design Sketching*
  - Gents/Ladies Open Fancy Footwear;
  - Gents Ankle Boot with collar;
  - Gents Stroble Shoe;
  - Safety Shoe;
- *Rendering medium of sketching*
  - Water Colour, Pencil Colour, Oil Colour, Texture, Volume, Light and Shade effect.

UNIT II — **MODELING AND PATTERN ENGINEERING OF OPEN FANCY FOOTWEAR FOR MEN WITH VARIATIONS.** ***Duration: 15 Periods (P: 15.0)***

- Masking;
- Derivation of Mean Forme;
- Derivation of Geometric Standards;
- Derivation of component patterns, folding patterns and lining patterns;
- Derivation of bottom standard;
- Derivation of bottom profiles;
- Grading of patterns for different sizes;
- Calculation consumption of materials according to the pattern;
- Prototyping;
- Development of specification, quality checks and pattern trials;

Course Code	:	**FWTPC 602**
UNIT III	**MODELING AND PATTERN ENGINEERING OF OPEN FANCY FOOTWEAR FOR LADIES WITH VARIATIONS.** ***Duration: 21 Periods (P: 21.0)*** ● Masking; ● Derivation of Mean Forme; ● Derivation of Geometric Standards; ● Derivation of component patterns, folding patterns and lining patterns; ● Derivation of bottom standard; ● Derivation of bottom profiles; ● Grading of patterns for different sizes; ● Calculation consumption of materials according to the pattern; ● Prototyping; ● Development of specification, quality checks and pattern trials;		
UNIT IV	**MODELING AND PATTERN ENGINEERING OF ANKLE BOOT WITH COLLAR FOR MEN.** ***Duration: 10 Periods (P: 10.0)*** ● Masking. ● Derivation of Mean Forme; ● Derivation of Geometric Standards; ● Derivation of component patterns, folding patterns and lining patterns; ● Derivation of bottom standard; ● Derivation of bottom profiles; ● Grading of patterns for different sizes; ● Calculation consumption of materials according to the pattern; ● Prototyping; ● Development of specification, quality checks and pattern trials;		

Course Code	:	**FWTPC 602**

UNIT V **MODELING AND PATTERN ENGINEERING OF STROBLE SHOE FOR MEN WITH VARIATIONS.** ***Duration: 10 Periods (P: 10.0)***

- Masking;
- Derivation of Mean Forme;
- Derivation of Geometric Standards;
- Derivation of component patterns, folding patterns and lining patterns;
- Derivation of bottom standard;
- Derivation of bottom profiles;
- Grading of patterns for different sizes;
- Calculation consumption of materials according to the pattern;
- Prototyping;
- Development of specification, quality checks and pattern trials.

Suggested Student Assignment

Each student follows the following instruction before assignment.

- Geometric Modeling and Pattern engineering of aforesaid footwear styles.
- Prototype Sample Preparation.

Evalution Scheme

Practical
(100 Marks)

Practical Internal Assessment			**Practical External Assessment**	
Class Assignments	**Class Performance**	**Class Attendance**	**Exam Day Assignment**	**Exam Day Viva**
30	20	10	20	20

Pass Criterion: Students have to obtain at least **40% marks (Pass marks)** in both Internal Assessment and External Assessment separately.

References/ Suggested Learning Resources

1. Footwear Design (2012) by Aki Chokolat-*London Laurance King*.
2. Pattern Cutting and Making Up by Martin, Shoben, Janet P. Ward
3. Designing Manual by Bata India Pvt. Ltd.
4. Footwear Pattern Making and Last Design by Wade and Andrea Motawi-*Sneaker Factory*.

Suggested E- Learing Resources

1. http://Shoemakingcoursonline.com
2. http://Icanmakeshoes.com
3. http://youtu.be/-ShfGnBoLvl
4. http://youtu.be/uob64u9D5LM

Course Outcomes

After completion of the course "**Advance Footwear Designing II**" the students will able to

CO I	Sketch and colour various advanced footwear styles.
CO II	Develop mean forms, base standards, bottom standards, bottom profiles, and component patterns for a variety of advanced footwear styles.
CO III	Develop prototypes of a variety of advanced footwear styles as well as gain knowledge in component pattern grading.
CO IV	Check pattern accuracy by pattern-trialing of different advanced footwear styles.

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SEMINAR PRESENTATION ON PROJECT (FWTS 604)

Course Code	:	**FWT Sem. 604**
Course Title	:	**SEMINAR ON PROJECT**
Course Category	:	**Seminar**
Number of Credits	:	**2**
Contact	:	**4 Practical/week, 1hr/Practical, Total 60 Practical**
Offered to	:	**6th Semester, FWT students**
Pre Requisite	:	**Adequate knowledge on various fields of Footwear Engineering**

Course Objectives

FWTS 604 The course aims at providing exposure to the students

- To identify parctical learning skills and concept that will promote students academic access;
- To identify and compare technical and practical issues related to the area of course specilization;
- To outline annotated bibliography of research demonstrating scholarly skills;
- To prepare a well organized report employing elements of technical writing and critical thinking;
- To demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.
- To help students to develop research skills and competencies.

Course Content

Sl No	Topics for SEMINAR PRESENTATION (Any One)
1.	Creative Designing of Open/Close Type Street Footwear(s)/ Dress Shoe(s)/ Sports Shoe(s) /Fashionables based on modern fashion & trends.
2.	How to Implement Sustainable Manufacturing in Footwear.
3.	Role of Supply Chain & Logistics in Footwear Management.
4.	Health and Safety at Work (HSW) in Footwear Industry.
5.	Modernization & Optimization of Footwear Manufacturing.
6.	Investigative study on Podorthic Footwear(s).
7.	Manufacturing of Open/Close Type Street Footwear(s)/ Dress Shoe(s)/ Sports Shoe(s) /Fashionables based on modern fashion & trends.
8.	Testing of Footwear Materials and Result analysis.
9.	Footwear Costing.
10.	Fashion Forecasting on upcoming Footwear Trends.
11.	Machinery/Equipment maintainance in Footwear Manufacturing Unit(s).
12.	Any topic related to Internship Programme may be undertaken after consultation with the Project Guide and Head of Footwear Technology Department.

Impotant Instruction

Student in consultation with the guide/s shall carry out literature survey/visit industries to finalize the aforesaid topic of the Project. Subsequently, the students shall collect the material required for the selected project as mentoned below, prepare synopsis and narrate the methodology to carry out the

project work. Single/Group presentation under the guidance of a faculty is required to

- Present the Seminar on aforesaid topics through **Power Point Slides.**
- Submit one copy of the typed individual report with a list of references.

The teacher concerned (Guide) may organize an **Expert Lecture** on selected seminar topics by inviting resource persons from the domain specific i.e Footwear Industry.

Evaluation Scheme

THEORY
(100 MARKS)

Internal Assessment (60 Marks)			**External Assessment (40 Marks)**	
Slides Preparation	**Slide Presentation**	**Attendance**	**Exam Day Presentation**	**Exam Day Viva**
30	20	10	30	10

Pass Criterion: Students have to obtain at least **40% marks (Pass marks)** in both Internal Assessment and External Assessment separately.

References/Suggested Learning Resources

1. Manual of Shoe Making by C.J Clarke- *C & J Clark Ltd. 1976*.
2. Comprehensive Footwear Technology (1st Edition) by Somenath Ganguly- *ILTA Publications*.
3. Modern Concept of Leather and Footwear Manufacturing by R.D Singh-*Invincible Publishers*.
4. ABC of Footwear Technology by Varun Gupta and A.V Suresh-*Notion Press*.
5. Shoe Material and Design Guide by Wade Motawi- *Sneaker Factory*.
6. An Introduction to Principles of Leather Manufacture (4th Edition) by S.S Dutta-*ILTA Publications*.
7. Shoe Design-A Handbook for Footwear Designers-*Fashionary International Ltd*.
8. Mastering Auto Cad 2019 and Auto Cad 2019 by George Omura – *Willey India Pvt. Ltd.*
9. Industrial Engineering & Product Management- Mart & Telsang – *S.Chand Publishers*.
10. Fashion Trend Forecasting by Gwyneth Holland, Rae Jones – *Lawrence King Publishing*.
11. Apparel Merchandising by R. Rathinamoorthy and R. Surjit-*Woodhead Publishing Indian Textiles*.
12. An Introduction to the Principles of Physical Testing of Leather by S.S. Dutta- *ILTA Publications.*

Suggested E-Learning Resources

1. https://youtu.be/78n7rPilrBc
2. http://youtu.be/QPt_ChCjDMU
3. http://youtu.be/waSUDmCXpk
4. http://youtu.be/fACEzzmXeIY
5. http://youtu.be/8X1UhBchDju
6. http://youtu.be/v89iJQRHnl4

Course Outcomes

At the successful completion of this course, students will be able to

CO I	Establish motivation for any topic of interest and develop a thought process for technical presentation.
CO II	Organize a detailed literature survey and build a document with respect to technical publications.
CO III	Poses academic skills, including preparing and conducting project in the field of Footwear manufacturing.
CO IV	Effective presentation and improve soft skills.
CO V	Make use of new and recenet technology for creating technical reports.
CO VI	To acquaint them with contemporary real life aspects of Footwear Engineering.

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PORT FOLIO PREPARATION & COURSE VIVA

(FWTPC 606)

Course Code	:	**FWTPC 606**
Course Title	:	**PORT FOLIO PREPARATION & COURSE VIVA**
Course Category	:	**Programme Core Course**
Number of Credits	:	**1**
Contact	:	**2 Practical/week, 1hr/Practical, Total 30 Practical**
Offered to	:	**6th Semester, FWT students**
Pre Requisite	:	**Elementary knowledge on various Physical & Chemical Tests for Footwear manufacturing materials**

Course Objectives

FWTPC 606 PORT FOLIO PEPARATION & COURSE VIVA The course aims at providing exposure to the students

- To reflect on their learning, to self assess and to formulate deeper understanding of the concepts they are learning beyond a simple surface explanation.
- To demonstrate learning over the course of time rather thanhe/she knows on a particular day.
- To reflect accomplishments, skills, experiences and attributes.
- To develop innovative ideas in developing creative footwear articles.
- To prepare the students to face interview both at the academic and industrial sector.

Course Content

UNIT I	**PORT FOLIO PREPARATION** ✓ **Elements of Footwear Designing Port Folio** ➢ Design Trend Analysis; ➢ Exploration of design source and influence available for footwear design. ➢ Conceptualizing the anatomy of designs; ➢ Sketching and Rendering of Prototype; ➢ Derivation of Geometric base of the Prototype Upper; ➢ Derivation of Geometric Bottom profiles of the Prototype; ➢ Derivation of complete set of sectional pattern, folding copies, lining and bottom profile patterns; ➢ Componentwise material and accessory selection (Theme/Color Board preparation); ➢ Sample Preparation (Pattern Trial); ➢ Feedback summary after fitting and wearing test. ➢ Product Costing in Excel Format. ➢ Product Presentation.

	➢ Range Building. ✓ **Elements of Footwear Manufacturing Port Folio** ➢ Sample Analysis; ➢ Sketching and Rendering of Prototype; ➢ Schematic representation of Production Planning of Prototype; ➢ Prepartion of Production Guide; ➢ Material Board Preparation; ➢ Analysis of Material Testing reports; ➢ Preparation of Componentwise Stage Sample Board; ➢ Assembling of Upper components; ➢ Preparation of Bottom components; ➢ Constructionwise Assembly operations. ➢ Finishing and Packaging operations.
UNIT II	• **COURSE VIVA** At the end of the 3rd year (after completing all the courses of 3 years) a student will appear for a viva examination. Members of the examination committee will evaluate the students by asking questions relevant to the courses of the 3 years. The teacher panel interviews the students on subjects studied 3 years long and measure their competency and understanding.

Evaluation Scheme

PRACTICAL
(100 MARKS)

Practical Internal Assessment (60 Marks)			**Practical External Assessment (40 Marks)**	
Port Folio Preparation	**Course Viva**	**Class Attendance**	**Exam Day Assignment**	**Exam Day Viva**
30	20	10	20	20

Pass Criterion: Students have to obtain at least **40% marks (Pass marks)** in both Internal Assessment and External Assessment separately.

References/Suggested Learning Resources

1. Manual of Shoe Making by C.J Clarke- *C & J Clark Ltd. 1976*.
2. Comprehensive Footwear Technology (1st Edition) by Somenath Ganguly- *ILTA Publications*.
3. Modern Concept of Leather and Footwear Manufacturing by R.D Singh-*Invincible Publishers*.
4. ABC of Footwear Technology by Varun Gupta and A.V Suresh-*Notion Press*.
5. Shoe Material and Design Guide by Wade Motawi- *Sneaker Factory*.

Suggested E-Learning Resources

1. https://youtu.be/DLI6kTBzn48
2. https://youtu.be/CU2sdcc43y8
3. https://youtu.be/1XEVx3nyS0
4. https://youtu.be/btUOadCpwic

Course Outcomes

At the successful completion of this course, students will be able to do about the following

CO I	To articulate expertise skills in designing and manufacturing footwear prototypes.

CO II	To explore expertise competency in preparation of Production Guide.
CO III	Pose academic skills including preparing and conduction project in the field of Footwear Manufacturing.
CO IV	To interpret the results of analysis and prediction on its suitability as footwear manufacturing component.
CO V	To recapitulate the relevant subjects taught in diploma course of footwear technology.

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PROJECT (MAJOR) ON
ADVANCE FOOTWEAR MANUFACTURE II
(FWTProj. 608)

Course Code	:	**FWT Proj. 608**
Course Title	:	**PROJECT (MAJOR) ON ADVANCE FOOTWEAR MANUFACTURE II**
Course Category	:	**Major Project**
Number of Credits	:	**2**
Contact	:	**4 Practical/week, 1hr/Practical, Total 45 Practical**
Offered to	:	**6th Semester, FWT students**
Pre Requisite	:	**Elementary knowledge on footwear upper and bottom fabrication technology**

Course Objectives

FWT Proj. 501 PROJECT (MAJOR) ON ADVANCE FOOTWEAR MANUFACTURE The Project aims at providing exposure to students in skill development and

- To work in groups, planning and co-ordination of the work.
- To develop leadership qualities.
- To be able to develop knowledge, skill and attitude to apply subject knowledge in manufacturing of Advance footwear's.
- To develop innovative ideas in the field of footwear engineering and manufacturing.
- To develop skills in writing Project Report.
- To demonstrate skill and knowledge of current information and technological tools and techniques specific to the professional field of study.

Course Content

Practical Exercises on Manufacturing of the Self Designed Advance Footwears.

- Open Type Fancy Footwear for Gents.
- Open Type Fancy Footwear for Ladies.
- Strobel Shoe for Gents.

UNIT I	**FABRICATION TECHNIQUES FOR OPEN TYPE FANCY FOOTWEAR FOR GENTS** ***Duration: 20 Periods (P: 20.0)*** ➢ Sorting, identification & procurement of materials for Gents Fancy footwear with variations. ➢ Testing/Suitability of materials for Gents Fancy footwear with variations. ➢ Relevant machinery and equipment selection. ➢ Component pattern nesting or pattern layouting. ➢ Cutting/Clicking of components (Hand/Machine) and Upper closing. ➢ Area consumption and wastage calculation. ➢ Bottom exercises on fabricated upper.

	➢ Finishing and Packaging exercises on finished product. ➢ Costing of the product.
UNIT II	**FABRICATION TECHNIQUES FOR OPEN TYPE FANCY FOOTWEAR FOR LADIES** ***Duration: 20 Periods (P: 20.0)*** ➢ Sorting, Identification & procurement of materials for Ladies Fancy footwear with variations. ➢ Testing/Suitability of materials for Ladies Fancy footwear with variations. ➢ Relevant machinery and equipment selection. ➢ Component pattern nesting or pattern lay outing. ➢ Cutting/Clicking of components (Hand/Machine) and Upper closing. ➢ Area consumption and wastage calculation. ➢ Bottom exercises on fabricated upper. ➢ Finishing and Packaging exercises on finished product. ➢ Costing of the product.
UNIT III	**FABRICATION OF ANKLE BOOT WITH COLLAR FOR GENTS** ***Duration: 10 Periods (P: 10. 0)*** ➢ Sorting, Identification & procurement of materials for Gents Strobel Shoe. ➢ Testing/Suitability of materials for Gents Strobel Shoe with variations. ➢ Relevant machinery and equipment selection. ➢ Component pattern nesting or pattern lay outing. ➢ Cutting/Clicking of components (Hand/Machine) and Upper closing. ➢ Area consumption and wastage calculation. ➢ Bottom exercises on fabricated upper. ➢ Finishing and Packaging exercises on finished product. ➢ Costing of the product.
UNIT IV	**FABRICATION OF STROBEL SHOE** ***Duration: 10 Periods (P: 10.0)*** ➢ Sorting, Identification & procurement of materials for Strobel Shoe. ➢ Testing/Suitability of materials for Strobel Shoe with variations. ➢ Relevant machinery and equipment selection.

	➢ Component pattern nesting or pattern lay outing. ➢ Cutting/Clicking of components (Hand/Machine) and Upper closing. ➢ Area consumption and wastage calculation. ➢ Bottom exercises on fabricated upper. ➢ Finishing and Packaging exercises on finished product. ➢ Costing of the product.

Suggested Student Assignment

Documentation in the form of ***Technical Report on Project Work*** should be submitted by the candidates for evaluation purposes.

Evaluation Scheme

PRACTICAL
(100 MARKS)

Internal Assessment (60 Marks)			**External Assessment (40 Marks)**	
Project Work/ Assignment	**Submission of Technical Report on Project Work**	**Exam Day Viva**	**Project Presentation on Work done**	**Exam Day Viva**
30	20	10	30	10

Pass Criterion Students have to obtain at least **40% marks (Pass marks)** in both Internal Assessment and External Assessment separately.

References/Suggested Learning Resources

1. Comprehensive Footwear Technology by Somenath Ganguly (1st Edition) - *ILTA Publications.*
2. Introduction to Modern Footwear Technology by B. Venkatappaiah-*CLRI Publications.*
3. Manual of Shoe Making by C.J Clarks-*Clarks limited*.
4. Modern Concept of Leather and Footwear Manufacturing by R.D Singh-*Invincible Publications*.
5. Mastering Shoe Making by Debabrata Chakrabarty-*Business Press India, Delhi, India*.
6. Text Book of Footwear Manufacturing by J.H Thornton-*Temple Press Books Ltd.*

Suggested E-Learning Resources

1. www.simpleshoemaking.com
2. http://shoemakingcourseonline.com
3. http://icanmakeshoes.com>shoemaking
4. www.schoolofshoemaking.com

Course Outcomes

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

CO I	Implement Project Planning in their industrial In-Plant Training Project Work.
CO II	Expertise skill in manufacturing of various advance footwear's.
CO III	Capable of self-education and clearly understand the value of achieving the perfection in the respective project work.
CO IV	Application of fundamental and disciplinary concepts and methods in ways appropriate to their areas of study.
CO V	Determine the economic benefit of the produced components using footwear estimating subjects.

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West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Geographic Information System & Global Positioning System [GISGPS]

Part-III (6th Semester)

2023

CURRICULAR STRUCTURE OF DIPLOMA IN GIS AND GPS

WEST BENGAL STATE COUNCIL OF TECHNICAL & VOCATIONAL EDUCATION AND SKILL DEVELOPMENT

BRANCH: GIS & GPS | **SEMESTER: VI**

SL NO	CATEGORY	CODE	COURSE TITLE	CREDIT	CLASS/WK			EVALUATION SCHEME						
								INTERNAL			ESE	PIA	PEA	TOTAL
					L	T	P	INT	AS/QZ	ATD				
1	Program core course	GISPC306	Application of GIS and Planning	2	2			20	10	10	60			100
2	Program Elective course	GISPE303	PROGRAMME ELECTIVE IV	3	3			20	10	10	60			100
3	Humanities and Social Science course	HS301	Entrepreneurship and Start-ups	3	2	1		20	10	10	60			100
4	Open Elective	GISOE301	OPEN ELECTIVE I	3	3			20	10	10	60			100
5	Open Elective	GISOE302	OPEN ELECTIVE II	3	3			20	10	10	60			100
6	Seminar	SE301	Seminar	1	1							60	40	100
7	Program core course	GISPC307	GIS LAB-III	2			4					60	40	100
8	Major Project	PR 302	PROJECT	3			6					60	40	100
TOTAL				20	14	1	10							800

GISPE303: Any one of the two subjects 1. Application of GIS In Environmental Science & Management. 2.Application of GIS In Disaster Management, Resources Management.
GISOE301: 1. Engineering Economics and Project management.
GISOE302: Any one of the two subjects 1. Industrial Safety 2. Internet of Things 3. Environmental Science & Engineering.

STUDENT CONTACT HOURS PER WEEK: 25 Hrs. Theories and Practical Period of 60 Minutes each.
L – Lecture, T –Tutorial, P – Practical, INT- Internal Assessment AS/QZ – Assignment / Quiz ATD- Attendance ESE - End Semester Exam, PIA-Practical Internal Assessment PEA-Practical External Assessment.

Name of the Course : Diploma in GIS & GPS		
Course Title: Application of GIS and Planning	**Course code : GISPC306**	
Number of Credit : 2	**Semester : SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration : 15 weeks	**Maximum Marks : 100**	
Theory : - 2 hrs/week	Continuous Internal Assessment	20 Marks
Tutorial: - NIL	Attendance	10 Marks
Practical : NIL	Assignment/Presentation/Quiz	10 Marks
Total Contact Hours: 30 Hours	**End Semester Examination**	60 Marks

Prerequisite: Basic knowledge of GIS and its application areas.

Aim: To study, understand and apply the concepts of GIS planning.

Course Objective :

Understand the Application areas of GIS like social science, and policy-related problems and to evaluate alternative options for addressing these.

Understand and develop the concepts of GIS planning.

Course Content :

Content (Theory)		Module	Hrs./Unit
Unit:1	Application of GIS in water resource development. 1.1 Concept of water resources: hydrological cycle, Darcy's law, Porosity, permeability, transmissibility, specific yield, specific retention and hydraulic conductivity Issues in water resources development, management and utilization. 1.2 Spectral characteristics of water and relevance of RS techniques for hydrological investigations.	Module 1	7
Unit: 2	Application of GIS in watershed management 2.1 Introduction, philosophy and concept. 2.2 Planning and management 2.3 Watershed characterisation and mapping 2.4 Runoff estimates from watersheds & GIS database for watershed management 2.5 Groundwater flow, surface and groundwater interaction, control and occurrence of groundwater movement		8
Unit: 3	Application of GIS in Forestry 3.1 Introduction and concept of forestry 3.2 Role of RS and GIS in forestry 3.3 Interaction of EMR with vegetation and spectral characteristics of vegetation 3.4 Temporal characteristics of vegetation 3.5 Vegetation indices 3.6 Forest cover mapping through RS and GIS	Module 2	8
Unit: 4	Application of GIS in Soil Study 4.1 Distribution of soil types in India 4.2 Introduction of remote sensing and GIS in soil survey. 4.3 Soil morphology and classification 4.4 Salt affected soil and mapping of salt affected soil using remote sensing and GIS	Module 3	7
Total			**30**

Examination Scheme of ESE (End Semester Examination)

Theoretical	Question Type	Question to be set	Questions to be answered

	Gr:A MCQ, Fill in the blanks, True or False (Carrying 1 mark each)	**25**	**20**
	Gr.:B Subjective type questions (carrying 8 marks each)	**10** **(At least 3 questions from each of 3 modules)**	**5**
TOTAL			**60**

References:

Course outcomes:

. After completion of this course student will be able to identify different application areas and plan accordingly for implementing the concept of GIS in that areas.

Name of the Course : Diploma in GIS & GPS		
Course Title: Programme Elective IV **1. Application of GIS In Environmental Science & Management**	**Course code : GISPE303**	
Number of Credit : 3	**Semester : SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration : 15 weeks	**Maximum Marks : 100**	
Theory : - 3 hrs/week	Continuous Internal Assessment	20 Marks
Tutorial: - NIL	Attendance	10 Marks
Practical : NIL	Assignment/Presentation/Quiz	10 Marks
Total Contact Hours: 30 Hours	**End Semester Examination**	60 Marks

Prerequisite: To study analyses and acquire in depth knowledge of different practical problems in the field of Environmental Engineering.

Aim : To learn how to apply concept of GIS in different areas/ practical problems.

Course Objective:

Knowledge of Remote Sensing, GIS, and Digital Image Processing is required.

Course Content :

	Content (Theory)	Module	Hrs./Unit
Unit:1	1.1 Water and the environment, water quality-water pollution-sources of water pollution-water runoff. 1.2 Remote Sensing of fluorescence. 1.3 Remote Sensing and Water quality management. 1.4 Snow surface cover-flood prediction	Module 1	15
Unit: 2	2.1 Soils and land forms-soil erosion 2.2 salinity-flood damage assessment of soil degradation using Remote Sensing and GIS. 2.3 Ecology and ecosystem, Conservation and resource management. 2.4 Spectral reflectance from vegetated surface -Stress monitoring-forest conservation-wild life studies-GIS for monitoring non-point source and point source pollution.	Module 2	10
Unit: 3	3.1 Air pollution- sources of air pollution-Environmental degradation. 3.2 Urban environment, General consideration rural structure-urban areas 3.3 Impact of industrial pollution-chemical effluents. 3.4 Remote Sensing technique for Air quality monitoring. 3.5 case studies weather forecasting and climatology-emissivity characteristics.	Module 3	20
Total			**30**

Examination Scheme of ESE (End Semester Examination)

	Question Type	Question to be set	Questions to be answered	Marks
Theoretical	**Gr:A** MCQ, Fill in the	**25**	**20**	**10**

	blanks, True or False (Carrying 1 mark each)			
	Gr.:B Subjective type questions (carrying 8 marks each)	**10 (At least 3 questions from each of 3 modules)**	**5**	**40**
TOTAL				**60**

Reference Book

Course Outcomes:

Upon completion of this course, students should be able to:

1. Apply the knowledge of GIS in the field of environmental science & management.

Name of the Course : Diploma in GIS & GPS		
Course Title: Programme Elective IV **2. Application of GIS In Disaster Management, Resources Management.**	**Course code : GISPE303**	
Number of Credit : 3	**Semester : SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration : 15 weeks	**Maximum Marks : 100**	
Theory : - 3 hrs/week	Continuous Internal Assessment	20 Marks
Tutorial: - NIL	Attendance	10 Marks
Practical : NIL	Assignment/Presentation/Quiz	10 Marks
Total Contact Hours: 30 Hours	**End Semester Examination**	60 Marks

Prerequisite: To study analyse and acquire in depth knowledge of different disaster related to natural calamity.

Aim : To learn how to apply concept of GIS in different areas/ practical problems in disaster management.

Course Objective:

Knowledge of Remote Sensing, GIS, and Digital Image Processing is required.

Course Content :

Content (Theory)		Module	Hrs./Unit
Unit:1	1.1 Introduction to Fundamental concepts of hazards and disasters.-Types of hazards and disasters, characterization, zonation of hazards, natural and manmade disasters. 1.2 Disaster and National losses, history of disasters in India. 1.3 Fundamental concept of Disaster Management, Government, NGOs and peoples participation in disaster management. Existing organization structure for managing disasters in State Government and Central Government. 1.4 Geoinformatics in disaster mitigation.	Module 1	15
Unit: 2	2.1 Application of Geo-informatics in Hazards and Disasters Management. 2.2 Geological Hazards: Landslide, Earthquake, Mining hazards (subsidence, flooding etc.), Volcanic hazards, Groundwater hazards, Glacial hazards. 2.3 Hydro meteorological Hazards: Flash floods, River floods, Dam burst, Cloud burst, Cyclones, Coastal hazards and Drought. 2.4 Environmental hazards: Forest hazards-Deforestation, Degradation and Forest fire.	Module 2	10
Unit: 3	3.1 Land, soil degradation, desertification and Pollution (Water, air and soil) 3.2 Geoinformatics Applications: Geoinformatics models in managing forest fires, floods, landslides, cyclone and earthquake, multiple hazard mapping. 3.3 Case Studies: Earthquakes in India, Floods in Indo Gangetic plains, Landslides in Himalayan region, Drought in Indian plateau regions	Module 3	20

Total				**30**
Examination Scheme of ESE (End Semester Examination)				
Theoretical	**Question Type**	**Question to be set**	**Questions to be answered**	**Marks**
	Gr:A MCQ, Fill in the blanks, True or False (Carrying 1 mark each)	**25**	**20**	**10**
	Gr.:B Subjective type questions (carrying 8 marks each)	**10 (At least 3 questions from each of 3 modules)**	**5**	**40**
TOTAL				**60**

1.

Course Outcomes:

Upon completion of this course, students should be able to:

Apply the knowledge of GIS in disaster management.

Name of the Course : Diploma in GIS & GPS		
Course Title: Entrepreneurship and Start-ups	**Course code : HS 302**	
Number of Credit : 3	**Semester : SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration : 15 weeks	**Maximum Marks : 100**	
Theory : - 2 hrs/week	Continuous Internal Assessment	20 Marks
Tutorial: - 1	Attendance	10 Marks
Practical : NIL	Assignment/Presentation/Quiz	10 Marks
Total Contact Hours: 45 Hours	**End Semester Examination**	60 Marks

Prerequisite: None

Course Objective:

1. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
2. To motivate and inspire students toward an entrepreneurial career.
3. To understand venture creation process and to develop generic entrepreneurial competences.
4. To introduce students to the basic steps required for planning, starting and running a business.
5. To familiarise students with the different exit strategies available to entrepreneurs.

Course Content :

Unit	Name of the Topic	Hours

Unit:1	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS**
	• Concept, Competencies, Functions and Risks of entrepreneurship
	• Entrepreneurial Values& Attitudes and Skills
	• Mindset of an employee/manager and an entrepreneur
	• Types of Ownership for Small Businesses
	  ○ Sole proprietorship
	  ○ Partnerships
	  ○ Joint Stock company- public limited and private limited companies
	• Difference between entrepreneur and Intrapreneur
		10

Unit: 2	**PREPARATION FOR ENTREPRENEURIAL VENTURES** • Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. • Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard Feasibility Study Report • Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan • Project Report- Concept, its features and components • Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. They **may not** be asked to prepare	20

	a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.	
Unit: 3	**ESTABLISHING SMALL ENTERPRISES** • Legal Requirements and Compliances needed for establishing a New Unit- o NOC from Local body o Registration of business in DIC o Statutory license or clearance o Tax compliances	3
Unit: 4	**START-UP VENTURES** • Concept & Features • Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical • Problems and challenges faced by start-ups. • Start-up Ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. No questions are to be set from the case studies.	4
Unit: 5	**FINANCING START-UP VENTURES IN INDIA** • Communication of Ideas to potential investors – Investor Pitch • Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups • Govt Initiatives including incubation centre to boost start-up ventures • MSME Registration for Start-ups –its benefits	6
Unit: 6	**EXIT STRATEGIES FOR ENTREPRENEURS** • Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – **Basic Concept only**	2
Total		**45**

Examination Scheme of ESE (End Semester Examination)

	Question Type	Question to be set	Questions to be answered	Marks
Theoretical	**Gr:A** MCQ, Fill in the blanks, True or False (Carrying 1 mark each)	**25**	**20**	**20**
	Gr.:B Subjective type questions (carrying 8 marks each)	**10**	**5**	**40**
TOTAL				**60**

References:

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of IndiaLearning Private Ltd
2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Caseson Entrepreneurship	Anjan Raichaudhuri	Prentice Hall of India Learning Private Ltd

6.	How to Start a Business in India	Simon Daniel	Buuks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development and Business Ethics	Abhik Kumar Mukherjee & Shaunak Roy	Oxford University Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

Course Outcomes
CO1: Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
CO2: Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
CO3: Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
CO4: Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

Name of the Course : Diploma in GIS & GPS		
Course Title: OPEN ELECTIVE I Engineering Economics & Project Management	**Course code : GISOE 301**	
Number of Credit : 3	**Semester : SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration : 15 weeks	**Maximum Marks : 100**	
Theory : - 3 hrs/week	Continuous Internal Assessment	20 Marks
Tutorial: - NIL	Attendance	10 Marks
Practical : NIL	Assignment/Presentation/Quiz	10 Marks
Total Contact Hours: 45 Hours	**End Semester Examination**	60 Marks
Course Objective:		
Details syllabus as per common syllabus of all discipline		

Name of the Course : Diploma in GIS & GPS		
Course Title: OPEN ELECTIVE II **1. Industrial Safety**	**Course code : GISOE 302**	
Number of Credit : 3	**Semester : SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration : 16 weeks	**Maximum Marks : 100**	
Theory : - 3 hrs/week	Continuous Internal Assessment	20 Marks
Tutorial: - NIL	Attendance	10 Marks
Practical : NIL	Assignment/Presentation/Quiz	10 Marks
Total Contact Hours: 42 Hours	**End Semester Examination**	60 Marks
Details syllabus as per common syllabus of all discipline		

Name of the Course : Diploma in GIS & GPS		
Course Title: OPEN ELECTIVE II **2. Internet of Things**	**Course code : GISOE 302**	
Number of Credit : 3	**Semester : SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration : 15 weeks	**Maximum Marks : 100**	
Theory : - 3 hrs/week	Continuous Internal Assessment	20 Marks
Tutorial: - NIL	Attendance	10 Marks
Practical : NIL	Assignment/Presentation/Quiz	10 Marks
Total Contact Hours: 45 Hours	**End Semester Examination**	60 Marks
Details syllabus as per common syllabus of all discipline.		

Name of the Course : Diploma in GIS & GPS		
Course Title: OPEN ELECTIVE II **3. Environmental science & engineering**	**Course code : GISOE 302**	
Number of Credit : 3	**Semester : SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration : 15 weeks	**Maximum Marks : 100**	
Theory : - 3 hrs/week	Continuous Internal Assessment	20 Marks
Tutorial: - NIL	Attendance	10 Marks
Practical : NIL	Assignment/Presentation/Quiz	10 Marks
Total Contact Hours: 45 Hours	**End Semester Examination**	60 Marks
Details syllabus as per common syllabus of all discipline.		

Name of the Course : Diploma in GIS & GPS

Course Title: GIS LAB-III	**Course code : GISPC307**	
Number of Credit : 2	**Semester : SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration : 15 weeks	**Maximum Marks : 100**	
Theory : - NIL	Continuous Internal Assessment	50 Marks
Tutorial: - NIL	Attendance	10 Marks
Practical : 4 hrs/week		
Total Contact Hours: 60 Hours	**End Semester Examination**	40 Marks

Prerequisite: Concept of GIS LAB-II

Aim : Developing the knowledge of Application of GIS in different areas like Urban Planning,Disaster Management,Agriculture etc.

Course Objective:

Students will be able to:

Implement the concept of GIS.in real world problem.

Prepare report on the basis of Analysis.

Instructions:

Group size for practical work should be formed in such a way that each student from a group can handle software independently to understand the functions of different components of the subject/software.

Content :

Sl. No.	Assignments / Practical	Hrs./Unit
1	1.1 Soil mapping 1.2 Crop estimation 1.3 Identification of forest species from aerial photographs 1.4 Vegetation mapping from satellite images 1.5 Digital image enhancements for vegetation/forest 1.6 NDVI analysis 1.7 Digital classification for forest cover mapping 1.8 Forest change detection studies	60
2	1.1 Route location 1.2Dam site location studies 1.3Digital Terrain Modelling 1.4Drainage mapping. 1.5Morphometric analysis 1.6Estimation of potential evapotranspiration and water balance through empirical equation 1.7 Hydro-morphologeo-logic interpretation 1.8Preparation of groundwater potential zone maps	

Note: All the application of GIS should be done by using QGIS/ Arc GIS / tNT Mips / ERDAS IMAGINE

Total	**60**

Examination Scheme (End Semester Assessment)

	Assessment type	Marks
Practical/Sessional	**Assignment on the day of viva-voce and practical report submission**	**20**
	Viva-voce	**20**

Total	40
Course Outcomes:	
Upon completion of this course, students should be able to 1. Acquire skills for implementing concept of GIS in different application areas.	

Name of the Course : Diploma in GIS & GPS

Course Title: SEMINAR	**Course code : SE301**	
Number of Credit : 1	**Semester : SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration : 15 weeks	**Maximum Marks : 100**	
Theory : - NIL	Continuous Internal Assessment	50 Marks
Tutorial: - NIL	Attendance	10 Marks
Practical : 1 hrs/week		
Total Contact Hours: 15 Hours	**End Semester Examination**	40 Marks

Prerequisite:

Good presentation skills.

Aim : 1. Development of presentation skills.
2.Enhancement in soft skills through innovation.
3. Development of professional approach

Course Objective:

Students will be able to

1. Acquire information from different sources.
2. Prepare presentation for given topic or project.
3. Present given topic in a seminar using different audio visual method.
4. Interact with audience to share thoughts.
5. Defend their projects by answering queries from audience.

Instructions:

1. Seminar should be presented by Group/individual. This will be decided by respective lecturer.

Content :

Seminar is intended to provide opportunity to the student to present their project related work in front of a technical gathering with the help of different oral, aural and visual communication aids. To prepare the presentation of seminar, students have to go through the proper research methodology. Students are expected to defend the project or topic while answering questions arising out of their presentation.

Examination Scheme (End Semester Assessment)

	Assessment type	**Marks**
Practical/Sessional	Assignment on the day of viva-voce and practical report submission	**20**
	Viva-voce	**20**
Total		**40**

Course Outcomes:

Upon completion of this course, students should be able to:

1. Present given topic in a seminar using different audio visual method .

Name of the Course : Diploma in GIS & GPS		
Course Title: PROJECT	**Course code : PR 302**	
Number of Credit : 3	**Semester : SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration : 15 weeks	**Maximum Marks : 100**	
Theory : - NIL	Continuous Internal Assessment	50 Marks
Tutorial: - NIL	Attendance	10 Marks
Practical : 6 hrs/week		
Total Contact Hours: 90 Hours	**End Semester Examination**	40 Marks

Prerequisite: Knowledge of GIS and Digital Image Processing.

Aim : Developing skill for undertaking a project related to advanced GIS concepts.

Course Objective:

Identify and use different advanced GIS techniques.

Overall idea of carrying out a project on GIS.

Prepare report including drawing/chart/tables etc. using GIS software.

Instructions:

Project may be done individually or in Group. Subject teacher may take decision in this regard considering the vastness of the project.

Content :

Sl. No.	Assignments / Practical	Hrs./Unit
1	A project on GIS may be performed covering all the knowledge / technics taught in previous Semesters. Domain area: Project taken in 5th semester may be continued or any Special domain selected by subject teacher.	60
Total		**60**

Examination Scheme (End Semester Assessment)

	Assessment type	Marks
Practical/Sessional	**Assignment on the day of viva-voce and practical report submission**	**20**
	Viva-voce	**20**
Total		**40**

Course Outcomes:

Upon completion of this course, students should be able to:

1. Identify application areas and may undertake any advanced project on GIS.

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Instrumentation & Control Engineering [ICE]

Part-III (6th Semester)

2023

Curriculum Structure & Syllabus
Instrumentation & Control Engineering

Semester VI

Sl No.	Category	Code No.	Course Title	Hours Per week			Total Contact hrs/week	Credits	Marks
				L	T	P			
1	Programe Core Course	ICEPC302	Microcontroller	2	1		3	2	100
2	Programe Core Course	ICEPC304	Microcontroller Lab			2	2	1	100
3	Program Core Course	ICEPC306	PCB Design and Control Simulation Lab			2	2	1	100
4	Program Elective course	ICEPE302	Renewable energy Or Power Plant Instrumentation & Control	2	1		3	2	100
5	Humanities and Social Science	HS302	Entrepreneurship and Start-ups	3			3	3	100
6	Open Elective course	ICEOE302	Engineering Economics & Project Management	2	1		3	3	100
7	Open Elective course	ICEOE304	Industrial Safety Or Disaster Management Or Sustainable Development Or Industrial Management	2	1		3	3	100
8	Major Project	PR302				4	4	2	100
9	Seminar	SE302				2	2	1	100
	TOTAL						**25**	**18**	**900**

Syllabus for Microcontroller		
Semester	:	**VI**
Course Code	:	**ICEPC302**
Course Title	:	**Microcontroller**
Number of Credits	:	**2 (L:2, T:1, P:0)**
Prerequisite	:	**Idea on digital eletronics and microprocessor**
Course Category	:	**PC**

Course Objective

Following are the objectives of this course

- To develop background knowledge and core expertise of microcontroller.
- To know the importance of different peripheral devices and their interfacing to microcontrollers.
- To know the design aspects of microcontrollers.
- To write assembly language programs of microcontrollers for various applications

Course Content			**Hrs/Unit**
Module 1	**Unit 1**	**Microcontroller 8051 Architecture** 1.1 Difference between microcontroller & Microprocessor. 1.2 Block diagram of the Architectural of 8051. 1.3 PIN Diagram, features of 8051. 1.4 8051 Programming Model. 1.5 Port Structure & Operation of 8051	
	Unit II	**8051 Addressing Modes & Instruction Set** 2.1 Different addressing modes of 8051. 22.2 Different types of Instruction sets of 8051. 2.2.1 Data Transfer 2.2.2 Arithmetic Operations 2.2.3 Logical Operations 2.2.4 Boolean Variable Manipulation 2.2.5 Program Branching	
Module 2	**Unit III**	**8051 Assembly Language Programming Tools** 3.1 Programs using Jump, Loop and Call Instructions, Time Delay Generation and Calculation. 3.2 I/O Port Programming, Bit manipulation 3.3 Arithmetic Programs a. Unsigned Addition and Subtraction b. Unsigned Multiplication and Division c. Signed number concept and Arithmetic operations d. Logic Programs 3.4 Programs using Logic and Compare Instructions a. Programs using Rotate and Swap Instructions b. BCD and ASCII Application Programs	
	Unit IV	**Timers and Serial communication in 8051** 4.1 Timer in 8051. 4.2 Special function register-TMOD , TCON 4.3 Different modes of operation of timer 4.4 Simple delay program using timer 4.5 Basics of serial communication 4.6 Serial data transmission and reception in 8051 4.7 Different serial data transmission modes 4.8 Special function register- SCON,PCON 4.9 Simple program based on serial communication in 8051	

Module 3	**Unit V**	**Interrupt processing in 8051** 5.1 Type of interrupts in 8051 5.2 Steps involved in interrupt processing of 8051 5.3 Special function register- IE,IP 5.4 Priority of interrupts in 8051 5.5 Simple program using interrupts	
	Unit VI	**Application** 6.1 Stepper motor control 6.2 Speed/position control of ac/dc motor 6.3 Control of physical parameter like temp, pressure, flow etc	

Suggested Learning resources

Title	**Author**	**Publisher**
Microcontroller: Principle & Application	Pal	PHI
The 8051 Microcontroller & Embeded Systems	Mazidi, Mazidi	PHI
The 8051 Microcontroller Architecture, Programming and Application	K J Ayla	Penram International
Microprocessor and Microcontroller	Kumar, Saravanan, Jeevananthan	Oxford University Press
Embedded Systems Engineering	C.R Sharma	University Press
Advanced Microprocessor & Microcontroller	Prof. S K Venkata Ram	University Science Press (Laxmi Publications Pvt. Ltd)

Course Outcome

At the end of the course student will be able to:	➢ Do assembly language programming. ➢ Do interfacing design of peripherals like, I/O, A/D, D/A, timer etc. ➢ Develop systems using different microcontrollers

Syllabus for Microcontroller Lab

Semester	:	**VI**
Course Code	:	**ICEPC304**
Course Title	:	**Microcontroller Lab**
Number of Credits	:	**1 (L:0, T:0, P:2)**
Prerequisite	:	
Course Category	:	**PC**

Course Objective	
Following are the objectives of this course	
	❖ Develop assembly/C language programs using instruction set of 8051(or other microcontroller) ❖ Design and develop microcontroller interfacing with different peripheral device.
List of Practical work to be performed.	
Construct the circuit and do the experiments with following aims:	
Sl. No.	Aim:
1	Programming Languaage- Assembly/CPrograamming KIT—ATMEL / PIC
2	Demonstration and study of microcontroller trainer kit
3	Demonstration and use of software simulator / assembler
4	Programming examples (any two) – Data transfer instructions
5	Programming examples (any two) – Logical Operations
6	Programming examples (any two) – Jump and Call instructions
7	Demonstration and testing of the following applications (Any four)Keyboard Interface LCD display Interface D/A or A/D converter Interface Relay Interface Stepper motor control DC motorcontrol
Course Outcome	
At the end of the course student will be able to:	➢ Develop different assembly/C language program of 8051(or other microcontroller). ➢ Understand and design interfacing of different peripheral device.

Syllabus for PCB Design and Simulation Lab

Semester	:	**VI**
Course Code	:	**ICEPC306**
Course Title	:	**PCB Design and Control Simulation Lab**
Number of Credits	:	**1 (L:0, T:0, P:2)**
Prerequisite	:	
Course Category	:	**PC**

Course Objective	
Following are the objectives of this course	
	❖ Understand the need for PCB Design and steps involved in PCB Design. ❖ Familiarize Schematic and layout design flow using Electronic Design Automation (EDA) Tools. ❖ To know about fundamentals of MATLAB tool . ❖ To gain knowledge about MATLAB Simulink .

List of Practical work to be performed.	
Construct the circuit and do the experiments with following aims:	
Sl. No.	Aim:
1	Idea on PCB,PCB types (single, double , PTH , multilayer , flexible) ,PCB classes (analog ,digital , mixed technology ,RF)
2	**Familiarization with PCB Design Software (TINA pro /Altium/ KiCAD etc)** Rules and Guidelines for designing PCB Library Creation (Schematic Symbols & PCB Footprints), Schematic entry and PCB Interface (Netlist creation and Cross Probing) Component Placement Routing Planes and Copper Pouring Post Layout Editing
3	**Draft , Simulate & Design PCBs for the following circuits(minimum 2)** . i) Bridge Rectifier with and without filter load using discrete diodes . ii) Using op-amp a) Inverting and Non-Inverting Amplifier b) Summing amplifier and Difference Amplifier c) Comparator d) Differentiator & Integrator iii) Digital circuit design using IC's a)Decoder b)UP/DN counter c)Frequency divider d)Shift register
4	**Introduction to MATLAB Software** Getting MATLAB to RUN, Programming, The Command Prompt, Workspace, Simple Mathematical Expressions
5	**Basic Mathematics Using MATLAB** Data types, Matrix, Differentiation,Integration
6	**Logic Operations Using MATLAB** Conditional Operators, For loop, While loop,While loop
7	**MATLAB Simulink:** Introduction to MATLAB Simulink, Simulink libraries ,Simulation of a control system using MATLAB/SIMULINK.

Course Outcome	
At the end of	➢ Appreciate the necessity and evolution of PCB, types and classes of PCB.

the course student will be able to:	➢ Understand the steps involved in schematic, layout, fabrication and assembly process of PCB design. ➢ Design (schematic and layout) PCB for analog circuits, digital circuits and mixed circuits. ➢ Able to implement loops, branching, control instruction and functions in MATLAB programming environment. ➢ Able to simulate MATLAB Simulink examples

Syllabus for Renewable Energy

Semester	:	**VI**
Course Code	:	**ICEPE302/1**
Course Title	:	**Renewable Energy**
Number of Credits	:	**2 (L:2, T:0, P:0)**
Prerequisite	:	**Nil**
Course Category	:	**PE**

Course Objective	
Following are the objectives of this course	
	To provide basic knowledge of different sources of renewable energy and Renewable energy plants

Course Content			**Hrs/Unit**
Module 1	**Unit 1**	**Introduction**	4
		1.1 Forms of energy: Primary and secondary energy, , Renewable and Non-renewable energy, Conventional and Non-conventional energy. 1.2 Advantage and limitation of Renewable energy 1.3 Sources of Renewable Energy: Solar Energy,Wind Energy, Biomass Energy, Waste to energy, Geothermal Energy, Tidal and Ocean energy (only brief idea on all these)	
	Unit II	**Solar energy**	6
		2.1 Units of solar power and solar energy 2.2 Essential subsystem in solar energy plant: Solar tracking system , concentrator,Solar furnace, energy transport medium, energy storage, energy conversion plant, protection system, 2.3 Solar Electric System: Solar water Heater, Solar lighting system, Solar cooker.	
Module 2	**Unit III**	**Bioenergy**	5
		3.1 Introduction on Biogas, Sources of Bioenergy 3.2 Different forms of Biomass, their composition & fuel properties 3.3 Production of Biogas: working principle of fixed- dome type and floating gas holder type biogas plant 3.4 Idea of gasifier, digester 3.5 Enviromental and social impacts of biogas plants.	
	Unit IV	**Wind Energy**	4
		4.1 Basic working principle of Wind energy production 4.2 Speed and power relation, Average power of the wind 4.3 System components of wind Energy (e.g. Tower, Turbine, Blades etc). 4.4 Control of rotor speed	
Module 3	**Unit V**	**Waste to Energy Conversion**	5
		Introduction, characterization of wastes; classification of wastes; energy production from wastes through incineration, gasification; management and treatment of hazardous and nonhazardous	

		industrial waste; Municipal sewage waste- Energy production from organic waste through anaerobic digestion;	
	Unit VI	**Measuring Instruments**	6
		6.1 Basic principle of Pyranometer for solar radiation measurement. 6.2 Idea on different instrument used in Solar plant, Wind power plant, Biogas plant , Waste energy management	

Suggested Learning resources		
Title	**Author**	**Publisher**
Non-Conventional Energy	ShobhNath Singh	Pearson
Renewable and Efficient Electric Power Systems	Gilbert M. Masters	Wiley
Alternative Energy Systems & Applications	B.K.Hodge	Wiley
Renewable Energy Technologies,	J.C.Sabonnadiere,	Wiley
Introduction to Renewable Energy	Vaughn Nelson	CRC Press
Renewable Energy: Power for a Sustainable Future	Godfrey Boyle	
Renewable Energy Technology	Jha, Sen, Tiwari, Kothari	New Age International
Renewable Energy Technology	Chetan Singh Solanki	PHI
Non-Conventional Energy Resources	S.H.Saeed, D.K.Sharma	S.K.Kataria& Sons
Energy Techonology: Nonconventional, Renewable & conventional	Rao, Parulekar	Khanna Publisher
Non-conventional Energy Sources	G.D. Rai	Khanna Publisher
Non-Conventional Energy Resources	B. H. Khan	McGraw Hill Publications.
Solar Energy – Principles of Thermal Collection and Storage	S. P. Sukhatme, J.K. Nayak	Tata McGraw-Hill, New Delhi
Solar Energy, Fundamentals and Applications	Garg, Prakash	Pearson
Solar energy	A.M. Rehman	Scitech Publications(India) Pvt. Ltd
Introduction to solar principles	Thomas E. Kissell	Pearson
Biogas Systems, Principle and	Mital KM.	New Age International Ltd.

Course Outcome	
At the end of the course student will be able to:	➢ Classify different energy sources ➢ Understand the concept of solar energy, bioenergy, wind energy, and hydropower. ➢ Identify different parts of solar energy plant. ➢ Know various sources of biomass, and construction of biogas production plant ➢ Understand concepts of wind energy,components and functions of it ➢ grow critical thinking and problem-solving skills to overcome obstacles to use renewable energy system. ➢ Identify different measuring instruments related to specific renewable energy plant.

Syllabus for Power Plant Instrumentation & Control

Semester	:	**VI**
Course Code	:	**ICEPE302/2**
Course Title	:	**Power Plant Instrumentation & Control**
Number of Credits	:	**2 (L:2, T:0, P:0)**
Prerequisite	:	**Idea on basic Instrumentation & Process Control**
Course Category	:	**PE**

Course Objective

Following are the objectives of this course to

- Get an idea on thermal and nuclear power plant
- Measure different parameter like temperature, level, flow, vibration etc.in power plant
- Know the different control system like air/ fuel ratio, drum level , superheated steam temperature, turbine vibration etc.
- Know different components and power generation process of nuclear power plant

Course Content			**Hrs/Unit**
Module 1	**Unit 1**	**Overview of Power Generation** Brief survey of methods of power generation- hydro, thermal, nuclear,solar and wind power Importance of Instrumentation in power generation Thermal power plant –building blocks, details of boiler	4
	Unit II	**Measurement** Measurement of temperature, pressure, flow vibration etc (in different locations of thermal power plant)	5
Module 2	**Unit III**	**Control Loops in Boiler** Combustion Control-Fuel/Air ratio Control, Furnace draft control, Drum level control-2element & 3 element Main steam & reheat steam temperature control,Superheater control Deaerator control, DCS in power plant, Interlocking in boilers	6
	Unit IV	**Turbine - Monitoring & Control** Speed, vibration, shell temperature monitoring & control,Steam pressure control Lubricant oil temperature controlCooling system	5
Module 3	**Unit V**	**Data handling-processing** logging, acquisition, accounting, display and storage Instrumentation for Generator and Busbar coupling Introduction topower plant modeling/simulation	4
	Unit VI	**Nuclear Power Plant** Nuclear fusion: Nuclear fusion reaction, requirement of nuclear fusion, characteristics of D-T reaction; Components of Nuclear Power Plant: Moderators, Reflectors, Shielding, Cladding,Coolant, Nuclear Reactor, Steam Generator, Turbines, Operation of Nuclear Power Plant, Advantages and Disadvantages of Nuclear Power Plants.	6

Suggested Learning resources

Title	**Author**	**Publisher**
Principles of Industrial Instrumentation,	D. Patranabis,	TMH
Instrument Engineers Handbook Vol & II	Liptak,	Butterworth

Power Plant Instrumentation	Krisnaswami, M P Bala	PHI
Power Plant Control & Instrumentation	David Lindsley	Institute of Electrical Engineers
The Control of Boilers	S G Dukelow	ISA
Modern Power Station Practice-Instrumentation,Controls		Pergamon Press, Oxford
Standard Boiler Operation	S. M. Elonka, A. L. Kohal	TMH
Boiler Control Systems Engineering	G.F. Gilman	ISA Publication.
Power Plant Engineering	P.K.Nag	. McGraw Hill.
Power Plant Instrumentation & Control	Philip Kiameh	
Introduction to Nuclear Engineering	Richards Stephenson	McGraw Hill.
Basic Nuclear Engineering	K.S.Ram	Wiely Eastern.
Nuclear power engineering	M N EI Vakil	McGraw Hill

Course Outcome	
At the end of the course student will be able to:	➢ Understand power generayion process of thermal and nuclear power plant ➢ Demonstrate measurement technique of different parameters like temperature, level, flow, vibration etc.in power plant ➢ Understand the different control system like air/ fuel ratio, drum level , superheated steam temperature, turbine vibration etc. .

Syllabus of Entrepreneurship and Start-ups

Course Title	**Entrepreneurship and Start-ups**
Course Code	**HS 302**
Number of Credits	3
Pre Requisites	None
Total Contact Hours	3(L: 2; T: 1)/week = 45 hrs
Course Category	HS

Course Learning Objectives

- To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
- To motivate and inspire students toward an entrepreneurial career.
- To understand venture creation process and to develop generic entrepreneurial competences.
- To introduce students to the basic steps required for planning, starting and running a business.
- To familiarise students with the different exit strategies available to entrepreneurs.

Course Outcomes:
After completing the course students will able to:

CO 1	Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
CO 2	Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
CO 3	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
CO 4	Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

Detailed Course Content

Unit	**Name of the Topic**	**Hours**
1.	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS** • Concept, Competencies, Functions and Risks of entrepreneurship • Entrepreneurial Values& Attitudes and Skills • Mindset of an employee/manager and an entrepreneur • Types of Ownership for Small Businesses o Sole proprietorship o Partnerships o Joint Stock company- public limited and private limited companies • Difference between entrepreneur and Intrapreneur	10
2.	**PREPARATION FOR ENTREPRENEURIAL VENTURES** • Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. • Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard	20

	Feasibility Study Report • Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan • Project Report- Concept, its features and components • Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. <u>They **may not** be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.</u>	
3.	**ESTABLISHING SMALL ENTERPRISES** • Legal Requirements and Compliances needed for establishing a New Unit- o NOC from Local body o Registration of business in DIC o Statutory license or clearance o Tax compliances	03
4.	**START-UP VENTURES** • Concept & Features • Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical • Problems and challenges faced by start-ups. • Start-up Ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. <u>No questions are to be set from the case studies.</u>	04
5.	**FINANCING START-UP VENTURES IN INDIA** • Communication of Ideas to potential investors – Investor Pitch • Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups • Govt Initiatives including incubation centre to boost start-up ventures • MSME Registration for Start-ups –its benefits	06
6.	**EXIT STRATEGIES FOR ENTREPRENEURS** • Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – **<u>Basic Concept only</u>**	02

Examination Scheme

- **End Semester Examination: 60 marks**

  Suggested Question Paper Scheme for End Semester Examination

Group A: 20marks

Question Type	Number of questions to be set	Number of questions to be answered
MCQ, Fill in the blanks, True or False (Carrying 1 mark each)	25	20

Group B: 40marks

Question Type	Number of questions to be set	Number of questions to be answered
Subjective Type questions (Carrying 8 marks each)	10	5

- **Internal Assessment: 40 marks**
  - Class test : 20 marks
  - Assignment: 10 marks
  - Class attendance: 10 marks

Suggested Learning Resources

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of IndiaLearning Private Ltd
2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Caseson Entrepreneurship	Anjan Raichaudhuri	Prentice Hall of India Learning Private Ltd
6.	How to Start a Business in India	Simon Daniel	Buuks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development and Business Ethics	Abhik Kumar Mukherjee & Shaunak Roy	Oxford University Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

Syllabus of Engineering Economics & Project Management

Course Code:	OE301
Course Title:	Engineering Economics & Project Management
No. of Credits:	3 (L:3, T:0,P: 0)
Prerequisites:	NIL
Course Category:	Open Elective (Compulsory for all branches)

Course Objectives:

- To acquire knowledge of basic economics tofacilitate theprocess ofeconomic decision making.
- To acquire knowledge on basic financial management aspects.
- To develop the idea of project plan, fromdefining and confirming theproject goals and objectives, identifying tasks andhow goalswill be achieved.
- To develop an understanding of key project management skills and strategies.

Group-A

Unit-I (INTRODUCTION, THEORY OF DEMAND & SUPPLY) [9 hours]

1.1 Introduction to Engineering Economics, the relationship between Engineering and Economics

1.2 Resources, scarcity of resources, and efficient utilization of resources.

1.3 Opportunity cost, rationality costs, and benefits

1.4 Theory of Demand: the law of demand, different types of demand, determinants of demand, demand function, price elasticity of demand.

1.5 Theory of Supply: determinants of supply, supply function.

1.6 Market mechanism: Equilibrium, basic comparative static analysis (Numerical problems)

Unit-II (THEORY OF PRODUCTION & COSTS) [10 hours]

2.1 Concept of production (goods & services), Different factors of production (fixed and variable factors), Short-run Production function (Graphical illustration), and Long run production function (returns to scale).

2.2 Theory of Cost: Short-run and long-run cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost etc.

2.3 Economic concept of profit, profit maximization (numerical problems)

UNIT-III (DIFFERENT TYPES OF MARKET AND ROLE OF GOVERNMENT) [4 hours]

3.1 Perfect Competition: Features of Perfectly Competitive Market.

3.2 Imperfect Competition: Monopoly, Monopolistic Competition, and Oligopoly.

3.3 Role of government in Socialist, Capitalist and Mixed Economy structure with example.

Group-B

Unit-I (CONCEPT OF PROJECT) [4 hours]

1.1 Definition and classification of projects)

1.2 Importance of Project Management.

1.3 Project life Cycle [Conceptualization→Planning→Execution→Termination]

Unit-II (FEASIBILITY ANALYSIS OF A PROJECT) [10 hours]

2.1 Economic and Market analysis.

2.2 Financial analysis: Basic techniques in capital budgeting– Payback period method, NetPresentValue method, InternalRate of Returnmethod.

2.3 Environmental Impact study–adverse impact of the project on the environment.

2.4 Project risk and uncertainty: Technical, economical, socio-political, and environmental risks.

2.5 Evaluation of the financial health of a project–Understanding the basic concept of Fixed & Working Capital, Debt & Equity, Shares, Debentures etc., and different financial ratios like Liquidity Ratios, Activity Ratios, Debt-equity ratio & Profitability Ratio (Basic concept only).

N.B: Knowledge of financial statements is not required; for the estimation of ratios the values of the relevant variables will be provided.

Unit-III (PROJECT ADMINISTRATION) [8 hours]

3.1 Gantt Chart– a system of bar charts for scheduling and reporting the progress of a project (basic concept).

3.2 Concept of Project Evaluation and Review Technique (PERT) and Critical Path method (CPM): basic concept and application with real-life examples.

ExaminationScheme:

A. SemesterExaminationpatternof60 marks:

1. Objective type Question (MCQ, Fill in the blanks, and Very Short question-1 mark each): At least five questions from each unit. [Total marks: 20]

2. Subjective questions: Eight questions to be answered taking at least three from each group. (Two questions should be given from each unit). [Total marks: 40]

B. Assignment (10Marks)

Guidelinefor Assignment (10 Marks)

Students should be instructed to prepare a report on a project (preferably the Major Project they prepare in 6th Semester), using a popular project management software in IT/ Computer Laboratory, under the guidance of the Lecturer in Computer Science & Technology and Lecturer in Humanities.

C. Class Test: Two examinations 20 marks each. Take best of two.

D. Attendance: 10 Marks

Suggested reference books:

1 *Principles of Economics – Case and Fair, Pearson Education Publication*
2 *Principles of Economics – Mankiw, Cengage Learning*
3 *Project planning, analysis, selection, implementation and review – Prasannachandra– Tata McGraw Hill.*
4 *Project Management – Gopala Krishnan – Mcmillan India Ltd*

Syllabus of Industrial Safety

Name of the Course: Diploma in Engineering	
Category: Open Elective	**Semester : Sixth**
Code no. : OE	**Theory : 100** Marks
Course Title : Industrial Safety **Duration :16 weeks** **Total lecture class/week : 3** **Credit : 3**	**Examination Scheme :** (i) **External Assessment : 60** marks (End Semester Examination) (ii) **Internal Assessment: 40** marks [Class test : 20 marks Assignment, viva voce : 10 marks Class attendance : 10 marks]
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

1. Course outcomes (COs):

By the end of this course, a student should be able to:

1. Understand the various basic concepts of Hazard, Risk, and Accidents in various industries and their management.
2. Understand the various effects of physical hazards on human health and the various control measures to rectify the same.
3. Understand and identify various hazards in industries and the impact of damages in these areas.
4. Understand the various fire prevention techniques to be followed in various industries.
5. Evaluate workplace to determine the existence of occupational safety and health hazards.
6. Explain important legislations related to Health, Safety and Environment
7. Understand and implement statutory requirements mentioned in factories act for the prevention of accidents.

Besides the above this course would equip the students to effectively employ hazard analysis techniques in Industry and helpful to prevent the accidents in Industry.

2. Theory Components:

The following topics/subtopics should be taught and assessed for achieving the course outcomes to attain the identified competency.

UNIT	Topics & Sub-topics	Teaching Hour
UNIT 1 INTRODUCTION TO INDUSTRIAL SAFETY	History and Development of Safety Movement, Importance of Safety, Safety Policy: Safety Organization and Its Responsibilities, Accident Sequence Theory, Causes of Accidents, Accident Prevention and Control Techniques Including Near Misses. Risk, Hazards and Dangerous Occurrences. First Aid. Financial Costs-Direct And Indirect Costs of Accidents.	**4**

UNIT 2 **INDUSTRIAL HYGIENE**	Industrial Hygiene – Principles and its Control Measures.Permissible Limits. Stress, Exposuresto Heat, Heat Balance, Effects of Heat Stress, ChemicalAgents, Flammables, Explosives- Types, Water Sensitive Chemicals, Oxidants, GasesUnder Pressure, Chemicals Causing Health Hazards: Irritants, Asphyxiates, Anaesthetics, Poisons and Carcinogens.Air Sampling, Types of Airborne Contaminants and Their Evaluation Methods, Housekeeping and its Importance.	**6**
UNIT 3 **WORKPLACE HAZARDS AND ITS CONTROL**	**Physical Hazards** Illumination - Principlesand Purpose of Good Illumination. Standards of Illumination. Ventilation – Principle and Purpose of Ventilation. Classification of Ventilation (Natural and Artificial), Heat Stress – Various Indexes, Different Controls (Including Air Conditioning), Vibrationand its Control, NoisePollution and its Control, Noise Mapping, Personal Protective Aids. Safe Weight Lifting Procedure. Safe Start Up, Shut Down and Emergency Shut Down Procedures.Permit to Work System. **Chemical Hazards** HazardousChemicals – Classification and its Properties, Common Hazard and Precautions for Each Class. Safety in Transportation and Bulk Storage of Hazardous Materials. CorrosionPrevention and Preventive Maintenance of Vulnerable Equipment. Safe Entry Into Confined Spaces. Permit to Work System. **Electrical Hazards** Dangers from Electricity. Safe Limits of Voltage and Amperage. Safe Distance from LT and HT Lines. Means of Cutting of Power Overload and Short Circuit Protection. Methods and Importance of Earthing.Earth Fault Protection. Earth Insulation and Continuity Tests. Protection Against Overvoltage. Lighting Arrester, Flame Proof and Intrinsic Electrical Equipment, Precautions in Their Selection, Installation, Maintenance and Use. Control of Hazards due to Static Electricity.Permit to Work System. **Fire Hazards** Chemistry of Fire,Classification of Fire. Common Causes of Industrial Fire.Statutory Provisions Regarding Fire Safety, Factors Contributing Towards Fire. Determination of Fire Load. Fire Resistance of Building Materials. Design of Industrial Plant for Fire Safety. Prevention of Fire:PortableExtinguishers- Water Type Extinguisher, Carbon dioxideTypeExtinguisher,Foam Type Extinguisher,Dry Chemical Type Extinguisher.Sprinkle Systems, CO_2 Flooding System FoamFlooding System. Industrial Fire Detection and Alarms. Special Precautionary Measures in Handling/Processing Flammable Liquids, Gases, Vapours, Mists and Dusts. Emergency Action Plan.	**16**

	Construction Hazards Safe Operating Procedure (SOP) and Code of Practice (COP) for Various Civil Works, Works at Heights and Various Safe Conditions IncludingFall Protection and Preventive Measures. Personal Protective Aids for Working at Construction Site.Permit to Work System. **Mining Hazards** Mine Rules and Regulations (CMR 2017 and MMR 1961), Specific Statutory Provisions from DGMS Circulars, Mine Act, Bye Laws for Safe Mining. Permit to Work System.	
UNIT 4 **OCCUPATIONAL HEALTH**	History of Occupational Health, Concept of Occupational Health, Occupational and Work Related Diseases, Levels of Prevention, Health Examination (Initial and Periodic), Essentials of Occupational Health Services (OHS), Personal Protective Equipment (Respiratory and Non-Respiratory), Ergonomic Controls, Risk Assessment, Risk Management and Risk Tolerance.	**6**
UNIT 5 **INDUSTRIAL SAFETY LEGISLATIONS**	The Factories Rules, Functions of Safety Management, Legislative Measures in Industrial Safety: Factories Act, 1948, Workmen's Compensation Act, 1943, Employees State Insurance Act, 1948. Water (Prevention and Control) Pollution Act, 1974, Boiler Vessels Act. Child Labour and Women Employee Act. ILO Convention and Recommendations in the Furtherance of Safety, Health and Welfare. Occupational Safety, Health and Environment Management: Bureau of Indian Standards on Safety and Health 14489 - 1998 and 15001 – 2000 OSHA(Occupational Safety and Health Administration).	**5**
UNIT 6 **INDUSTRIAL SAFETY MANAGEMENT**	Industrial Safety: History of Safety Movement in India and Abroad. Accident-Nature& Size. Need for Safety, Legal, Humanitarian, Economic and Social Considerations. Total Loss Control Concept, Introduction to Productivity, Quality, Reliability, and Safety (PQRS) Theory. Safety Management- Principles &PracticesWith Case Studies, Role of Management in Industrial Safety. Process Safety Management (PSM). Safety Organization: Role of Safety Committee and its Formation, Safety Awareness Programme: Motivation, Education and Training, Appraisal of Industrial Safety and Measurement of Safety Performance.	**5**
Sub Total : Total Lecture Classes		**42**
No. of classes required for conducting Internal Assessment examination		**6**
Grand Total :		**48**

3. Suggested Home Assignments/Students' Activities: (any Five)

i. What do you understand by safety, risks and hazards? Differentiate between risks and hazards.
ii. What are the various causes of dangerous occurrences arising due to dust, fire and chemicals refereeing different types of industries?
iii. Can you measure some control measures to limit the degree of hazards for factories highlighting the "permissible limits" of different pollutants?
iv. Draw charts to impose upon safety in chemical/power/construction/mining or any other heavy industries (any two types of industries). While doing these, highlight the role of top and middle management of these organization.
v. Draw an emergency response action plan in case of fire in any heavy industry.
vi. Draw schematic diagram of any fixed firefighting system (sprinkler/CO2 total flooding/foam flooding system) and describe it.
vii. Draw the labelled schematic diagram of portable fire extinguishers (showing all internal components) of DCP type, water type, CO2 type and foamtype.
viii. Classify hazardous chemical and describe the hazards associated with them.
ix. Draw a labelled diagram of lighting arrester fitted on a multi-storied building and describe its functional procedure.
x. Briefly describe Factories Act, 1948 and Employees State Insurance Act, 1948.

4. **Suggested scheme for question paper design for conducting internal assessment examination:(Duration: 45 minutes)**

Questions to be set as per Bloom's Taxonomy				
	Distribution of Theory Marks			
	Level 1 (Remember)	**Level 2 (understand)**	**Level 3 (Apply & above)**	**Total**
Class Test - 1	04	08	08	20
Class Test - 2	04	08	08	20

5. **Suggested Scheme for End Semester Examination [duration 3 hours]**

A: Multiple Choice Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
A1	1& 2	04	10	10 x 01 = 10
A2	3	06		
A3	4, 5 & 6	05		
	Total:	**15**	**10**	**10**
B: Fill-in the Blank Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
B1	1& 2	04	10	10 x 01 = 10
B2	3	06		
B3	4, 5 & 6	05		
	Total:	**15**	**10**	**10**
C: Short Answer Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
C1	1& 2	04	10	10 x 01 = 10
C2	3	06		
C3	4, 5 & 6	05		
	Total:	**15**	**10**	**10**
			Sub-Total [A+B+C]:	**30**

D: Subjective Type Questions (Carrying 2 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
D1	1 & 2	2	06	06 x 02 = 12
D2	3	4		
D3	4, 5 & 6	4		
	Total:	**10**	**06**	**12**
E: Subjective Type Questions(Carrying 6 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
E1	1 & 2	2	03	06 x 03 = 18
E2	3	4		
E3	4, 5 & 6	3		
	Total:	**09**	**03**	**18**
			Sub-Total [D+E]:	**30**
			Total [A+B+C+D+E]:	**60**

6. Rubrics for the Assessment of Students Activity: (20 marks)

Sl. No.	Performance Indicators	Weightage in %	
1	In time submission of home assignment or submission of report after conducting site visit/ industry visit/ micro-project / market survey / internet search on specific topic, preparation of chart, creation of innovative model etc.		40
2	Viva voce or present seminar on submitted report.		60
2a	Communication skill	10	
2b	Technical interpretation skill	10	
2c	Answering / Conclusion with justification	40	
		Total:	100

7. Suggested Learning Resources:

Sl. No.	Title of Book	Author	Publication
1	Industrial Safety, Health and Environment Management Systems	R. K. Jain and Sunil S. Rao	Khanna Publishers
2	A Handbook On Industrial Safety and Fire Management	Ravi Kant Pandey	Chetan Prakashan
3	Principles of Industrial Safety Management	Akhil Kumar Das	PHI Learning Pvt Ltd
4	Industrial Safety Management	L M Deshmukh	McGraw Hill Education
5	Industrial Safety & Environment	AnupamaPrashar	S.K. Kataria& Sons
6	Fundamentals of Occupational Safety and Health	Mark A. Friend and James P. Kohn	Government Institutes An imprint of The Scarecrow Press, Inc.
7	Safety in Industry	Brij Mohan Bansal	Woodhead Publishing India Pvt. Ltd.

Syllabus of Disaster Management			
Name of the Course	**Diploma in Engineering**	Course duration	6 semester
Course Title	**Disaster Management**	Course Code	**OE**
Subject offered in Semester	**Sixth**	Number of Credits	3 (L:3, T: 0, P: 0)
Prerequisites	NIL	Course Category	**OE**
Question distribution	As per standing norms of WBSCT&VE&SD	Marks distribution	As per standing norms of WBSCT&VE&SD

Course Learning Objectives:

Following are the objectives of this course:

- To learn about various types of natural and man-made disasters.
- To know pre- and post-disaster management for some of the disasters.
- To know about various information and organisations in disaster management in India and Legal framework of disaster management.
- To get exposed to technological tools and their role in disaster management.

Module/ Group [as per directives from WBSCT&VE&SD in framing questions of end semester]	Distribution of unit
Module A/ Group A	Unit I and II
Module B/ Group B	Unit III and V
Module C/ Group C	Unit IV

Course Content:

Unit – I: Understanding Disaster

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity – Disaster and Development, and disaster management.

Unit – II: Types, Trends, Causes, Consequences and Control of Disasters

Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire);

Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters, health disaster) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.

Unit- III: Disaster Management Cycle and Framework

Disaster Management Cycle – Paradigm Shift in Disaster Management.

Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness.

During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation –

Post-disaster – Damage and Needs Assessment, addressing Residual issues, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action (HFA).

Unit– IV: Disaster Management in India and Legal framework of disaster management

Disaster Profile of India – Mega Disasters of India and Lessons Learnt.

Disaster Management Act 2005 – Institutional and Financial Mechanism

National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter Governmental Agencies

Refugee Camps and Settlements: Water Supply and Sanitation in Emergency: *Introduction*- Human rights, international humanitarian law and refugee conventions, water and sanitation, refugee camp planning.

Settlement planning- Environmental health risks in emergencies – needs and standards – public health approach to water supply and sanitation in emergencies – partners in the humanitarian response – working with disaster affected people – social diversity – local context Emergency settlements, site selection and planning – introduction – physical planning of emergency settlement – settlement location and physical layout: implications for water supply and sanitation.

Water supply – planning and implementation – water sources – treatment – pumping – tinkering – storage – distribution – collection and use – testing. Waste water – storm water – community involvement.

Waste Management- Phased response – organizational options – staffing needs – monitoring latrine programmers – technical options – options for problem sites- Health risk of solid waste from health centers – dead bodies disposal

Unit– V: Applications of Science and Technology for Disaster Management

Geo-informatics in Disaster Management (RS, GIS and GPS).

Disaster Communication System (Early Warning and Its Dissemination).

Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non Structural Mitigation of Disasters

S & T Institutions for Disaster Management in India

References:

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management

2. Bhandani, R. K., An overview on natural & man-made disasters and their reduction, CSIR, New Delhi

3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi

4. Alexander, David, Natural Disasters, Kluwer Academic London

5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation

6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

7. Singh Jagbir, Disaster Management-Future Challenges and Opportunities, IK International Publishing House Pvt. Ltd.

8. Gupta, Harsh K., Disaster Management, Universities Press (India) Pvt. Ltd.

9. Harvey, P.A., Baghri, S. and Reed, R.A. (2002) **Emergency Sanitation: Assessment and programme design**, WEDC, Loughborough University, UK.

Course outcomes:

After completing this course, student will be:

- Acquainted with basic information on various types of disasters
- Knowing the precautions and awareness regarding various disasters
- Decide first action to be taken under various disasters
- Familiarized with organization in India which are dealing with disasters and Legal framework of disaster management
- Able to select IT tools to help in disaster management

Syllabus of Sustainable Development

Course Code	**OE**
Course Name	Sustainable Development
Number of Credits and L-T-P	3 [L – 3, T – 0, P - 0]
Course Category	OE
Prerequisites	NA

Course Objectives:

After completing this course, the students will be able

1. To increase the awareness towards sustainability.
2. To recognize and apply the role of technology towards sustainable development.
3. To know the method and tools used for sustainability.
4. To know about the environmental pollution management act.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
01	**Sustainability** 1.1 Sustainability – introduction – concept – application of this concept 1.2 Social, Economical and environmental Sustainability (Concept only) 1.3 Relation between Technology and Sustainable development 1.4 Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs)- 17th goals of sustainable development by UN. (Name and concept) 1.5 REACH (Registration, evaluation, authorization and restriction of chemicals) – Definition – Application – Aim 1.6 Clean Development Mechanism (CDM) 1.7 National Action Plan on Climate Change (NAPCC)	12
02	**Environmental Pollution** 2.1. Introduction of environment- basic elements of environment, 2.2. Environmental pollution – Type of Environment pollution (definition and concept) 2.1. Air Pollution and its sources and effects, - reducing process 2.2. Water pollution and its sources and effect, - reducing process 2.3. Soil pollution – cause –effect – reducing process 2.4. Noise pollution – causes –effect- reducing process 2.5. Radioactive Pollution- cause –effect and controlling mechanism 2.6. Solid waste and its causes and effect - Zero waste concept and 3 R concepts in solid waste management; 2.7. Greenhouse effect, Global warming, Climate change, Ozone layer depletion, Carbon credits, carbon trading, carbon foot	10

	print, water footprint, legal provisions for environmental protection.	
03	**Environmental pollution management** 3.1. ISO 14001:2015 frame work and benefits, Scope and goal of Life Cycle Analysis (LCA), 3.2. Circular economy, Bio-mimicking, Environment Impact Assessment (EIA), 3.3. Industrial ecology and industrial symbiosis.	08
04	**Non-conventional recourse management** 4.1. Basic concepts of Renewable energy sources 4.2. Working principle, advantages, disadvantages about solar photovoltaic, solar thermal energy, bio-energy, Fuel cells, Wind energy, hydro energy, geothermal energy, ocean and tidal energy 4.3. Worldwide and national progress in renewable energy. 4.4. Environmental aspects of renewable energy projects	06
05	**Sustainability practices** 5.1. Basic concept of sustainable habitat, Methods for increasing energy efficiency in buildings, 5.2. Green Engineering, Sustainable Urbanization, Sustainable cities, Sustainable transport and other sustainable concepts based on technology upgradation	06
Total Hours		**42 Hrs**

Weightage distribution in both objective, short and broad answer type questions:

Group	Module Number	Weightage (%)
A	1 & 2	50
B	3 & 4	30
C	5	20

Course Outcomes:

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

CO1	Recognize the relevance and the concept of sustainability and different world-wide activities on this direction.
CO2	Illuminate the different types of environmental pollutant, their effects and their sustainable solutions
CO3	Discuss the environmental regulations act. and standards
CO4	Gather basic idea about conventional and non-conventional energy resources
CO5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

Text Books:

1. M.C. Dash, Concepts of Environmental Management for Sustainable Development, Dreamtech Press
2. Deb Prasanna Choudhury, Sustainability Management, Zorba Books

Reference Books:

3. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
4. Bradley. A.S; Adebayo,A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning
5. Environment Impact Assessment Guidelines, Notification of Government of India, 2006
6. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998
7. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System
8. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
9. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).
10. Purohit, S. S., Green Technology - An approach for sustainable environment, Agrobios Publication

Syllabus of Industrial Management

<table>
<tr><td colspan="7">Name of the Course: Open Elective for All disciplines except Mechanical Engineering</td></tr>
<tr><td colspan="4">Course Title : Industrial Management</td><td colspan="3">Semester : Sixth</td></tr>
<tr><td colspan="4">Category: Open Elective</td><td colspan="3">Full Marks: 100</td></tr>
<tr><td colspan="4">Code no. : OE</td><td colspan="3">Examination Scheme:</td></tr>
<tr><td colspan="4" rowspan="3">Duration : 17 weeks</td><td colspan="3">External Assessment</td></tr>
<tr><td colspan="2">End Semester Examination</td><td>60</td></tr>
<tr><td colspan="3">Internal Assessment</td></tr>
<tr><td colspan="4" rowspan="3">Teaching Scheme</td><td>Class Test :</td><td>20</td><td rowspan="3">40</td></tr>
<tr><td>L</td><td>T</td><td>Total</td><td>Credit</td><td>Assignment/Student activity</td><td>10</td></tr>
<tr><td>3</td><td></td><td></td><td>3</td><td>Class attendance</td><td>10</td></tr>
<tr><td colspan="5"></td><td>Total</td><td>100</td></tr>
<tr><td colspan="7">Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.

Assignment / Student Activity: Submission of Home assignment, submission of report after conducting site visit/ industry visit/ micro-project / market survey / internet search on specific topic, preparation of chart, creation of innovative model or present seminar on specific topic which is suitable for the given subject as per instruction of subject teacher.</td></tr>
</table>

1. **Course Outcomes:**

    1. Explain the importance of management process in Business.
    2. Understand different types of organization, Objectives and functions of management.
    3. Understand the functional areas of management relating human resources, Materials, Finance.
    4. Apply various rules and regulations concerned with Business & Social Responsibilities of the Technician
    5. Identify various components of management
    6. Find the economic order quantity (EOQ) for given situation.
    7. Apply beak even analysis for optimum production
    8. Apply principles of safety in industrial activities.

2. **Theory Components:**

Unit	Topics	Teaching Hours
Unit: 1 Overview Of Business	1.1. Types of Business -Service -Manufacturing -Trade 1.2. Industrial sectors Introduction to: -Engineering industry -Process industry -Textile industry -Chemical industry -Agro industry	04

	1.3 Globalization Introduction - Advantages & disadvantages w.r.t. India 1.4 Intellectual Property Rights (I.P.R.)	
Unit: 2 Management Process	2.1 What is Management? -Evolution - Various definitions - Concept of management -Management is the combination of art and science - Levels of management -Administration & management - Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management -Planning -Organizing -Directing -Controlling 2.4 Social responsibility and Environmental dimension of management.	05
Unit: 3 Organizational Management	3.1 Organization :- - Definition -Steps in organization 3.2 Types of organization - Line - Line & staff - Functional - Project 3.3 Departmentation - Centralized & Decentralized -Authority & Responsibility - Span of Control 3.4 Forms of ownership - Proprietorship -Partnership - Joint stock - Co-operative Society - Govt. Sector	06
Unit: 4 Human Resource Management	4.1 Personnel Management - Introduction - Definition -Objectives -Functions 4.2 Staffing - Introduction to HR Planning -Recruitment Procedure 4.3 Personnel– Training & Development - Types of training - Induction -Skill Enhancement 4.4 Grievance handling 4.5 Leadership, Leadership quality, Leadership style -Motivation - Maslow's Theory of Motivation	08

	4.6 Introduction to -ESI Act -Workmen Compensation Act	
Unit: 5 Financial Management	5.1. Financial Management - Objectives & Functions 5.2. Break Even Analysis -Introduction -Graphical representation -Significance -Limitations 5.3. Introduction to – -Excise Tax - Income Tax -GST -Custom Duty	06
Unit: 6 Materials Management	6.1 Objectives and function of Materials Management 6.2. Purchase Procedure - Objects of Purchasing - Functions of Purchase Dept. - Steps in Purchasing 6.2 Economic Order Quantity(EOQ) - Introduction & Graphical Representation 6.3 Inventory Management. -Meaning & Objectives 6.4 ABC Analysis, VED Analysis 6.5 Stores function, -BIN card, -Pricing of materials -Store verifications	08
Unit: 7 Sales and Marketing Management	7.1 Introduction 7.2 Difference between Selling and Marketing 7.3 Functions of Marketing 7.4 Market Survey 7.5 Sales promotions 7.6 Recent trends	04
Unit: 8 Safety Engineering	8.1 Accidents -causes of accidents 8.2 Need for safety 8.3 Organization for safety 8.4 Safety committee 8.5 Safety programmes 8.6 Safety measures	04
Sub Total :	**Total Lecture Classes**	45
No. of classes required for conducting Internal Assessment		06
	Grand Total :	51

Assignments: (any five)-

1. Preparation of chart for fire safety.
3. Preparation of chart for personal, Tools & Equipment and products safety.
4. Preparation of chart to avoid accident.
5. Preparation of chart to show the different financial ratios.
6. Preparation of chart to show the different types of organization.
7. **Preparation of EOQ model.**

8. **Preparation of beak even analysis model**
9. **Prepare charts for showing steps of recruitment, training and performance appraisal**

Suggested scheme for question paper design for conducting internal assessment examination: (Duration:45minus)

Questions to be set as per Bloom's Taxonomy				
	Distribution of Theory Marks			
	Level1(Remember)	Level 2(understand)	Level3 (Apply &above)	Total
Class Test -1	4	8	8	20
Class Test -2	4	8	8	20

4. Suggested Scheme for End Semester Examination[duration: 2 hours 30 minutes]

A: Multiple Choice Type Questions(Carrying 1mark each)				
Group	Unit	To be Set	To be Answered	Total Marks
A1	1 & 2	07	20	20x01=20
A2	3,4 &5	10		
A3	6,7 & 8	08		
	Total:	25	20	20
B: Subjective Type Questions (Carrying 8 marks each)				
Group	Unit	To be Set	To be Answered	Total Marks
B1	1 & 2	02	05	08x05=40
B2	3,4 &5	04		
B3	6,7 & 8	03		
	Total:	09	05	40
			Sub-Total[A]:	20
			Total[A+B]:	60

6. Suggested Learning Resources:

Sl. No.	**Title of Book**	**Author**	**Publication**
1.	Industrial Engineering and Management	O.P. Khanna	Dhanpat Rai & Sons
2	Management Principles, Processes & Practices	A.Bhattaraya & A.Kumar	Oxford University Press
3	The process of Management	W.H. Newman E.Kirby Warren Andrew R. McGill	Prentice-Hall of India, New Delhi 2004.
4	Industrial Engineering & Management,	V.Arun Viswanath, Anoop. S. Nair, S.L.Sabu	SCITECH Publication(s) Pvt. Ltd
5	Industrial Management	Rustom S. Davar	Khanna Publication
6.	Industrial Engg & Management	N V S Raju	Cengage
7.	Industrial Management	Jhamb & Bokil	Everest Publication , Pune

Syllabus for Major Project

Semester	:	**VI**
Course Code	:	**PR302**
Course Title	:	**Major Project**
Number of Credits	:	**2 (L:0, T:0, P:4)**
Prerequisite	:	**Basic on Electronics & Instrumentation**
Course Category	:	**PC**

Course Objective	
Following are the objectives of this course.	
	➢ To understand the problem and solution of real-life problem ➢ To achieve the potentiality of doing team work ➢ To fill up the gap between academic knowledge and actual real-life problem-solving knowledge. ➢ To prepare the project repot in a skill full way. ➢ To develop technical skill, presentation skill and enhance creative thinking. ➢ To work in Groups, Plan the work and coordinate the work. ➢ To develop leadership qualities and Innovative ideas.
Project group	The project shall be undertaken by a group of students as per convenience. Individual student can also perform separate project.

Course Content	
Suggested Projects	**(A)Process Instrumentation and Process Control** 1. Ultrasonic motion detection using Arduino Uno. 2. Automatic room temperature controlled fan. 3. Arduino Based Home Automation. 4.Arduino based home security system. 5.Industrial fault monitoring system using Arduino. 6.Weather monitoring System Project using Arduino Uno. 7.Fire Alerting System Project using Arduino. 8.Liquid Level Monitoring and Control System Project using Arduino. 9.Greenhouse Monitoring and Control System Project using Arduino. 10.RFID based security system project using Arduino. 11.Early Flood Detection and Avoidance using Arduino. 12.Temperature monitoring and Control using Arduino 13.Wireless temperature monitoring using Arduino. 14.Traffic light control using Arduino. 15.Railway gate control using Arduino. 16.PLC using Arduino. **(B) Robotics** 1.Self-Balancing Robot using Arduino. 2.Obstacles avoiding robot using Arduino. 3.Line follower robot using Arduino. 4.Place and pick up robot using Arduino. **(C)Biomedical Instrumentation** 1.Eye ball control vehicle for paralysed patient. 2.Patient health monitoring system project using Arduino Uno. **(D)Power Electronics** 1. Voltage control of AC to DC converter. 2. Buck converter design 3. Boost Converter based solar battery charger. 4. SPWM inverter design. **(E)Drives:** 1. Closed loop speed control of Chopper based DC drive.

	2. Closed loop speed control of universal motor using AC voltage controller. 3. Obstacle sensing EV
Note	➢ Project topic may be selected having consultation with project guide. ➢ Every student will have to maintain record of individual contribution on project work. ➢ After completion of the project, each student should prepare project report. ➢ The project report should be signed by the guide and / or HOD. ➢ The student will have to submit reports on their assigned projects to the project guide in time. ➢ Student will have to perform a seminar presentation on their assigned project work in front of a Board of Internal Examiners of concern department at the time of end semester internal assessment. ➢ Seminar evaluation should be done on the basis of following points ✓ Quality of content presented ✓ Proper Planning for presentation ✓ Clarity of presentation ✓ Depth of knowledge and skills ✓ Questionnaire
Format of Project Report	1. Title page 2. Acknowledgement 3. Certificate from guide 4. Abstract 5. Objective 6. Literature review/ background survey/history 7. Present work 8. Methodology 9. Observation 10. Conclusion 11. References
Evaluation of Project Report	The project Report will be evaluated on the basis of following criteria ➢ Originality ➢ Awareness about the significance of project topic ➢ Setting and operation of experimental set up ➢ Observations and recording data ➢ Interpretation of result and conclusion ➢ Organizations, format, drawing, sketches, style, language ➢ Submission of report in time ➢ Answer to sample questions
Assessment	**Internal Assessment: Total marks: 60** ➢ Continuous assessment of performance, contribution and in time submission of reports on projects: 30 Marks ➢ Seminar Presentation and Viva Voce at end of semester: 20 Marks Class Attendance:10 Marks **External Assessment: Total marks: 40** (End Semester Examination) ➢ Performance on exhibition of project work: 20 marks ➢ Evaluation on Project Reports: 10 marks ➢ Viva voce on project work: 10 marks

Course Outcome	
At the end of the course student will be able to:	1. Identify and analyse the problem statement. 2. Develop and design alternative solutions for the identified problem. 3. Adopt new skills and supplement knowledge 4. Build communication and teamwork skills. 5. Improve time management, multi-tasking, real time technical knowledge etc. 6. Apply their knowledge for doing some application-oriented work.

Semester	:	**VI**
Course Code	:	**SE302**
Course Title	:	**Seminar**
Number of Credits	:	**1 (L:0, T:0, P:2)**
Prerequisite	:	
Course Category	:	

Course Objective

Following are the objectives of this course

- To introduce ideas, methods and techniques so that students can use to improve the content and presentation of seminars.
- Identify and compare technical and practical issues related to the area of course
- Prepare a well-organized report employing elements of technical writing and critical thinking.
- Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

List of probable seminar topics.

The students need to prepare seminar report on a topic relevant to his course and it should be other than Project undertaken. No two students can have the same topic. Students should identify the topic of seminar and finalize in consultation with Guide. Students should understand the topic and compile the report in standard format and present in front of Panel of Examiners. Some probable topics are listed below

Process Control

1. PLC and it's applications in industry
2. DCS and it's applications
3. SCADA and it's applications
4.Tuning of PID controller

Biomedical Instrumentation

1. Biosensors
2.immuno biosensors
3.Pacemakers

Applied Electronics:

1.Classification of Power Semiconductor Switches.
2.Thyristor Protection Schemes and Cooling procedures.
3.Power Quality Problems and mitigation.
4.Various PWM techniques for PWM Inverters to reduce harmonic.

1. 3D optical storage Technology
2. Medical Mirror
3. Mobile Telemedicine system
4. Bio Battery
5. Feeder Protection

1. Vibration measurement
2. Tele medicine technology
3.Wind Power generator
4.Boiler maintenance
5.Water treatment in thermal power station
6.NMR
7.Solid level measurement
8. Digital filters
9.Fuzzy control Technology
10. Modern power plant Technology
11.Optical Fibre in communication technology
12.Optical detector

Course Outcome	
At the end of the course student will be able to:	➢ Establish motivation for any topic of interest and develop a thought process for technical presentation. ➢ Effective presentation and improve soft skills. ➢ Make use of new and recent technology (e.g. Latex) for creating technical reports.

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Interior Decoration [ID]

Part-III (6th Semester)

2023

CURRICULUM STRUCTURE | INTERIOR DECORATION

West Bengal State Council of Technical and Vocational Education and Skill Development

Sixth Semester

Sl. No.	Category of Course	Code no.	Course Title	Hours per week			Credit	Marks
				L	T	P		
1	Pro. C. C.	IDPC302	Interior Maintenance	2	0	0	2	100
2	Pro. C. C.	IDPC304	Design & Drawing – B (6 Hr. Exam)	1	0	0	1	100
3	Pro. E. C.	*	*	2	0	0	2	100
4	Open Elective - I	IDOE310	Engineering Economics and Project Management	3	0	0	3	100
5	Open Elective - II	*	*	3	0	0	3	100
6	Humanities and Social Science	HS302	Entrepreneurship and Start-ups	3	1	0	4	100
7	Pro. C. C.	IDPC316	Interior Working Drawing – III (Lab)	0	0	4	2	100
8	Major Project	PR304	Project Part - B	0	0	6	3	100
9	Seminar	SE302	Seminar on Thematic Interior work	0	0	2	1	100
TOTAL				27			21	900

Total Contact Periods per week -26

PRO. E.C. - Programme Elective Course-1 No.
Open Elective Course-2 Nos.

- **List of Programme Elective Courses are given below**

List of Program Elective Courses

IDPE306	Interior of Heritage Structures
IDPE308	Modular Design

- **List of Open Elective Courses are given below**

List of Open Elective- II Courses

IDPE312	Environmental Engineering and Science
IDPE314	Disaster Management

INTERIOR MAINTENANCE

Subject Code	Course offered in	Duration	Periods/Week	Full Marks 100	
IDPC302	6th Semester	17 weeks	2 lectures	Int.Assess.40	Examination 60

OBJECTIVE:

This course aims to acquaint students with the causes and the adverse effects of decay in the building interior. It also aims that the students be able to adopt various methods to repair the decay as well as be able to apply the techniques of maintenance to protect the interior from decay.

MODULAR DIVISION

Module	Topic	Contact Periods
1	Deterioration (Sources, Causes, Effects)	8
2	Interior Maintenance	6
3	Repair of Defects	8
4	Maintenance of Finishes and Furnishing	8
Contact Periods 30	Internal Assessment 4	Total Periods 34

EVALUATION SCHEME

1. Examination (60 marks)

2. Internal Assessment (40 marks)

a. Mid Semester: 20marks

b. Teacher'sassessment:10 marks (seminar/homework/class performance etc.)

c. Attendance: 10marks

DETAIL COURSE CONTENT

Module 1 Deterioration (Sources, Causes, Effects) 8 periods

Definition of deterioration/decay of building interior; Factors causing deterioration; Classification of Factors-Human factors -Chemical factors -Environmental conditions -Miscellaneous factors; Effects of various agencies of deterioration on various building materials -. Bricks- timber- concrete- plaster- ceramics- paints- metals- plastics- stones- furnishing

Module 2 Interior Maintenance 6 periods

Definition of Interior Maintenance; Types of Building Maintenance-Routine maintenance-Preventive maintenance-Corrective maintenance; Determination of approximate age of a building; Dilapidated building (definition only)

Module 3 Repair of Defects 8 periods

Defects in room components; Walls –Cracks in walls- Causes- Crack repair methods-Epoxy injection-Grooving and sealing-Stitching-Adding reinforcement and grouting-Flexible sealing by sealant ; Repair of walls-Repair of mortar joints against leakage-Efflorescence removal

Floors-Damage of concrete Floor-Causes-Repair of surface defects of concrete-Bug holes-Form tie holes-Honey comb and larger voids; Repair of corrosion in RCC elements; Various Water proofing treatment to concrete floors; Damage of wooden floor-Causes-Repair

Ceiling-Damage of ceiling-causes-Repair, Damage of false ceiling-causes-repair

Stair-Decay of different parts of stair-causes and repair

Interior Services; Damages –causes and maintenance of Electrical-Water supply –Sanitary-Ventilating and Air-conditioning system

Defect-causes-repair of Doors; windows ; Glazing work

Module 4 **Maintenance of Finishes and Furnishing** **8 periods**

Wall Finishes- damages-causes ; maintenance of finishes-Distemper, paint & oil paint; wallpaper; wall sheet; wooden paneling-dado with tiles or stone-mural work
Maintenance of Floor Finish- Different types of floor finishing materials-stone; plain cement concrete; Terrazzo-ceramic tiles-Vinyl-Linoleum-Wooden strips- Epoxy resin- carpet- area carpet -wall-to-wall carpet.
Maintenance of False Ceiling finishes- care and maintenance of Gypsum board- POP- Plywood- Glass;
Sunshades & upholstery; different types of sunshades;-Screens- Curtains-drapery-valence-windows blinds of different materials; Upholstery- different types of upholstery materials
Rugs & Dhurries- Meaning of Rugs- Types of rugs- rugs for different areas- dimensions of rugs- cleaning and maintenance of rugs; Meaning of Dhurries- types of Dhurries- causes of damage-maintenance
Furniture-Care and maintenance of wooden furniture-surface finish-French polish- varnish- spirit polish-Iron and steel furniture-care and maintenance

SUGGESTED READINGS

- Building Defects and Maintenance Management by Gahlot P.S. and Sanjay Sharma; CBS Publishers, New Delhi
- Maintenance Engineering for Civil Engineers by Nayak, BS; Khanna Publishers, Delhi

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DESIGN & DRAWING – B (6Hr. Exam)

Subject Code	Course offered in	Duration	Periods/ Week	Full Marks 100	
IDPC304	6th Semester	17 weeks	1 lecture	Int. Assess. 40	Examination 60

OBJECTIVE

This course aims that the students achieve the skill of designing an interior space and skill of drafting drawings necessary to express design ideas within a stipulated time. It also aspires to examine a student's individual ability of space planning and taking decision for selecting appropriate materials to bring out the mood of the interior space, thus enabling themselves for building up self-confidence.

EVALUATION SCHEME

1. Examination (60 marks)
2.Internal Assessment (40 marks)
a. Mid Semester: 20marks
b. Teacher'sassessment:10 marks (seminar/homework/class performance etc.)
c. Attendance: 10marks

EXAMINATION SCHEME

A 6-hour (Six hour) examination is to be held during the Part – II, Sixth Semester examinations on the syllabus of all the courses related to Interior Designing and Drawing. Out of two questions set; any one (1) is to be answered. Two (2) internal assessments of 3 hours (Three hours) duration each, are to be taken on the same syllabus.

DETAIL COURSE CONTENT

Introduction to requirement framing and designing of interior spaces of the following types of building is to be covered and time bound assignments (in the form of sketch or drawings)are to be given on that: Institutional building, Business building, Assembly building (like: Building with health facilities, Bank, Office of the Professionals, Recreational building, Old age home, Library, Cinema hall, Auditorium, Transport hub catering to road and rail, etc).

MODULAR DIVISION

Module	Topic	Contact Periods
1	Institutional Building	5
2	Business Building	5
3	Assembly Building	5
Contact Periods :15	Internal Assessment 2	Total Periods 17

SUGGESTED READINGS

- Neufert Architect's Data/EmstNeufert/Wiley-Blackwell
- Time Saver Standards for Interior Design and Space Planning/Joseph De Chiara, Julius Panero and Martin Zelink/Mcgraw-Hill (Tx)
- The Interior Design Reference & Specification Book: Everything Interior Designers Need to Know Every Day O'Shea, Linda; Grimley, Chris; Love, Mimi, Rockport Press

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INTERIOR OF HERITAGE STRUCTURES

Subject Code	Course offered in	Duration	Periods/Week	Full Marks 100	
IDPC306	6th Semester	17 weeks	3 lectures	Int.Assess.40	Examination 60

OBJECTIVE

This course aims to acquaint students with the significance of heritage structure in relation to the nation's history and the sustainability of structure. This course also aims to equip students to deal with the interior design part for effective use of the structure interpreting earlier physical evidences with modern technology.

MODULAR DIVISION

Module	Topic	Contact Periods
1	Introduction	9
2	Historic significance and Documentation	12
3	Deterioration of Heritage Buildings	9
4	Conservation & Preservation Techniques	15
Contact Periods 45	Internal Assessment 6	Total Periods 45

EVALUATIONSCHEME

1. Examination (60marks)
2. Internal Assessment (40marks)
a. Mid Semester: 20marks
b. Teacher'sassessment:10 marks (seminar/ homework/ class performance etc.)

c. Attendance: 10marks

DETAIL COURSE CONTENT

Module 1 **Introduction** **9 periods**

Definition of Heritage Structure, Terminologies in conservation: "Heritage Precincts"- "Conservation" "Preservation"- "Restoration"- "Reconstruction"- "Authority"- "Competent Authority"- "Construction"- "Prohibited Area"- "Regulated Area"; Necessity of preservation of heritage structure; Introduction to conservation of Heritage structure in India; Institutional Aspects of Conservation(Names of different agencies and introduction only) : Heritage Conservation Committee (HCC) under Ministry of Urban Development - Archaeological Survey of India (ASI) -- State Archaeological Department- Govt. of NCT of Delhi - Delhi Development Authority (DDA) - MCD (EDMC, SDMC, NDMC) - Cantonment Board, Delhi - INTACH - Aga Khan Trust (Name and introduction only)

Module 2 **Historic significance and Documentation** **12 periods**

Historic significance ;Identification of the period in basic history of architectural and interior design style in spatial arrangement, furniture and furnishing, finishes, colour scheme, art and crafts, significant elements in the interior; Methods of Inventory formation and detail documentation.

Module 3 **Deterioration of Heritage Buildings** **9 periods**

Natural Factors : Flood - Biological Factors - Moisture - Rainstorm - Ground salts and water - Windstorm - Air Pollutant - Solar Radiation - Temperature – Vibration; Social Factors : Fire - Urban Development – Vandalism

Module 4 **Conservation & Preservation Techniques** **15 periods**

Concept of adaptive Reuse; Types of adaptive reuse- Structural Interventions-Renovation- Facades- Integration-Infrastructure;
Conservation of building elements- Bricks and Stones- Principle-Defects-Re-pointing-Mortar mixes-Cleaning with water and chemicals-Sandblasting
Stucco -Traditional Composition-Repair
Wood Siding- Conservation Principles-Different Types of Wood Siding-Maintenance-Choosing the Right Siding for an Addition
Conservation of Interiors- Furniture-Furnishing-Finishes
New Building materials in conservation practices; Light weight and Sustainable materials- finishes used in heritage building – Bamboo- straw-wood- dimension stone-Recycled stone- non-toxic metals- Earth blocks-compressed- rammed- baked; Vermiculites- flax linen- sisal- wood

SUGGESTED READINGS

- Architecture in Conservation: Managing Development at Historic Sites (Heritage: Care Preservation-Management) –James Strike
- Protection, Conservation and Preservation of Indian Monuments- Shanti Lal Nagar
- History of Architectural Conservation - Jukka Jokilehto

Handbook of Conservation of Heritage Buildings-Published by Directorate General, Central Public Works Department

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MODULAR DESIGN

Subject Code	Course offered in	Duration	Periods/Week	Full Marks 100	
IDPC308	6th Semester	17 weeks	2 lectures	Int.Assess.40	Examination 60

OBJECTIVE

This course aims to acquaint students with the system of module based design of interior space and objects incorporating the knowledge of ergonomics and anthropometry. It also aspires that they will be able to understand the dynamics of function related to furniture and suitable techniques in joinery to fit furniture for various uses.

MODULAR DIVISION

Module	Topic	Periods
1	Introduction to Modular Design	6
2	Principles of Modular Design	6
3	Modular Components	6
4	Modular Furniture	6
5	Joints, Jigs and Fixtures	6
ContactPeriods30	Internal Assessment 4	Total Periods 34

EVALUATION SCHEME

1. Examination (60 marks)
2.Internal Assessment(40 marks)
a. MidSemester:20marks
b. Teacher'sassessment:10marks (seminar/homework/class performance etc.)
c. Attendance: 10 marks

DETAIL COURSE CONTENT

Module 1 **Introduction to Modular Design** **6 periods**

Introduction to modular design**;**Advantages of Modular Design-Speed of construction/faster return on investment- Indoor construction- Ability to service remote locations- Low waste- Environmentally friendly construction process- Flexibility- Quality- Improved Air Quality; Disadvantages of Modular Design- Restricted flexibility- Module sizes and shapes can be limiting- Poorer overall design / aesthetic quality- lower valuations- Difficulty transporting and handling modules- Significant investment required to develop designs and manufacturing processes for modular buildings

Module 2 **Principles of Modular Design** **6 periods**

Le Corbusier's concept of modular and proportion; Ergonomics and Anthropometry in Workspace design; The Modularisation of space and furniture dimensions; Introduction to Prefabricated construction and dry technology; Principles -Minimize the number of components- Design for ease of part-fabrication-Tolerances of parts-Clarity of module-Minimize the use of flexible components(Rubber,Gasket,Cables etc.)-Design for ease of assembly- Eliminate or reduce required adjustments

Module 3 **Modular Components** **6 periods**

The prefabricated interior components of Modular building **-**Walls- Frames - Doors - Ceilings- Windows (Materials and Dimensions); Sandwich Panels-Definition-Sketches-Materials-Properties-Uses

Module 4 **Modular Furniture** **6 periods**

Importance of modular furniture in today's context; Concept of Dynamic furniture; Need for commercial production of furniture; Principles and techniques of design of multipurpose furniture-Multifunctional seating modules- Multifunctional storage/cabinet modules- Multifunctional divisible bed/seating modules- Chair- Stool and Extendable table modules;
Materials used for modular furniture - MDF- Commercial Plywood-Bwp- Hdmr- Veneer- Laminates; Finishing with Sap staining-ingredients - advantages - disadvantages ; Oil stain – Ingredient- advantages and disadvantages ;Application of NGR stain- non-grain raining (NGR) stain – advantages & disadvantages; Spray lacquer finish- The process of applying a clear brushing lacquer finish-Types of finishes like polymethanes-Polyester- Epoxy-Their application

Module 5 **Joints, Jigs and Fixtures** **6 periods**

Classification of Joints- Lengthening- Widening- Framing and Box joints; Jigs and fixtures; Furniture Hardware; Hinges- Screws-Nails- Locks and Accessories

SUGGESTED READINGS

- The Modular Way : achieving customization, cost efficiency and development speed

by Björn Eriksson (Author), Daniel Strandhammar (Author) ,Publisher : Ekerlids Förlag

- Design in Modular Construction Paperback – 12 December 2019

by Mark Lawson (Author), Ray Ogden (Author), Chris Goodier (Author),CRC Press

- Factory Design for Modular Homebuilding Hardcover – Import, 16 March 2011

by Michael Alan Mullens (Author)

- Modular Kitchen Planning & Designing Guide: A-Z Modular Kitchen Guide for Indian Homes

by Gopal Dwivedi (Author),Notion Press

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INTERIOR WORKING DRAWING– III

Subject Code	Course offered in	Duration	Periods/Week	Full Marks 100	
IDPC316	6th Semester	17weeks	4 Practical	Int.Assess.60	Ext.Assess.40

OBJECTIVE

The subject intends to equip the students with knowledge and skills of using construction techniques for preparing working drawing and details of designed educational, business or institutional space drawing. It further intends to equip the students with thorough knowledge specifically about the detailing of finishes and services of the interior spaces.

MODULARDIVISION

Module	Topic*	Contact Periods#	No. of sheets
1	Floor Plans	15	2
2	Elevations & Sections	15	4
3	Structural and finishing details	10	2
4	Detailing of Door, Windows and Furniture	10	2
5	Detailing of Services	10	2

*Assignments are be carried out in a journal-form on large size square grid pad and/or drawn to scale on A2 size drawing sheet as per instructions.
#The periods exclude tutorials

EVALUATION SCHEME

Name of the course	Marks Allotted
Interior Working Drawing-III	a. **Continuous internal assessment of 50 marks** is to be carried out by the teachers throughout the semester **b. Attendance of 10 marks** **c.External assessment of 40 marks** shall be held at the end of the Semester on the entire syllabus i.e. assignment

DETAIL COURSE CONTENT

Module 1 **Floor Plans** **15 periods**

Architectural Floor plan, Reflected Ceiling Plans, Doors and Window scheduling

Module 2 **Elevations & Sections** **15 periods**

Elevations showing placement of wall coverings, height of chair rails or mouldings around the perimeter of walls, acoustical treatment, bumper guards, plumbing fixtures, other design features permanently attached to the walls. Sections and details showing the particular feature attached to a surface its generic materials.

Module 3 **Structural and finishing details** **10 periods**

Matrix indicating each finish to be used in interior surfaces -listing by pattern, colour, size and quantity. Finish Floor plan-clarifying the patterns, borders and combination of floor finishes along with base details and Partition walls.

Module 4 **Detailing and Scheduling** **10 periods**

Details of Doors and Windows
Pattern of Window Coverings, Furniture, Furnishing and Upholstery

Module 5 **Furniture and Fixture** **10 periods**

Drawing showing the placement of lighting fixtures, placement of furniture panels, electrical connections, power layouts and components.

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PROJECT PART- B

Subject Code	Course offered in	Duration	Periods/Week	Full Marks 200	
PR304	6thSemester	17weeks	4 Practical	Int.Assess.60	Ext.Assess.40

OBJECTIVE

The aim of this course is that the students be able to present individually planned design projects that involve considerations of interactions with experts from the various fields associated with interior design and a range of different users .It also keeps the scope of the project to be supported by documentation and drawings in the complementary nature of systematic and creative thinking in the various stages of the design process. It aspires that the students develop their personal and communication skill to express their design thinking in the form of audio-visual presentation in the viva-voce of the project.

MODULAR DIVISION

Module	Topic	Contact Periods
1	Detail Drawing of Ceiling, Flooring and Wall/Partitions	36
2	Detailing of furniture with specification	27
3	Service Layouts ,Detailing	27
4	Preparation of Perspective/Model	36
5	Cost Estimation	27
Total Contact Periods		**153**

EVALUATION SCHEME

Name of the course	Marks Allotted
Project Part-B	**Continuous internal assessment of 50 marks** is to be carried out by the teacher throughout the semester on sessional work. Seminar presented by each student individually is to be assessed by the teacher during this semester. **Attendance: 10 marks** presented by each student individually is to be assessed by the teacher during this semester. At the end semester examination, **External assessment of 40 marks** is to be carried out by an external examiner of the jury as mentioned in the general guidelines.

GENERAL GUIDELINES:

1. On completion of the projects, students are required to produce the necessary drawings, documentation and presentation aids prepared in a professional standard.

2. At the end of the semester each student is expected to submit all original drawings prepared as per the departmental specifications. Two Copies of the report in the specified format should be submitted to the department after the approval of the respective guides.

3. The Department shall schedule the viva voce and the seminar at its convenience only after the receipt of the project document from the student. The performance sheet submitted by the guide should be the basis for allowing the student to appear for the final viva voce.

4. The end semester examination is to be conducted by a jury comprising of an external examiner and one internal examiner. The External Examiner is to be from industry / engineering college / university / government organization and he / she should give credit out of 50 marks on the report and the drawing.

SUGGESTED READINGS

- Neufert Architect's Data/EmstNeufert/Wiley-Blackwell
- Time Saver Standards for Interior Design and Space Planning/Joseph De Chiara, Julius Panero and Martin Zelink/Mcgraw-Hill (Tx)
- Construction Drawings and Details for Interiors, 4th Edition by Rosemary Kilmer, W. Otie Kilmer /Wiley Publisher

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SEMINAR ON THEMATIC INTERIOR WORK

Subject Code	Course offered in	Duration	Periods/Week	Full Marks 200	
SE302	6th Semester	17 weeks	2 Practical	Int. Assess 60	Ext. Assess 40

OBJECTIVE

This course aims that the students get exposure to the changing trends of "theme based interior design" involving different factors like developing technology, industries, environmental issues and the needs of the society. It aims that the students build their graphical presentation skill to express their understanding and inclination towards a particular innovative work followed by a case study.. It also aspires to enable the students to develop their personal and communication skill in the form of audio-visual presentation in a seminar.

EVALUATION SCHEME

Name of the course	Marks Allotted
Seminar on Thematic Interior Work	**Continuous internal assessment of 50 marks** is to be carried out by the teacher throughout the semester on sessional work and on Seminar Presentation **Attendance:10** At the end semester examination, **External assessment of 40 marks** is to be carried out by an external examiner on Graphical Presentation Work, a Write-up and Seminar Presentation

MODULAR DIVISION

Module	Topic
1	A case study by visiting a site of one theme based interior work
2	Preparing a study report in the graphical presentation form like: write up and drawings.
3	Preparing report with understanding and analyzing the design in audio-visual form.

SUGGESTED READINGS

- The Interior Design Reference & Specification Book/Linda O'Shea, Chris Grimley, Mimi Love
- Interior Design Course: Principles, Practices and Techniques for Aspiring Designer/TomrisTangaz/Barron's
- Neufert Architect's Data/EmstNeufert/Wiley-Blackwell
- Time Saver Standards for Interior Design and Space Planning/Joseph De Chiara, Julius Panero and Martin Zelink/Mcgraw-Hill (Tx)

PROPOSED CURRICULUM AND SYLLABI OF FULL-TIME DIPLOMA COURESES IN INTERIOR DECORATION (PART – III SEMSTER – 6TH) (W.E.F. 2020-21)

WEST BENGAL STATE COUNCIL OF TECHNICAL AND
VOCATIONAL EDUCATION AND SKILL DEVELOPMENT
(AStatutoryBodyunderWestBengalActXXIof1995)
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West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Leather Goods Technology
[LGT]

Part-III (6th Semester)

2023

CURRICULAR STRUCTURE OF DIPLOMA IN LEATHER GOODS TECHNOLOGY

WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION & VOCATIONAL EDUCATION AND SKILL DEVELOPMENT

SIXTH SEMESTER

S.L No	Course Category	Code	Course Title	Hours Per Week			Total Contact Hours/ Week	Credits	Marks	EXAMINATION SCHEME			
										External Assessment	Internal Assessment		
				L	T	P				End Semester Examination	Mid Semester Test	Quizzes/ Viva Voce/ Assignment	Class Attendance
THEORETICAL SUBJECTS													
1	Pro-Elec	LGTPE3	PROGRAMME ELECTIVE IV	2	2	0	4	3	100	60	20	10	10
2	Humanities	HS302	Entrepreneurship and Start-ups	2	1	0	3	3	100	60	20	10	10
3	Prog core	LGTPE601	Fundamentals of Safety Leather Gloves	2	1	0	3	2	100	60	20	10	10
4	Open Elec	LGTOE1	OPEN ELECTIVE I	3	0	0	3	3	100	60	20	10	10
5	Op-Elec	LGTOE2	OPEN ELECTIVE II	3	0	0	3	3	100	60	20	10	10
PRACTICAL SUBJECTS													

S.L No	Course Category	Code	Course Title	Hours Per Week			Total Contact Hours/ Week	Credits	Marks	Continuous Assessment			End Semester Assessment	
										Class Assignments	Class Performance	Class Attendance	Assignment on Grand Viva day	Viva Voce (Before board of Examiners)
				L	T	P								

6	Proj	LGTPE602	PROJECT WORK	0	0	6	6	3	100	30	20	10	20	20
7	Semi	LGTPE603	Seminar on Project	0	0	1	1	1	100	30	20	10	20	20
8	Prog core	LGTPC604	Port Folio Development	0	0	4	4	2	100	30	20	10	20	20
TOTAL				**12**	**04**	**11**	27	20	**800**					

STUDENT CONTACT HOURS PER WEEK: 26Hrs.Theories and Practical Period of 60 Minutes each.

PROGRAMME ELECTIVE IV: Basic Footwear Construction / Basic Garment construction
OPEN ELECTIVE I Engineering Economics and Project Management
OPEN ELECTIVE II Export Import Management | Industrial Management and Safety

Name of the Course: Diploma in LEATHER GOODS TECHNOLOGY		
Course Title: PROGRAMME ELECTIVE IV [Basic Footwear Construction]	**Course code :** LGTPE3	
Number of Credit: 3	**Semester: SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration: 15 weeks	**Maximum Marks: 100**	
Theory : - 2 hrs/week	Mid. Sem. Tests	20 Marks
Tutorial: -2 hrs/week	Quizzes, Viva-voce, Assignments	10 Marks
Practical: NIL	Class Attendance	10 Marks
Total Contact Hours: 60 Hours	**End Semester Examination**	60 Marks

Prerequisite: Basic knowledge of fundamental of footwear technology and Basic Footwear Design

Aim: To involve in development of footwear for various practical purposes, ranging from household to daily uses footwear

Course Objective:

1) Introduce students about pattern cutting techniques.
2) To discuss Drafting of shoe uppers on last
3) To study Prototype production
4) To develop Production Specifications sheet
5) To develop bottom pattern (Insole, shock & Sole) of different construction
6) To describe different trims, accessories
7) To draw close type footwear
8) To develop mean forme of close type footwear
9) To develop base of close type and make different pattern
10) To perform some physical tests
11) To illustrate footwear costing and quality checking techniques.

Course Content :

	Content (Theory)	**Module**	**Hrs./Unit**
Unit 1	1. Specialised pattern cutting technique:- Springing/deadning techniques for economy, look and fit. One pair tracing to observe material consumption and pattern interlock. 2. Drafting - Drafting of shoe uppers on last. 3. Prototype production:- Production of prototype samples for appraisal and assessment to commercial qualities of suitability and excellence. 4. Production Specifications:Specification procedures for use in production, detailing of style, edge treatments, materials and components used, colours, last and constructions. Information and sequence for uppers and bottom – stock processes. Stage sample boards,	**Module1**	20
Unit 2	5. Production of bottom shock patterns: Insole of last pattern making and its use in the production of the lasting insole, socks and sole pattern for various constructions such as – Cemented,	**Module 2**	20

	Veldtschoen, Goodyear welted, California Sliplasted, Sandal and Chappal. 6. Heel Patten , Sole patterns, Heel cover pattern . 7. Fitting test and wearing test: a) Correctness of last b) Correct position of upper design c) Quality of upper, lining and bottom materials d) Colour fastness of upper and lining materials, etc.		
Unit 3:	Tutorial A (Close Type) : 1. Construction of Mean Forme by different methods such as: a) Masking tape method 2. Construction of base model and section patterns of upper and lining for: a) Derby shoe with toe cap b) Oxford shoe with toe cap C) Bottom patterns preparation for above designs Pattern tracing for one pair material consumption. Footwear Costing	**Module 3**	20
	Total		60

Examination Scheme of ESE (End Semester Examination)				
Theoretical	**Question Type**	**Question to be set**	**Questions to be answered**	**Marks**
	MCQ-type questions are carrying one mark.	**15**	**10**	**10**
	Short answer-type questions carrying one mark.	**15**	**10**	**10**
	Subjective-type questions carrying two marks.	**10**	**6**	**12**
	Subjective-type questions carrying six marks.	**9 (3 each from each of 3 modules)**	**3**	**18**
TOTAL				**60**

Pass Criterion: Students have to obtain at least **40% marks** individually both in Internal assessment and end semester exams to pass.

REFERENCE MATERIALS

1. “Comprehensive Footwear Technology” by Somenath Ganguly, ILTA, Kolkata Publication.

2. "Manual of Shoe Making" by Jane & Clark. Clarks Limited.
3. Basic Shoe Making, SATRA Technology centre
4. Swayam Siddha FDDI
5. Comprehensive Footwear Technology, Somnath Ganguly, ILTA
6. Text Book of Footwear Manufacture, John Henry Thornton, National Trade Press
7. Hand book of Footwear design and Manufacture, A. Luximon, Woodhead Publishing
8. The Science of Footwear, Ravindra S. Goonetilleke, CRC Press

Course outcomes:

Upon completion of this course, students should be able to:

1) Understand Specialised pattern cutting techniques.
2) Demonstrate Drafting of shoe uppers on last
3) Develop Production Specifications sheet
4) Develop bottom pattern (Insole, shock & Sole) of different construction
5) Interpret different trims, accessories
6) Draw close type footwear
7) Develop mean forme of close type footwear
8) Develop base of close type and make different pattern
9) Develop Prototype of production
10) Perform some physical tests
11) Illustrate footwear costing and quality checking techniques.

Name of the Course: Diploma in LEATHER GOODS TECHNOLOGY		
Course Title: PROGRAMME ELECTIVE V [Basics of Garment Construction]	**Course code :** LGTPE3	
Number of Credit: 3	**Semester: SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration: 15 weeks	**Maximum Marks: 100**	
Theory : - 2 hrs/week	Mid. Sem. Tests	20 Marks
Tutorial: -2 hrs/week	Quizzes, Viva-voce, Assignments	10 Marks
Practical: NIL	Class Attendance	10 Marks
Total Contact Hours: 60 Hours	**End Semester Examination**	60 Marks

Prerequisite: Basic knowledge of Basic Garment Design and fundamentals of leather garments

Aim: This module aims at strengthening the concepts of Patter Making relative to Trousers, variations of different components in Garment Designing and Construction and to work on more complex concept of Pattern Making of Waist coat and Jackets for Men's and Women's Wear, development.

Course Objective:

1) To understand steps of garment construction
2) To understand Various Seams and Samples of disposal and control of fullness.
3) To understand preparation and handling different fabrics for clothing construction
4) To Illustrate fabric layering marking and cutting
5) To Handle Sewing Machine and Sewing Needles and Stitch Formation
6) To illustrate Work with fabric grain and Basic Hand Stitches,
7) To Practice of threading, oiling and handling and care of the sewing machine and machine control exercise.
8) To identify perfect seam and Samples of Plain Seam and its finishing

Course Content :			
Content (Theory)		**Module**	**Hrs./Unit**
Unit 1	Principles of steps of garment Construction Drafting of Basic Blocks Samples of Various Seams and Samples of disposal and control of fullness.	**Module 1**	16
Unit 2	Preparation of Fabrics for Garment Making Working with fabric grain Handling Various Fabrics Laying Marking and Cutting Sewing Equipment Seams and Seam Finishes basic sewing techniques	**Module 2**	16
Unit 3:	Basic Hand Stitches Practice of threading, oiling and handling and care of the sewing machine and machine control exercise. Identify perfect seam and Samples of Plain Seam and its finishing Applications of different stitches of different fabric. Application of trim e.g. zippers, hooks and eye, Construction of garments with lining, inter lining, inter facing Construction of Shirring, ruffles, frill, quilting, honey comb, Sleeves- plain, puff, umbrella, kimono, ruffled, bishop, Neck- round, boat, scoop, square, v, key hole, cowl, half shoulder Collar- peter, sailor, band quaker, jabot Pocket- inseam, round box, pouch, cowl, cargo steps of garment construction of-- Making of Female& Children: Salwar & Churidar, Kameez, frock, Women Jacket (Leather) Making of Male: Pant, Shirt, Panjabi, Trousers, Leather Jacket for Men	**Module 3**	16
Assignment:	1. Make Women Jacket 2. Make Waist coat and Jackets		12
Total			**60**

Examination Scheme of ESE (End Semester Examination)				
	Question Type	**Question to be set**	**Questions to be answered**	**Marks**

Theoretical	**MCQ-type questions are carrying one mark.**	**15**	**10**	**10**
	Short answer-type questions carrying one mark.	**15**	**10**	**10**
	Subjective-type questions carrying two marks.	**10**	**6**	**12**
	Subjective-type questions carrying six marks.	**9 (3 each from each of 3 modules)**	**3**	**18**
TOTAL				**60**

Pass Criterion: Students have to obtain at least **40% marks** individually both in Internal assessment and end semester exams to pass.

BOOKS AND REFERENCES

1. Connie, A.C. (2019). A guide to Fashion Sewing. 6th edition. Fairchild publications.
2. Jennifer, D. Mc. (2018). Basic Hand Sewing guide. Kindle edition
3. Linda Tain, (2018), Portifolio Presentation for Fashion Designers, 4th edition, Fairchild Publication, USA
4. Mary Mathews. (1993). Practical Clothing Construction II. Cosmic Press, Madras.
5. Gerry Cooklin. (1991). Introduction Clothing Manufacture. Black well Publications. London.
6. Doongaji and Deshpandey. (1977). Basic Processes of Clothing Construction. Raj prakashan Publishings, New Delhi

Course outcomes:

Upon completion of this course, students should be able to:

1) Understand steps of garment construction
2) Understand Various Seams and Samples of disposal and control of fullness.
3) Understand preparation and handling different fabrics for clothing construction
4) Illustrate fabric layering marking and cutting
5) Handle Sewing Machine and Sewing Needles and Stitch Formation To illustrate Work with fabric grain and Basic Hand Stitches,
6) Practice of threading, oiling and handling and care of the sewing machine and machine control exercise.
7) Identify perfect seam and Samples of Plain Seam and its finishing
8) Pursue careers in the field of leather/ apparel

Name of the Course: Diploma in LEATHER GOODS TECHNOLOGY	
Course Title: Entrepreneurship and Start-ups	**Course code :** HS302
Number of Credit: 3	**Semester: SIXTH**
Teaching Scheme	**Examination Scheme**
Duration: 15 weeks	**Maximum Marks: 100**

Theory : - 2 hrs/week	Mid. Sem. Tests	20 Marks
Tutorial: -1 hrs/week	Quizzes, Viva-voce, Assignments	10 Marks
Practical: NIL	Class Attendance	10 Marks
Total Contact Hours: 45 Hours	**End Semester Examination**	60 Marks

Prerequisite: NIL

Aim:

Course Objective:

1. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
2. To motivate and inspire students toward an entrepreneurial career.
3. To understand venture creation process and to develop generic entrepreneurial competences.
4. To introduce students to the basic steps required for planning, starting and running a business.
5. To familiarise students with the different exit strategies available to entrepreneurs.

Unit	Content (Theory)	Module	Hrs./Unit

1.	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS**
	• Concept, Competencies, Functions and Risks of entrepreneurship
	• Entrepreneurial Values& Attitudes and Skills
	• Mindset of an employee/manager and an entrepreneur
	• Types of Ownership for Small Businesses
	  o Sole proprietorship
	  o Partnerships
	  o Joint Stock company- public limited and private limited companies
	• Difference between entrepreneur and Intrapreneur
			10

2.	**PREPARATION FOR ENTREPRENEURIAL VENTURES** • Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers.		20

	• Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard Feasibility Study Report • Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan • Project Report- Concept, its features and components • Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. <u>They **may not** be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.</u>		
3.	**ESTABLISHING SMALL ENTERPRISES** • Legal Requirements and Compliances needed for establishing a New Unit- o NOC from Local body o Registration of business in DIC o Statutory license or clearance o Tax compliances		03
4.	**START-UP VENTURES** • Concept & Features • Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical • Problems and challenges faced by start-ups. • Start-up Ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. <u>No questions are to be set from the case studies.</u>		04

5.	**FINANCING START-UP VENTURES IN INDIA** • Communication of Ideas to potential investors – Investor Pitch • Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups • Govt Initiatives including incubation centre to boost start-up ventures • MSME Registration for Start-ups –its benefits		06
6.	**EXIT STRATEGIES FOR ENTREPRENEURS** • Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – **Basic Concept only**		02

Examination Scheme of ESE (End Semester Examination)

	Question Type	Question to be set	Questions to be answered	Marks
Theoretical	**MCQ-type questions are carrying one mark.**	**15**	**10**	**10**
	Short answer-type questions carrying one mark.	**15**	**10**	**10**
	Subjective-type questions carrying two marks.	**10**	**6**	**12**
	Subjective-type questions carrying six marks.	**9 (3 each from each of 3 modules)**	**3**	**18**
TOTAL				**60**

Pass Criterion: Students have to obtain at least **40% marks** individually both in Internal assessment and end semester exams to pass.

References:

1. Entrepreneurship Development, Sangeeta Sharma, Prentice Hall of IndiaLearning Private Ltd
2. Entrepreneurship Development, S. Anil Kumar, New Age International

3. Fundamentals of Entrepreneurship, Sangram Keshari Mohanty, Prentice Hall of India Learning Private Ltd
4. Fundamentals of Entrepreneurship, Dr. G.K. Varshney, Sahitya Bhawan Publication
5. Managing New Ventures: Concepts and Caseson Entrepreneurship,Anjan Raichaudhuri, Prentice Hall of India Learning Private Ltd
6. How to Start a Business in India, Simon Daniel Buuks, Chennai
7. Entrepreneurship and Small Business Management, S.S. Khanka S. Chand & Sons, New Delhi
8. Entrepreneurship Development and Business Ethics, Abhik Kumar Mukherjee & Shaunak Roy, Oxford University Press
9. Entrepreneurship Development and Business Ethics, Dr B Chandra & Dr B Biswas, Tee Dee Publications
10. Entrepreneurship Development Small Business Entrepreneurship, Poornima Charantimath, Pearson Education India

Course outcomes:

1. Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
2. Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
3. Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
4. Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

Name of the Course: Diploma in LEATHER GOODS TECHNOLOGY		
Course Title: Fundamentals of Safety Leather Gloves	**Course code :** LGTPE601	
Number of Credit: 2	**Semester: SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration: 15 weeks	**Maximum Marks: 100**	
Theory : - 2 hrs/week	Mid. Sem. Tests	20 Marks
Tutorial: -1 hrs/week	Quizzes, Viva-voce, Assignments	10 Marks
Practical: NIL	Class Attendance	10 Marks
Total Contact Hours: 45 Hours	**End Semester Examination**	60 Marks

Prerequisite: Basic Engineering for Leather Goods and Material Science for Leather Goods-I

Aim: To know designing , manufacturing and quality checking of safety leather gloves

Course Objective:

1. Introduce students about different types of safety gloves.
2. To study different classification of safety gloves
3. To draw and illustrate different types of gloves
4. To interpret size , shapes and patterns of safety gloves as per order
5. To understand materials requirements for making safety gloves
6. To discuss different safety parameter for different types of safety gloves

7. To explain material requirements and testing for exporting safety gloves
8. To identify defects of safety gloves

Course Content:

Content(Theory)		Module	Hrs./Unit
Unit: 1	Introduction, History, Classification, Materials Specification, Discussion on glove leather,	**Module1**	**9**
Unit: 2	Safety gloves designing, pattern making, and construction techniques Physical and Chemical testing of glove leather as well as finished product, Types of machines used in glove manufacturing, Types of threads used, Types of seam. Costing	**Module2**	**15**
Unit: 3	Quality Checking Different Social Audit references. Parameters used for application of Audits. Gloves packaging	**Module3**	**12**
ASSIGNMENTS	Make Pattern for different safety gloves		**9**
Total			**45**

Examination Scheme of ESE (End Semester Examination)

	Question Type	Question to be set	Questions to be answered	Marks
Theoretical	**MCQ-type questions are carrying one mark.**	**15**	**10**	**10**
	Short answer-type questions carrying one mark.	**15**	**10**	**10**
	Subjective-type questions carrying two marks.	**10**	**6**	**12**
	Subjective-type questions carrying six marks.	**9 (3 each from each of 3 modules)**	**3**	**18**
TOTAL				**60**

Pass Criterion: Students have to obtain at least **40% marks** individually both in Internal assessment and end semester exams to pass.

Reference:

TEXT BOOKS
1. “Practical Glove Making” by Isabel M. Edwards. Read Books (24 July 2009).
2. “A Guide to Making Leather Gloves” by Various Authors. Gleed Press (August 17, 2011).

Course outcomes:

Upon completion of this course, students should be able to:

1. Understand different types of safety gloves.
2. Describe different classification of safety gloves
3. Draw and illustrate different types of gloves
4. Interpret size , shapes and patterns of safety gloves as per order
5. Solve materials requirements for making safety gloves
6. Identify defects of safety gloves
7. Calculate safety parameter for different types of safety gloves
8. Make yourself knowledgeable in regards to different Audit applications.

Name of the Course: Diploma in LEATHER GOODS TECHNOLOGY		
Course Title: OPEN ELECTIVE I - Engineering Economics and Project Management	**Course code :** LGTOE1	
Number of Credit: 3	**Semester: FIFTH**	
Teaching Scheme	**Examination Scheme**	
Duration: 15 weeks	**Maximum Marks: 100**	
Theory : - 3 hrs/week	Mid. Sem. Tests	20 Marks
Tutorial: -NIL	Quizzes, Viva-voce, Assignments	10 Marks
Practical: NIL	Class Attendance	10 Marks
Total Contact Hours: 45 Hours	**End Semester Examination**	60 Marks

Prerequisite: NIL

Aim: -

Course Objective:

1. To acquire knowledge of basic economics to facilitate the process of economic decision making.
2. To acquire knowledge on basic financial management aspects.
3. To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
4. To develop an understanding of key project management skills and strategies.

Course Content :

	Content (Theory)	**Module**	**Hrs./Unit**
Unit:1	Unit-I (INTRODUCTION, THEORY OF DEMAND & SUPPLY) 1.1 Introduction to Engineering Economics, the relationship between Engineering and Economics 1.2 Resources, scarcity of resources, and efficient utilization of resources. 1.3 Opportunity cost, rationality costs, and benefits		[9 hours]

	1.4 Theory of Demand: the law of demand, different types of demand, determinants of demand, demand function, price elasticity of demand. 1.5 Theory of Supply: determinants of supply, supply function. 1.6 Market mechanism: Equilibrium, basic comparative static analysis (Numerical problems)		
Unit 2	Unit-II (THEORY OF PRODUCTION & COSTS) 2.1: Concept of production (goods & services), Different factors of production (fixed and variable factors), Short-run Production function (Graphical illustration), and Long run production function (returns to scale). 2.2: Theory of Cost: Short-run and long-run cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost etc.		[10 hours]
Unit: 3	Unit-III (PROJECT ADMINISTRATION) 3.1: Gantt Chart – a system of bar charts for scheduling and reporting the progress of a project (basic concept). 3.2: Concept of Project Evaluation and Review Technique (PERT) and Critical Path method (CPM): basic concept and application with real-life examples.		[8 hours]
Assignment	Assignment (10 Marks) Guideline for Assignment (10 Marks) Students should be instructed to prepare a report on a project (preferably the Major Project they prepare in 6 th Semester), using a popular project management software in IT/Computer Laboratory, under the guidance of the Lecturer in Computer Science & Technology and Lecturer in Humanities.		
Total			**45**

Examination Scheme of ESE (End Semester Examination)				
	Question Type	**Question to be set**	**Questions to be answered**	**Marks**

Theoretical	**MCQ-type questions are carrying one mark.**	**15**	**10**	**10**
	Short answer-type questions carrying one mark.	**15**	**10**	**10**
	Subjective-type questions carrying two marks.	**10**	**6**	**12**
	Subjective-type questions carrying six marks.	**9 (3 each from each of 3 modules)**	**3**	**18**
TOTAL				**60**

Pass Criterion: Students have to obtain at least **40% marks** individually both in Internal assessment and end semester exams to pass.

References:

1. Principles of Economics – Case and Fair, Pearson Education Publication
2. Principles of Economics – Mankiw, Cengage Learning
3. Project planning, analysis, selection, implementation and review –Prasannachandra – Tata McGraw Hill.
4. Project Management – Gopala krishnan – Mcmillan India Ltd

Course outcomes:

Upon completion of this course, students should be able to:

1. Understand basic economics to facilitate the process of economic decision making.
2. Understand basic financial management aspects.
3. Develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
4. Develop an understanding of key project management skills and strategies.

Name of the Course: Diploma in LEATHER GOODS TECHNOLOGY	
Course Title: OPEN ELECTIVE II Export Import Management	**Course code :** LGTOE2
Number of Credit: 3	**Semester: SIXTH**
Teaching Scheme	**Examination Scheme**
Duration: 15 weeks	**Maximum Marks: 100**

Theory : - 3 hrs/week	Mid. Sem. Tests	20 Marks
Tutorial: -NIL	Quizzes, Viva-voce, Assignments	10 Marks
Practical: NIL	Class Attendance	10 Marks
Total Contact Hours: 45 Hours	**End Semester Examination**	60 Marks

Prerequisite:

Aim : The aim of the course is to acquaint the students with the export-import procedures, documentation and logistics and to familiarize students with the role of merchandiser in exports and buying Industry.

Course Objective:

1) To explain the meaning & nature of imports & exports;
2) To know the facets of foreign trade policy;
3) To develop a conceptual understanding of the regulatory framework for exports in India;
4) To highlight the main characteristics of the global trade environment;
5) To provide an exposure regarding export –import management and documentation procedures.

Course Content :

Content (Theory)		**Module**	**Hrs./Unit**
Unit:1	**Introduction to Export & Import:** Export: Meaning & Importance Import: Meaning & Importance Export Vs. Import Basic Planning for Export &Import Registration for Exporters Registration for Importers Export License Import License General provisions regarding Export & Import	Module-1	13
Unit:2	**Regulatory Framework Governing Exports and Imports:** **Laws governing India's export-import (general provisions):** • Foreign trade (Development and Regulation) Act, 1992 • Foreign trade (Development and Regulation) Amendment Bill, 2010 • The Customs Act • GST Act **Government/Semi-government agencies in export-import promotion:** • Ministry of Commerce and Industry • Director General of Foreign Trade(DGFT) • Export Promotion Council (EPC) • Export Inspection Council (EIC) • Export Credit Guarantee Corporation (ECGC)		

	• Directorate General of Commercial Intelligence and Statistics ((DGCI&S) • EXIM Bank • State Trading Corporation of India Ltd.(STC) • Central Board of Indirect Taxes & Customs (CBIC) **Overview of Foreign Trade Policy (2015-2020)** • Legal basis and duration of FTP • Handbook of Procedures (HBP) • e-IEC & e-BRC • Reduction in mandatory documents required for Export and Import • Electronic Data Interchange (EDI) • Self-Assessment of Customs Duty • Time Release Study (TRS) • Towns of Export Excellence (TEE) • Special provision for import of Hides Skins and semi-finished goods • Free Exports • Bonded Warehouses for imports & exports • Import & Export of Samples • Export Promotion Councils (EPC) • Merchandise Exports from India Scheme (MEIS) • Service Exports from India Scheme (SEIS)		
Unit:3	**Export Documentation:** Export Documentation in India: • Aligned Documentation System (ADS) – Meaning & Advantages • Paper Size and Specifications • **Export documents:** Commercial documents & Regulatory documents • **Classification of Commercial and Regulatory Documents:** **Documents related to goods:** Proforma Invoice, Commercial Invoice, Consular Invoice, Legalized Invoice, Customs Invoice, Packing Note and Packing List, Certificate of Origin **Documents related to shipment:** Shipping Bill, Mate's Receipt, Cart Ticket, Certificate of Measurement, Bill of Lading, Airway Bill, Marine Insurance Policy Certificate, Shipping advice	Module-2	13

	Documents related to payment: L/C, Bill of Exchange, Trust Receipt, Bank Certificate of Payment **Documents related to inspection**: Certificate of Inspection **Documents related to excisable goods**: GP Forms (GP-I/GP-II), Form C, ARE-1 Form **Documents related to foreign exchange regulations**: GR/SDF Form, PP Form, VP/COD Form, SOFTEX Form		
Unit:4	**Export procedure:** • **Preliminary Stage** : Export Licensing, Inquiry and Offer, Examination of Terms & Conditions of Export, Export Contract and Confirmation of Acceptance • **Pre-shipment Stage :** Pre-shipment Finance, Production and Procurement of Goods, Shipping Space, Packing and Marking, Quality Control and Pre-Shipment Inspection, Central Excise Clearance, Appointment of Clearing and Forwarding agents, Insurance Cover (ECGC & Marine Policy) • **Shipment Stage:** Documentary Examination at Customs House, Obtaining 'Carting Order' and Customs Physical Examination, Loading cargo on Vessel, Exchange Control Formalities • **Post-shipment Stage:** Presentation of Documents to the Bank, Export Incentives • How to export raw hides, skins and leather? Export clearance formalities to export articles of leather, saddler, harness, travel goods, handbags		
Unit-5	**Import Procedure & Documentation:** **Import Procedure:** • Obtaining Import Export Code (IEC) • Ensuring legal compliance under different trade laws • Procuring import licenses • Filing Bill of Entry & documents to conclude the customs clearance formalities	Module-3	13

	• Determining the import duties to clear goods • Receiving permission to import goods **Import Documentation:** IEC Number, Import License , Bill of Entry, Commercial Invoice Commercial invoice cum packing list, Bill of Lading or Airway Bill, , Certificate of Insurance, Purchase Order or Letter of Credit (L/C), Technical Write-up or Literature (Only required for specific goods), Industrial License (for specific goods), Test Report (If any), Registration cum Membership Certificate (RCMC), GATT/DGFT declaration, DEEC/DEPB/ECGC License for duty benefits		
Unit-6	**INCO Terms & different Methods of Payments in International Trade:** **INCO Terms :** EXW, FCA, CPT, CIP , DAP , DPU , DDP ,FAS, FOB, CFR, CIF **Methods of Payments:** Advance Payment, Letter of credit, Documents against Payments - D.A.P or D/P basis, Documents against Acceptance (D/A)		
Unit-7	**Impact of GST Rates, HSN Codes on Leather Goods Industry:** • **GST Rates :** Meaning of GST Rates, Types of GST Rates and GST Rate structure in India • **HSN Codes** : Meaning & Importance • GST Rate & HSN Code for Raw hides and skins (other than furskins) and leather – Chapter 41 • GST Rate & HSN Code for Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silkworm gut) - Chapter42 GST Rate & HSN Code for Furskins and artificial fur; manufactures thereof - Chapter43		
Assignment	• Students can visit exporters and importers and understanding the practical processes and formalities involved. • Students can also simulate an export order and create a detailed process involving all documentation and procedural aspects.		6
Total			**45**

Examination Scheme of ESE (End Semester Examination)				
	Question Type	**Question to be set**	**Questions to be answered**	**Marks**

Theoretical	**MCQ-type questions are carrying one mark.**	**15**	**10**	**10**
	Short answer-type questions carrying one mark.	**15**	**10**	**10**
	Subjective-type questions carrying two marks.	**10**	**6**	**12**
	Subjective-type questions carrying six marks.	**9 (3 each from each of 3 modules)**	**3**	**18**
TOTAL				**60**

Pass Criterion: Students have to obtain at least **40% marks** individually both in Internal assessment and end semester exams to pass.

References:

1. Export Marketing- TAS Balagopal, Himalaya Publishing House, Mumbai
2. Export Management- D.C. Kapoor, Vikas Publishing House, New Delhi.
3. Handbook of Import-Export Procedures – Ministry of Commerce, Govt. of India.
4. Export Documentation and procedures – Nabhi Publications, New Delhi.
5. Import – Do it Yourself, M.I. Mahajan, Snow White Publications, New Delhi.

Course outcomes:

Upon completion of this course, students should be able to:

1) Identify and evaluate export or import opportunities in Leather Goods Sector.
2) Discuss the insights of procedure to set up an international trading company.
3) Understand the meaning, eligibility and procedure to get IEC Number for export-import business in India.
4) Understand documents involved in export-import activities & custom procedures for export & import in India.
5) Simulate an export / import order and create a detailed process involving all documentation and procedural aspects.

Name of the Course: Diploma in LEATHER GOODS TECHNOLOGY		
Course Title: OPEN ELECTIVE II Industrial Management and Safety	**Course code :** LGTOE2	
Number of Credit: 3	**Semester: SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration: 15 weeks	**Maximum Marks: 100**	
Theory : - 3 hrs/week	Mid. Sem. Tests	20 Marks
Tutorial: -NIL	Quizzes, Viva-voce, Assignments	10 Marks
Practical: NIL	Class Attendance	10 Marks

Total Contact Hours: 45 Hours	End Semester Examination	60 Marks

Prerequisite:

Aim :

Course Objective:

1. Introduce students about the role of managements
2. To understand organizational behavior
3. To understand the role of HRM, Industrial Management
4. To understand the various basic concepts of Hazard, Risk, and Accidents in various industries and their management.
5. To understand the various effects of physical hazards on human health and the various control measures to rectify the same.
6. To understand and identify various hazards in industries and the impact of damages in these areas.
7. To understand the various fire prevention techniques to be followed in leather industries.
8. To evaluate workplace to determine the existence of occupational safety and health hazards.
9. To explain important legislations related to Health, Safety and Environment

Course Content:

UNIT	Topics & Sub-topics	Module	Teaching Hour
➢ **Unit:1** INTRODUCTION TO MANAGEMENT SCIENCE	Principles and function of Management-Contribution of different Management Writers(Henry Fayol, F.W. Taylor, Max Weber) in the field of Management Science. ➢ ORGANISATIONAL BEHAVIOR o Behavior-Motivation-Motivational Theories-Morale-Leadership-Communication.	Module 1	6
➢ **Unit: 2** HUMAN RESOURCE MANAGE MENT	o Human Resource Management-Concept and Definition-Function-Recruitment-Training, Performance Appraisal-Industrial Safety. . INTRODUCTION TO INDUSTRIAL ENGINEERING (Basic Idea), PRINCIPLES OF SHOPFLOOR SUPERVISION WITH EMPHASIS ON 5S, SAFETY AND MOTIVATION.		10
UNIT 3 INTRODUCTION TO INDUSTRIAL SAFETY and INDUSTRIAL HYGIENE	History and Development of Safety Movement, Importance of Safety, Safety Policy: Safety Organization and Its Responsibilities, Accident Sequence Theory, Causes of Accidents, Accident Prevention and Control Techniques Including Near Misses. Risk, Hazards and Dangerous Occurrences. First Aid. Financial Costs-Direct And Indirect Costs of Accidents.		~~6~~

	Industrial Hygiene – Principles and its Control Measures. Permissible Limits. Stress, Exposures to Heat, Heat Balance, Effects of Heat Stress, Chemical Agents, Flammables, Explosives - Types, Water Sensitive Chemicals, Oxidants, Gases Under Pressure, Chemicals Causing Health Hazards: Irritants,		
UNIT 4 **WORKPLACE HAZARDS AND ITS CONTROL**	**Physical Hazards** Illumination - Principles and Purpose of Good Illumination. Standards of Illumination. Ventilation – Principle and Purpose of Ventilation. Classification of Ventilation (Natural and Artificial), Heat Stress – Various Indexes, Different Controls (Including Air Conditioning), Vibration and its Control, Noise Pollution and its Control, Noise Mapping, Personal Protective Aids. Safe Weight Lifting Procedure. Safe Start Up, Shut Down and Emergency Shut Down Procedures. Permit to Work System. **Chemical Hazards** Hazardous Chemicals – Classification and its Properties, Common Hazard and Precautions for Each Class. Safety in Transportation and Bulk Storage of Hazardous Materials. Corrosion Prevention and Preventive Maintenance of Vulnerable Equipment. Safe Entry Into Confined Spaces. Permit to Work System. **Electrical Hazards** Dangers from Electricity. Safe Limits of Voltage and Amperage. Safe Distance from LT and HT Lines. Means of Cutting of Power Overload and Short Circuit Protection. Methods and Importance of Earthing. Earth Fault Protection. Earth Insulation and Continuity Tests. Protection Against Overvoltage. Lighting Arrester, Flame Proof and Intrinsic Electrical Equipment, Precautions in Their Selection, Installation, Maintenance and Use. Control of Hazards due to Static		**10**

	Electricity. Permit to Work System. **Fire Hazards** Chemistry of Fire, Classification of Fire. Common Causes of Industrial Fire. Statutory Provisions Regarding Fire Safety, Factors Contributing Towards Fire. Determination of Fire Load. Fire Resistance of Building Materials. Design of Industrial Plant for Fire Safety. Prevention of Fire: Portable Extinguishers- Water Type Extinguisher, Carbon dioxide Type Extinguisher, Foam Type Extinguisher, Dry Chemical Type Extinguisher. Sprinkle Systems, CO_2 Flooding System Foam Flooding System. Industrial Fire Detection and Alarms. Special Precautionary Measures in Handling/Processing Flammable Liquids, Gases, Vapours, Mists and Dusts. Emergency Action Plan.		
UNIT 5 **OCCUPATIONAL HEALTH**	History of Occupational Health, Concept of Occupational Health, Occupational and Work Related Diseases, Levels of Prevention, Health Examination (Initial and Periodic), Essentials of Occupational Health Services (OHS), Personal Protective Equipment (Respiratory and Non-Respiratory), Ergonomic Controls, Risk Assessment, Risk Management and Risk Tolerance.		**5**
UNIT 6 **INDUSTRIAL SAFETY LEGISLATIONS**	The Factories Rules, Functions of Safety Management, Legislative Measures in Industrial Safety: Factories Act, 1948, Workmen's Compensation Act, 1943, Employees State Insurance Act, 1948. Water (Prevention and Control) Pollution Act, 1974, Boiler Vessels Act. Child Labour and Women Employee Act. ILO Convention and Recommendations in the Furtherance of Safety, Health and Welfare. Occupational Safety, Health and Environment Management: Bureau of Indian Standards on Safety and Health 14489 - 1998 and 15001 – 2000 OSHA (Occupational Safety and Health Administration).		**5**

	Total		42
Suggested Home Assignments/Students' Activities: (any Five)	i. What do you understand by safety, risks and hazards? Differentiate between risks and hazards. ii. What are the various causes of dangerous occurrences arising due to dust, fire and chemicals refereeing different types of industries? iii. Can you measure some control measures to limit the degree of hazards for factories highlighting the "permissible limits" of different pollutants? iv. Draw schematic diagram of any fixed firefighting system (sprinkler/CO2 total flooding/foam flooding system) and describe it. v. Draw the labelled schematic diagram of portable fire extinguishers (showing all internal components) of DCP type, water type, CO2 type and foam type. vi. Classify hazardous chemical and describe the hazards associated with them. vii. Draw a labelled diagram of lighting arrester fitted on a multi-storied building and describe its functional procedure. viii. Briefly describe Factories Act, 1948 and Employees State Insurance Act, 1948.		

Examination Scheme of ESE (End Semester Examination)				
	Question Type	**Question to be set**	**Questions to be answered**	**Marks**
Theoretical	**MCQ-type questions are carrying one mark.**	**15**	**10**	**10**
	Short answer-type questions carrying one mark.	**15**	**10**	**10**
	Subjective-type questions carrying two marks.	**10**	**6**	**12**

	Subjective-type questions carrying six marks.	**9 (3 each from each of 3 modules)**	**3**	**18**
TOTAL				**60**

Pass Criterion: Students have to obtain at least **40% marks** individually both in Internal assessment and end semester exams to pass.

References:

1 "Industrial Engineering and Management" by Dr. Ravi Shankar. Galgotia Publications

2. Industrial Safety, Health and Environment Management Systems, R. K. Jain and Sunil S. Rao, Khanna Publishers

3 A Handbook On Industrial Safety and Fire Management, Ravi Kant Pandey, Chetan Prakashan

4 Principles of Industrial Safety Management, Akhil Kumar Das, PHI Learning Pvt Ltd

5 Industrial Safety Management, L M Deshmukh, McGraw Hill Education

6 Industrial Safety & Environment, Anupama Prashar, S.K. Kataria & Sons

7 Fundamentals of Occupational Safety and Health, Mark A. Friend and James P. Kohn, Government Institutes An imprint of The Scarecrow Press, Inc.

8 Safety in Industry, Brij Mohan Bansal, Woodhead Publishing India Pvt. Ltd.

Course outcomes:

At the end of this course, a student should be able to

1. Understand the role of managements in industry
2. Understand the importance of organizational behavior
3. Understand the role of HRM, Industrial Management
4. Understand the various basic concepts of Hazard, Risk, and Accidents in various industries and their management.
5. Understand the various effects of physical hazards on human health and the various control measures to rectify the same.
6. Understand and identify various hazards in industries and the impact of damages in these areas.
7. Understand the various fire prevention techniques to be followed in leather industries.
8. Evaluate workplace to determine the existence of occupational safety and health hazards.
9. Explain important legislations related to Health, Safety and Environment

Besides the above this course would equip the students to effectively employ hazard analysis techniques in Industry and helpful to prevent the accidents in Industry.

Name of the Course: Diploma in LEATHER GOODS TECHNOLOGY		
Course Title: PROJECT WORK	**Course code :** LGTPE602	
Number of Credit : 3	**Semester : SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration : 15 weeks	**Maximum Marks : 100**	
Theory : - NIL	Continuous Internal Assessment	50 Marks
Tutorial: - NIL	Attendance	10 Marks
Practical : 6 hrs/week		

Total Contact Hours: 90 Hours	**End Semester Examination**	40 Marks

Pre-Requisite: Knowledge of the following subjects:
History of Art and Fashion
Designing Principles and Development
Fashion Studies for leather goods
Fundamental of leather Goods Manufacturing
Material Knowledge for Leather Goods
Creative, Technical Drawing & Pattern Making

Aim: Final Semester Project will provide students to acclimatize the students in the real life work Scenario. Each student depending upon the kind of set-up will be assigned a project/ research brief. It will give an opportunity of industry and academic interface by identifying areas and opportunities for development.

Course Objective:

1. To develop an individual design portfolio highlighting strengths in design and related field.
2. To develop their own style in drawing fashion accessories.
3. To research and apply the same to develop a complete design collection

Content :

	Assignments /Practical	Hrs./Unit
Unit 1	Introduction to Portfolio design & effective visual communication Initial compilation and selection of potential work • Cohesive presentation, Organization, flow and visual pacing. • Concept development, • Layout design & Typography • Digitally editing your photographs • Content Writing and designing • Web knowledge.	20
Unit 2	Introduction to Digital portfolio Importance of digital portfolio Essentials of effective digital portfolio Module III: Development of Portfolio based upon Design assignments & projects of previous semesters Compilation of previous semesters work Developing sketches based on the design briefs given in the current semester.	30
Unit 3	Compilation of the work in the form of a Digital and well as a Hardcopy portfolio. Presentation & Feedback Tutorials & Exercises with different Graphic design techniques and assignments on and composition using basic design software Tutorials & Exercises with different professional software for portfolio design and compilation	30
	Portfolio Presentation	10

	Portfolio presentation of the work compiled throughout the semester	
Total		90

Examination Scheme (End Semester Assessment)		
Practical/Sessional	**Assessment type**	**Marks**
	Assignment on the day of Viva-voce	**20**
	Viva-voce	**20**
Total		**40**

Pass Criterion: Students have to obtain at least **40% marks** individually both in Internal assessment and end semester exams to pass.

Text Reading:

1. M.Oakley , Design management: A handbook of issues and methods
2. Clive Rassam, Design and corporate success
3. Clodfelter, Richard :Retail Buying from Basics to Fashion
4. Arthur D Little, Management Perspectives on Innovation
5. Fairhead, J, Design for a Corporate Culture
6. Lorenz, C, The Design Dimension
7. Rickards, J, Creativity at work

References:

8. Rickards, J, Stimulating Innovation
9. Jones, J.C, Essays in Design
10. Koestler, A, The Act of Creativity
11. Design Digest
12. Business World
13. Textile View
14. **https://www.slideshare.net/**
15. **ggosp.com**
16. **https://in.pinterest.com/**
17. **https://www.behance.net/**

Course Outcomes:

At the end of the course the students will develop the ability to:

1. Apply analytical, creative, and intellectual competencies when creating solutions for design projects and assignments.
2. Demonstrate an advanced ability to create complex design ideas and analyze the skills required to produce work that meets professional criteria and standards of excellence.
3. Evaluate critical thinking skills when developing solutions to design projects and assignments.
4. Understand, identify, explain and apply advanced skill sets to design range that meet the needs of specialized industry market categories

Name of the Course: Diploma in LEATHER GOODS TECHNOLOGY		
Course Title: Seminar on Project	**Course code : LGTPE603**	
Number of Credit : 1	**Semester : SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration : 15 weeks	**Maximum Marks : 100**	
Theory : - NIL	Continuous Internal Assessment	50 Marks
Tutorial: - NIL	Attendance	10 Marks
Practical : 1 hrs/week		
Total Contact Hours: 15 Hours	**End Semester Examination**	40 Marks

Prerequisite: Basic Computer knowledge and the subjects taught in Sem iii, iv, v.

Aim : improving communication skills, gaining expert knowledge, networking with others and renewing

Course Objective:

1. Introduce students about seminar and their presentation process
2. To understand topics of seminar
3. To discuss the techniques of attractive presentation
4. To explain individual seminar and group presentation
5. To describe dress code and rules for presentation
6. To develop interpersonal skill for seminar
7. To illustrate the PPT presentation
8. Prepare students so that can present themselves properly in seminar and any other types of presentation

Content :

	Assignments /Practical	Hrs./Unit
Unit 1	Designing Leather Goods- inspiring from Art and any fashion movement, and develop a range Trend and fashion forecasting Comparison of east and west culture and art ➢ Exercise on Making Mood Board ➢ Exercise on Develop design from mood board colour board and material board Exercise on Making Range ➢ Do short term Forecasting and Make trend boards based on market and consumer research for brand belonging to categories: Niche, Mass market, Fast Fashion Application of supply chain management Application of lean management Leather cutting wastage management Time and motion study Production floor planning SQC/TQM	12

	Leather Goods Costing E-commerce Product and fashion photography Or any relevant subjects	
Unit 2	PPT Making & Presentation	3
Total		**15**

Examination Scheme (End Semester Assessment)		
Practical/Sessional	**Assessment type**	**Marks**
	Assignment on the day of Viva-voce	**20**
	Viva-voce	**20**
Total		**40**

Pass Criterion: Students have to obtain at least **40% marks** individually both in Internal assessment and end semester exams to pass.

Reference Materials:

1. **https://www.slideshare.net/**
2. **ggosp.com**
3. **https://in.pinterest.com/**
4. **https://www.behance.net/**

Course Outcomes:

Upon completion of this course, students should be able to:

1. Introduce themselves in seminar
2. Understand presentation techniques and timing
3. Understand the techniques for attractive presentation
4. Demonstrate individually and in group presentation
5. Understand dress code and rules for presentation
6. Develop interpersonal skill for seminar
7. Make PPT presentation
8. Give presentation.
9. Conduct Q&A

Name of the Course: Diploma in LEATHER GOODS TECHNOLOGY		
Course Title: Port Folio Development	**Course code : LGTPC604**	
Number of Credit : 2	**Semester : SIXTH**	
Teaching Scheme	**Examination Scheme**	
Duration : 15 weeks	**Maximum Marks : 100**	
Theory : - NIL	Continuous Internal Assessment	50 Marks
Tutorial: - NIL	Attendance	10 Marks
Practical : 4 hrs/week		
Total Contact Hours: 60 Hours	**End Semester Examination**	40 Marks

Prerequisite: Knowledge of subjects taught upto sem 4

Aim - The Module developing portfolio to reflect students' creativity and showcases their work to the potential clients. It serves as a true example of what you are capable of and what abilities you have to offer.

Course Objective:

1. To develop necessary skills to capture the details of a product through analytical and technical drawing.
2. To synthesize and apply Design skills in product realization ideas and other market related aspects and costing.
3. To identify and use different advanced GIS technic
4. To develop overall idea of carrying out a project on Leather Goods.
5. To prepare report including drawing/chart/tables etc.

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Content :

	Assignments /Practical	Hrs./Unit
Unit:1	GUIDELINES: After completion of Second Year students are supposed to go for the Summer Internship and make project in this following area.. DEPARTMENT WISE PROJECT **Sample Department** Trend research, Range building/ **Merchandising** Different work order making Business developing and Lead Generation different email drafting, Seasonal Catalogue development Company profile making/ Website modification Market research, Product photography, presentation, Buyer communication by Export import data management **Cad** Brochure making, Cutting & production pattern making **Store**(Leather and Non leather) Material Identification techniques (Material Testing)/ Material Swatch card/Catalogue making, **Costing** Cost Sheet generation (Initial, Production) **Production** A. Cutting Dept. Wastage minimization B. Fabrication Work study, Management of Line/group, Line/group output optimization	30

	Quality control and Packing TQM, Line QC, Final QC (Quality parameters) Packing space management, material management Cost effective packaging	
	A hypothetical project can be developed where employer guide to pick up a brand and develop range of 3 bags (Small, Medium, Large)	30
		60

Examination Scheme (End Semester Assessment)

	Assessment type	**Marks**
Practical/Sessional	**Assignment on the day of Viva-voce**	**20**
	Viva-voce	**20**
Total		**40**

Pass Criterion: Students have to obtain at least **40% marks** individually both in Internal assessment and end semester exams to pass.

Reference Materials:

1. **https://www.slideshare.net/**
2. **ggosp.com**
3. **https://in.pinterest.com/**
4. **https://www.behance.net/**

Course Outcomes:

Upon completion of this course, students should be able to:

1. prepare a detailed project report based on the work they have done in the industry and as per the industry guide's instructions.
2. Undertake any advanced project on Leather Goods.

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Mechanical Engineering [ME]

Part-III (6th Semester)

2023

CURRICULUM STRUCTURE FOR PART-III (SEMESTER 6) OF THE FULL-TIME DIPLOMA COURSES IN MECHANICAL ENGINEERING

BRANCH: **MECHANICAL ENGINEERING**				**SEMESTER 6**						
SL No	**Category**	**Code No**	**Course Title**	**L**	**P**	**Total Class per week**	**Credit**	**Full marks**	**Internal Marks**	**ESE Marks**
1	**Program Core**	**MEPC302**	**Design of Machine Elements**	**3**		**3**	**3**	**100**	**40**	**60**
2	**Program Core**	**MEPC304**	**Work, Organization & Management**	**3**		**3**	**3**	**100**	**40**	**60**
3	**Program Elective**	**MEPE302**	**Program Elective (with Lab)**	**2**		**2**	**2**	**100**	**40**	**60**
4	**Humanities and Social Science**	**HS302**	**Entrepreneurship and Start-ups**	**3**		**3**	**3**	**100**	**40**	**60**
5	**Open Elective**	**MEOE302**	**Open Elective (Compulsory)**	**3**		**3**	**3**	**100**	**40**	**60**
6	**Open Elective**	**MEOE304**	**Open Elective**	**3**		**3**	**3**	**100**	**40**	**60**
7	**Program Elective**	**MEPE304**	**Program Elective Lab**		**2**	**2**	**1**	**100**	**60**	**40**
8	**Major Project**	**PR302**	**Major Project**		**6**	**6**	**3**	**100**	**60**	**40**
9	**Seminar**	**SE302**	**Seminar**	**1**		**1**	**1**	**100**	**100**	**0**
Total				**18**	**8**	**26**	**22**	**900**	**460**	**440**

STUDENT CONTACT HOURS PER WEEK: 26hours (Lecture-18 hours; Practical-8 hours)
Theory and Practical Period of 60 minutes each.
FULL MARKS-900 (Internal Marks-460; ESE Marks-440)
L-Lecture, P-Practical, ESE- End Semester Examination

Credit Distribution	**Credit**
Program Core	6
Program Elective	3
Open Elective	6
Project + Seminar	4
Humanities and Social Science	3
Total	22

Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately in each subject.

Sl. No.	**Program Elective (with Lab)**		**Credit**
1.	Mechatronics (Sub code: MEPE302/1)	Any one	2
2.	Oil Hydraulics & Pneumatics (Sub code: MEPE302/2)		

Sl. No.	**Open Elective**		**Credit**
1.	Engineering Economics & Project Management (***Compulsory for all Branches***) [Sub code: MEOE302]		3
2.	Electrical Machines& Controls(Sub code: MEOE304/1)	Any one	3
3.	Environment Engineering & Science(Sub code: MEOE304/2)		

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Name of the Course: Diploma in Mechanical Engineering	
Category: Programme Core	**Semester : Sixth**
Code No. : MEPC302	**Full Marks : 100**
Course Title : Design of Machine Elements	**Examination Scheme :** (i) **External Assessment : 60** marks (End Semester Examination) (ii) **Internal Assessment: 40** marks [Class test : 20 marks Assignment / viva voce : 10 marks Class attendance : 10 marks]
Duration : 17 weeks (total hours per week = 3)	
Total lecture class/week : 3	
Credit : 3	
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

1. Course outcomes (COs):

After completion of this course, the student will be able to -

a) Analyze the various modes of failure of simple machine parts under different load patterns.
b) Design simple machine parts and prepare part and assembly drawings as per the designed dimensions.
c) Use design data books and different IS codes of design for the selection of materials for given applications.
d) Calculate weight and various costs of different items such as pattern, casted parts, machined parts, forged parts etc.

2. Theory Components:

The following topics/subtopics should be taught and assessed in order for achieving the course outcomes to attain the identified competency.

Unit	Topics & Sub-topics	Teaching Hour
UNIT 1: **Introduction to Machine Design**	1.1. General considerations in machine design, Aesthetic considerations regarding shape, size, colour & surface finish. 1.2. Fatigue, Endurance Limit, Creep and creep curve. 1.3. Factor of safety and its selection criteria. 1.4. Stress concentration, its causes and remedies. 1.5. Use of design data books, Use of standards in design. 1.6. Types of failures.	**06**
UNIT 2: **Design of Simple Machine Parts**	2.1. Socket & Spigot type Cotter joint. 2.2. Knuckle Joint. Design of Bolt: 2.3. Basic types of screw fastening. 2.4. Stresses in screwed fasteners.	**08**

	2.5. Bolts of Uniform Strength. 2.6. Design of Eyebolt.	
UNIT 3: **Design of Shafts, Keys, Couplings & Flat Belt Pulleys**	*Design Of Shafts:* 3.1 Types of shafts, Shaft materials, Standard sizes. 3.2 Design of solid shaft and hollow shaft on strength basis and torsional rigidity basis. *Design of Keys:* 3.3 Types of keys & Applications, design of Saddle key and Sunk key. 3.4 Effect of keyways on strength of shaft. *Design of Couplings:* 3.5 Types of coupling and applications, design of rigid type flange coupling. Design of Pulley: 3.6 Types of pulleys and applications, design of Flat belt C.I. pulley.	**10**
UNIT 4: **Design of Welded Joints**	*Design of Welded Joints:* 4.1. Types of fillet joints. 4.2. Strength of parallel fillet welds. 4.3. Strength of transverse fillet welds. 4.4. Axially loaded symmetrical section welded joints. 4.5. Merits and demerits of threaded joints, riveted joints and welded joints.	**06**
UNIT 5: **Antifriction Bearings**	5.1 Classification and applications of bearings, comparison of sliding contact & rolling contact bearings, bearing materials. 5.2 Terminology of ball bearings-Load-Life relationship, Static load carrying capacity and Dynamic load carrying capacity, Equivalent-limiting load, limiting speed. 5.3 Selection of ball bearings using manufacturer's catalogue. 5.4 Bearing failure –causes & remedies.	**06**
UNIT 6: **Estimating & Costing**	6.1 Introduction to estimating& costing, Elements of costing. 6.2 Determination of weight of various parts such as simple bush, flanged pipe, lathe centre, rivet, bolt head, ring, cotter and knuckle pin. 6.3 Estimation of selling price of simple engineering parts. 6.4 Estimation of fabricated jobs such as simple cylindrical tank & cuboidal tank.	**09**
Sub Total : Total Lecture Classes		**45**
No. of classes required for conducting Internal Assessment examination		**6**
Grand Total:		**51**

3. Suggested Home Assignments/Students' Activities: (any four)

a) Assignment on the selection of materials for given applications using design data book. Also, list the mechanical properties of material selected.

b) Problems on design of simple machine parts like Cotter Joint / Knuckle Joint with free hand sketches of all types of failure of each component.

c) Problems on design Flange Coupling / Flat belt C.I. pulley with free hand sketches of all types of failure of each component.

d) ASME Code for shaft design (in case of line shaft carrying a pulley supported between bearings or one overhung pulley.

e) Problems on design of welded joints with parallel fillet welds /transverse fillet welds / combination of them, axially loaded symmetrical section welded joints.

f) Prepare a chart for various types of antifriction bearings along with their materials & applications, causes of failure of bearing and their remedies.

g) Problems on weight and cost calculation of different parts such as flanged pipe, lathe centre, rivets, bolts & nuts, wooden pattern of flange etc.

h) Problems on overhead cost calculation, selling price calculation.

4. **Suggested scheme for question paper design for conducting internal assessment examination:** (Duration: 45 minutes)

Questions to be set as per Bloom's Taxonomy				
	Distribution of Theory Marks			
	Level 1 (Remember)	Level 2 (Understand)	Level 3 (Apply & above)	Total
Class Test - 1	4	8	8	20
Class Test - 2	4	8	8	20

Suggested scheme for End Semester Examination: [Duration 2.5 hours]

Multiple Choice Type Questions (Carrying 1 mark each)				
Group	Unit	To be Set	To be Answered	Total Marks
A	1 & 2	09	20	20 x 01 = 20
	3 & 4	09		
	5 & 6	07		
	Total:	25	20	20
Subjective Type Questions(Carrying 8 marks each)				
Group	Unit	To be Set	To be Answered	Total Marks
B	1, 2, 3	04	05 (At least two from each group))	05 x 08 = 40
C	4, 5 & 6	05		
	Sub Total: (B + C):	**09**	**05**	**40**
			Total [A+B+C]:	**60**

6. Rubrics for the Assessment of Students Activity: (20 marks)

Sl. No.	**Performance Indicators**	**Weightage in %**	
1	In time submission of home assignment/micro-project/internet search on specific topic, preparation of chart, creation of innovative model etc.		40
2	Viva voce		60
2a	Communication skill	10	
2b	Technical interpretation skill	10	
2c	Answering / Conclusion with justification	40	
		Total:	100

7. Suggested Learning Resources:

Sl. No.	Title of Book	Author	Publication
1	Introduction to Machine Design	V.B. Bhandari	Tata Mc-Graw Hill
2	Machine Design	Sharma & Agarwal	S.K. Kataria& Sons
3	Machine Design	R. S. Khurmi	S. Chand & Co.
4	Machine Design	R. K. Jain	Khanna Publication
5	Machine Design, Drawing, Estimating & Costing	A.R. Basu	Dhanpat Rai
6	Design Data Book	V.B. Bhandari	Tata Mc-Graw Hill
7	Hand Book of Properties of Engineering Materials & Design Data for Machine Elements	Abdulla Shariff	Dhanpat Rai & Sons

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<table>
<tr><th colspan="8">Name of the Course: Diploma in Mechanical Engineering</th></tr>
<tr><td colspan="4">Course Title : Work, Organization & Management</td><td colspan="4">Semester : Sixth</td></tr>
<tr><td colspan="4">Category: Programme Core</td><td colspan="4">Full Marks: 100</td></tr>
<tr><td colspan="4">Code No. : MEPC304</td><td colspan="4">Examination Scheme:</td></tr>
<tr><td colspan="4" rowspan="3">Duration : 17 weeks</td><td colspan="4">External Assessment</td></tr>
<tr><td colspan="3">End Semester Examination</td><td>60</td></tr>
<tr><td colspan="4">Internal Assessment</td></tr>
<tr><td colspan="4" rowspan="3">Teaching Scheme</td><td colspan="2">Class Test :</td><td>20</td><td rowspan="3">40</td></tr>
<tr><td colspan="2">Assignment/Student activity</td><td>10</td></tr>
<tr><td colspan="2">Class attendance</td><td>10</td></tr>
<tr><td>L</td><td>T</td><td>Total</td><td>Credit</td><td colspan="2"></td><td>Total</td><td>100</td></tr>
<tr><td>3</td><td></td><td>3</td><td>3</td><td colspan="4"></td></tr>
<tr><td colspan="8">Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.

Assignment / Student Activity: Submission of Home assignment, submission of report after conducting site visit/ industry visit/ micro-project / market survey / internet search on specific topic, preparation of chart, creation of innovative model or present seminar on specific topic which is suitable for the given subject as per instruction of subject teacher.</td></tr>
</table>

1. **Course Outcomes:**
   Students will be able to:
   a. Understand the concept of management and organizational structure.
   b. Gain knowledge on work-study and workplace designs and evaluate standard time.
   c. Analyze the strategic issues and strategies required to select, develop and train work force.
   d. Understand the importance of Production planning & control and what is required for quality inspection.
   e. Apply various purchasing method, inventory control techniques in practice.

2. **Theory Components:**

Unit	Topics	Teaching Hours
Unit: 1 Management Process	-Concept of Business and management - Introduction to types of business – Service, Manufacturing , Trading - Introduction to types of Industry – Engineering Industry (Heavy & Light Engineering Industries), Process Industry , - Resources of management, primary and Secondary objectives of management -Introduction to types of management according to nature of Organization -	08

	Industrial Management, Hotel management , Sports management, Transport management , Event management etc. (types only) -Introduction to types functional areas of management -- Human resources management , Materials management, Financial management, Production management - Principles of Scientific management by F.W.Taylor - Principles of Management (14 principles of Henry Fayol) - Functions of Management -Planning, Organizing, Directing, Controlling	
Unit: 2 Organizational Management	-Definition - Types of organization – Line, Line & staff, Functional, Project -Authority & Responsibility, Span of Control	03
Unit: 3 Human Resource Management	-Objectives & Functions of Human resource Management -Recruitment & selection - process; Training & Development - Types of training – Induction, Skill Enhancement; Performance appraisal, Merit rating. Leadership & Motivation - Styles of Leadership; Qualities of a good leader; Motivation; Maslow's Theory of Motivation, Factors for motivation; Safety Management- Causes of accident, Safety precautions; Fire Safety - Fire triangle, classification of fire, Different extinguishing Modes;	06
Unit: 4 Materials Management and inventory control	-Objectives & Functions of materials Management Purchase procedure – steps involved in purchasing Stores Management – Functions, BIN card - objectives of inventory control Maximum & Minimum Stock, Lead Time, Reorder Level- Economic Order Quantity ABC analysis and VED analysis of Inventory, Break Even analysis,	06
Unit: 5 Work Study	Work Study- Method Study- Objectives, Selection of work ; Basic procedure for conduct of Method study, Flow process chart(Names only) Flow Process chart symbols, Work Measurement - Objectives, steps involved in work measurement, Time study, procedure of Time Study, Time Study Equipment. Standard Time, Allowances, PMTS.	05
Unit: 6 Plant location, Plant layout	Plant Location - Factors affecting Site Selection, Plant Layout – Objectives & principles of good plant lay out, Types of plant lay out based on types of production - Job production, Batch Production, Mass production, Productivity and types. Material handling – Need and Types of material handling devices.	05
Unit: 7 Introduction to Production Planning and Control	Production planning – Definition of planning, sequencing, Routing, Scheduling, loading, dispatching, follow up, Inspection, corrective action.	04
Unit:8 Introduction to Plant Maintenance	Importance of plant and machinery maintenance, Types of maintenance- breakdown, scheduled, Preventive & Predictive maintenance	04

Unit : 9 Inspection and Introduction to Quality Control	Purpose of inspection, Inspection of – incoming materials- in-process – Finished goods Concept Quality, quality Control, Brief introduction of Total quality Management (TQM), Quality circle, Concept of ISO series, Benefits of ISO	04
	Sub Total : Total Lecture Classes	45
	No. of classes required for conducting Internal Assessment	06
	Grand Total :	51

3. Suggested Home Assignments/Students' Activities: (any four)

i. Preparation of chart to show the different types of organization.
ii. Preparation of chart for fire safety.
iii. Preparation of chart for personal, Tools & Equipment and products safety.
iv. Preparation of chart showing layout of material handling system for a given application (coal handling system in power plant / Ash handling system / manufacturing industry / foundry shop / etc.)
v. Preparation of a flow process chart and operation process chart.
vi. Preparation of EOQ model
vii. Prepare charts for showing steps of recruitment, types of training and performance appraisal & merit rating
viii. Preparation of chart of maintenance of machinery used in an engineering industry
ix. Prepare a report on types of inspection and Total Quality Management.

4. Suggested scheme for question paper design for conducting internal assessment examination:

(Duration: 45 minutes)

Questions to be set as per Bloom's Taxonomy				
	Distribution of Theory Marks			
	Level 1(Remember)	Level 2(understand)	Level3 (Apply &above)	Total
Class Test -1	4	8	8	20
Class Test -2	4	8	8	20

f. **Suggested Scheme for End Semester Examination** [Duration3 hours]

A: Multiple Choice Type Questions(Carrying 1 mark each)				
Group	Unit	To be Set	To be Answered	Total Marks
A	1, 2 & 3	08	20	20x01=20
	4, 5 & 6	10		
	7, 8 & 9	07		
	Total:	25	20	**20**
B: Subjective Type Questions (Carrying 08 marks each)				
Group	Unit	To be Set	To be Answered	Total Marks
B	1, 2, 3 & 4	04	05 (taking at least one from each group)	05 x 08=40
C	5, 6, 7, 8 & 9	05		
	Total:(B + C)	09	05	**40**
			Total[A+B + C]:	**60**

6. **Suggested Learning Resources:**

Sl. No.	Title of Book	Author	Publication
1.	Industrial Engineering and Management	O.P. Khanna	Dhanpat Rai & Sons
2	Production & Operations Management	Kanishka Bedi	Oxford University Press
3	Essentials of Management	Joseph L. Massie,	Prentice-Hall of India, New Delhi 2004.
4	Industrial Engineering & Management	S. C. Sharma,	Khanna Book Publishing Co. (P) Ltd., Delhi
5	Management Principles, Processes & Practices	A.Bhattaraya & A.Kumar	Oxford University Press
6	Production & Operation Management	M.T.Telsang	S.Chand

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Name of the Course: **Diploma in Mechanical Engineering**	
Category: Program Elective	**Semester : Sixth**
Code No.: MEPE 302/1	**Full Marks : 100**
Course Title: Mechatronics	**Examination Scheme:**
Duration : 17 weeks (Total class hour/week = 2)	(i) **External Assessment**: **60** marks (End Semester Examination)
Total lecture class/week: 2	
Credit : 2	(ii) **Internal Assessment**: **40** marks [Class Test : 20 marks Assignment/ viva voce: 10 marks Class attendance : 10 marks]
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

1. Course Outcomes (COs):

After completion of this course, the students should be able to:

a) Understand and demonstrate the basic concept of Mechatronics.
b) Demonstrate the application of Mechatronics in Manufacturing.
c) Identify different components, interpret their function and demonstrate the working of a given Mechatronics System.
d) Understand the basic concept and application of CNC machines, Part Programming and Industrial Robotics.

2. Theory Components:

The following topics / subtopics should be taught and assessed in order to develop unit outcomes for achieving the identified course outcomes.

Unit	Topics and Sub-topics	Teaching Hours
Unit: 1 Introduction to Mechatronics	1.1. Definition of mechatronics. 1.2. Mechatronics in manufacturing, products and design.	**2**
Unit 2 Elements in Mechatronics	2.1. Basic working principle and applications of data conversion devices, sensors (Displacement, Position and Proximity Sensors, Velocity and Motion Sensors, Force Sensors, Fluid Pressure Sensors, Flow Sensors, Liquid Level Sensors, Temperature Sensors and Light Sensors), micro-sensors, transducers, signal processing devices and timers.	**6**
Unit: 3 Processors and Controllers	3.1. Basic working principle and applications of Microprocessors and Microcontrollers. 3.2. Basic working principle and applications of PID Controllers and PLCs.	**4**
Unit: 4	4.1. Basic working principle and applications of stepper motors and servo	**6**

Drives and Mechanisms of an Automated System	drives. 4.2. Basic working principle and applications of ball screws, linear motion bearings and cams. 4.3. Basic concept and application of systems controlled by camshafts and electronic cams. 4.4. Basic concept and application of tool magazines and indexing mechanisms.	
Unit: 5 Hydraulic Systems	5.1. Components, their symbol and functions of Hydraulic Systems: Pumps, Control Valves (Pressure Control Valves, Flow Control Valves and Direction Control Valves) and Actuators (Linear Actuators and Rotary Actuators). 5.2. Design of hydraulic circuits (Meter in, Meter out circuits and Sequencing circuit) 5.3. Application of hydraulic systems.	**5**
Unit: 6 Pneumatic System:	6.1. Components, their symbol and functions of Pneumatic Systems: Compressors, Control Valves (Pressure Control Valves, Flow Control Valves and Direction Control Valves), Actuators (Linear Actuators and Rotary Actuators), FRL Unit and Silencers. 6.2. Production, distribution and conditioning of compressed air. 6.3. Design of pneumatic circuits (Meter in, Meter out circuits and Sequencing circuit). 6.4. Application of pneumatic systems.	**5**
Unit: 7 CNC Technology and Robotics:	7.1. Basic concept and application of CNC machines and part programming. 7.2. Basic concept and application of Industrial Robotics.	**2**
	Total Lecture Classes (Sub Total):	**30**
	No. of classes required for conducting Internal Assessment:	**04**
	Grand Total :	**34**

3. **Suggested Home Assignments / Student Activities:** (Any Four)

Other than classroom and laboratory learning, following are the suggested student related co-curricular activities which can be undertaken to accelerate the attainment of the various outcomes in the course:

Note:

A suggested list of home assignments / student activities is given here. Similar home assignments / student activities could be added by the concerned faculty member also. **Four (04)** home assignments / student activities are to be undertaken by an individual student that needs to be assigned to him / her by the concern faculty member during the course. Students should prepare and submit report for each of their assignment / activity.

a) Prepare a chart of sensors and transducers showing their functions and applications.
b) Prepare a comparative study on Microprocessors and Microcontrollers for demonstration purpose.
c) Prepare a comparative study on of PID Controllers and PLCs for demonstration purpose.
d) With a flow diagram show the basic components, state their functions and overall working of a mechatronics system.
e) Prepare a report on application of mechatronics in manufacturing.
f) With a suitable diagram explain the working of a re-circulating ball screw nut mechanism.
g) Prepare a chart showing the symbols and stating the function of different components of a hydraulic system.
h) Prepare a chart showing the symbols and stating the function of different components of a pneumatic system.
i) Prepare a comparative study on hydraulic & pneumatic systems for demonstration purpose.

j) Identify different components, interpret their function and demonstrate the working of a given sequencing hydraulic circuit as assigned by the concern teacher.
k) Develop, draw and explain a suitable hydraulic / pneumatic circuit which may be used for speed controlling a hydraulic / pneumatic actuator.
l) Prepare a chart containing the labelled diagram of a CNC Machine showing all of its components and their functions.
m) Prepare a Part Programming for CNC Turning Centre (CNC Lathe) using different codes for a specific job as assigned by the subject teacher.
n) Prepare a Part Programming for CNC Machining Centre (CNC Milling) using different codes for a specific job as assigned by the subject teacher.

4. Suggested Scheme for Question Paper Design for Conducting Internal Assessment: (Duration: 45 Minutes)

Questions to be set as per following Bloom's Taxonomy				
Internal Assessment	Distribution of Theory Marks			
	Level 1 (Remember)	Level 2 (Understand)	Level 3 (Apply & above)	Total
Class Test: 1	4	8	8	20
Class Test: 2	4	8	8	20

5. Suggested Scheme for End Semester Examination: (Duration: 2.5 hours)

Multiple Choice Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
A	1, 2, 3 & 4	15	20	20 x 01 = **20**
	5, 6 & 7	10		
	Sub-Total [A]:	**25**	**20**	**20**
Subjective Type Questions (Carrying 8 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
B	1, 2, 3 & 4	05	05 (At least two from each group)	05 x 08 = **40**
C	5, 6 & 7	04		
	Sub-Total [B+C]:	**09**	**05**	**40**
			Total [A+B+C]:	**60**

6. **Rubrics for the assessment of students' activity:**

Sl. No.	**Performance Indicators**
1	Originality of completing the Assigned task / micro-project work
2	Presentation Skill
3	In time submission of assignment work / micro-project work
4	Viva voce

7. Suggested Learning Resources:

Sl. No.	Title of Book	Author	Publication
01	Mechatronics - Electronic Control Systems in Mechanical and Electrical Engineering	Bolton W.	Pearson Education Ltd.
02	Introduction to Mechatronics and Measurement Systems	Histand B.H. and Alciatore D.G.	Tata McGraw Hill
03	Programmable Logic Controllers	John W. Webb and Ronald Reis	Prentice Hall of India
04	Programmable Logic Control – Principles and Applications	NIIT	Prentice Hall of India
05	Programmable Logic Controller & Industrial Automation	Mitra & Sengupta	Penram International Publishing (India) Pvt. Ltd.
06	Sensors for Mechatronics	Paul P.L. Regtien	Elsevier
07	Introduction to Mechatronics	Appu Kuttan K.K.	Oxford
08	Process Control Principles & Applications	Surekha Bhanot	Oxford
09	Mechatronics Systems Design	Kolk R.A. and Shetty D.	Vikas Publishing, New Delhi
10	Mechatronics Principles, Concepts and Applications	Mahalik N.P.	Tata McGraw Hill
11	A Text book of Mechatronics	R.K.Rajput	S. Chand
12	Mechatronics	H.M.T.	Tata McGraw Hill
13	Mechatronics	Ramachandran	Wiley

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"Karigori Bhavan", 4th Floor, Plot No. B/7, Action Area-III, New Town, Rajarhat, Kolkata-700160

Name of the Course: **Diploma in Mechanical Engineering**	
Category: Program Elective	**Semester : Sixth**
Code No.: MEPE 302/2	**Full Marks : 100**
Course Title: Oil Hydraulics and Pneumatics	**Examination Scheme:**
Duration : 17 weeks(Total class hour/week = 2)	(iii) **External Assessment**: **60** marks (End Semester Examination)
Total lecture class/week: 2	
Credit : 2	(iv) **Internal Assessment**:**40** marks [Class Test : 20 marks Assignment/ viva voce: 10 marks Class attendance : 10 marks]
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

1. Course Outcomes (COs):

After completion of this course, the Students should be able to:

e) Understand the basic concept, advantages, limitations and applications of Fluid Power Systems (Oil Hydraulic and Pneumatic Systems).
f) Identify and understand the function of various components of Oil Hydraulic & Pneumatic Systems.
g) Understand and demonstrate the working principle of various components used for Oil Hydraulic & Pneumatic Systems.
h) Develop simple Oil Hydraulic and Pneumatic Circuits for specific requirement.

2. Theory Components:

The following topics / subtopics should be taught and assessed in order to develop unit outcomes for achieving the identified course outcomes.

Unit	Topics and Sub-topics	Teaching Hours
Unit: 1 Introduction to Oil Hydraulic and Pneumatic Systems	1.1. Basic concept of fluid power systems. 1.2. Practical applications, advantages and limitations of fluid power systems. 1.3. Classification of fluid power system. 1.4. General layout, basic components, their functions and applications of oil hydraulic system. 1.5. General layout, basic components, their functions and applications of pneumatic system. 1.6. Comparison of oil hydraulic & pneumatic systems.	**05**
Unit: 2 Components of Oil Hydraulic Systems	2.1. Classification, function and symbols of oil hydraulic pumps. 2.2. Working principle and construction of vane pumps, gear pumps and piston pumps. 2.3. Types, symbols and working of pressure control valves (pressure relief valve, pressure-reducing valve, unloading valve and sequence valve).	**10**

	2.4. Types, symbols and working of direction control valves–check valve, poppet type DCV and spool type DCV (spool positions of 3/2, 4/2, & 4/3). Method of actuation of DCV. 2.5. Types, symbols and working of flow control valves - pressure compensated and non-pressure compensated flow control valve. 2.6. Types, symbols and working of oil hydraulic actuators (rotary and linear actuators). 2.7. Function and symbols of oil hydraulic accessories (oil filter, intensifier and accumulator).	
Unit: 3 Oil Hydraulic Circuits	3.1. Control circuits of single acting / double acting linear hydraulic actuators / hydraulic motor. 3.2. Meter in, Meter out circuits, bleed off circuit. 3.3. Pump unloading circuit. 3.4. Motion synchronization circuit. 3.5. Sequencing circuit. 3.6. Accumulator Circuits.	**07**
Unit: 4 Components of Pneumatic System	4.1. Types, function and symbols of compressors and air receiver. 4.2. Working principle and construction of reciprocating compressors and rotary compressors (Screw compressor and vane compressor only). 4.3. Types, symbols and working of pneumatic pressure control valves, flow control valves and direction control valves (3/2, 4/3, 5/2). Working principle of poppet type 3/2 DCV. 4.4. Types, symbols and functions of pneumatic actuators (rotary and linear actuators). 4.5. Functions and symbols of pneumatic accessories (FRL unit& silencer).	**05**
Unit: 5 Pneumatic Circuits	5.1. Control circuits of single acting / double acting linear pneumatic actuators / Air motor 5.2. Meter in& Meter out circuits. 5.3. Sequencing circuits.	**03**
	Total Lecture Classes (Sub Total):	**30**
	No. of classes required for conducting Internal Assessment:	**04**
	Grand Total :	**34**

3. **Suggested Home Assignments / Student Activities:** (Any Four)

Other than classroom and laboratory learning, following are the suggested student related co-curricular activities which can be undertaken to accelerate the attainment of the various outcomes in the course:

Note:

A suggested list of home assignments / student activities is given here. Similar home assignments / student activities could be added by the concerned faculty member also. Four (04) home assignments / student activities are to be undertaken by an individual student that needs to be assigned to him / her by the concern faculty member during the course. Students should prepare and submit report for each of their assignment / activity.

a) Prepare a report on unique features and applications of fluid power systems for demonstration purpose.
b) Prepare an extensive comparative study on oil hydraulic & pneumatic systems for demonstration purpose.
c) Prepare a comparative study on positive displacement pump and non-positive displacement pump for demonstration purpose.
d) Deduce the expression of volumetric displacement and discharge of an external gear pump and / or an unbalance vane pump and / or a bent axis type piston pump from its setting and geometry (assume all required information).
e) Prepare a chart explaining the spool positions of 3/2 and 4/3 spool type DCV for demonstration purpose.
f) Prepare a chart showing the symbols of different types of pumps / compressors, control valves and actuators used in oil hydraulic and pneumatic systems.
g) Prepare a report on purpose of mandatory mountings and accessories generally installed in an air receiver.

h) Prepare a report on conditioning of working fluid generally implemented in oil hydraulic and pneumatic systems.
i) Prepare a comparative study on meter-in and meter-out hydraulic circuits for demonstration purpose.
j) Develop, draw and explain a suitable speed control circuit of hydraulic motor which may be used for driving the arbor of a hydraulic horizontal milling machine.
k) Develop, draw and explain a suitable sequencing hydraulic circuit which may be used for sequential operation of two double acting linear actuators.
l) With suitable circuit diagrams explain the purpose of using accumulator in oil hydraulic system.
m) Develop, draw and explain a suitable intensifier circuit which may be used for driving a hydraulic punching press.

4. Suggested Scheme for Question Paper Design for Conducting Internal Assessment:
(Duration: 45 Minutes)

Questions to be set as per following Bloom's Taxonomy				
Internal Assessment	**Distribution of Theory Marks**			
	Level 1 (Remember)	**Level 2 (Understand)**	**Level 3 (Apply & above)**	**Total**
Class Test: 1	4	8	8	20
Class Test: 2	4	8	8	20

5. **Suggested Scheme for End Semester Examination:** (Duration: 2.5 hours)

Multiple Choice Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
A	1, 2 & 3	18	20	20 x 01 = **20**
	4 & 5	07		
	Sub-Total [A]:	**25**	**20**	**20**
Subjective Type Questions (Carrying 8 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
B	1 & 2	05	05 (At least two from each group)	05 x 08 = **40**
C	3, 4 & 5	04		
	Sub-Total [B+C]:	**09**	**05**	**40**
			Total [A+B + C]:	**60**

6. Rubrics for the assessment of students' activity:

Sl. No.	**Performance Indicators**
1	Originality of completing the Assigned task / micro-project work
2	Presentation Skill
3	In time submission of assignment work / micro-project work
4	Viva voce

7. Suggested Learning Resources:

Sl. No.	Title of Book	Author	Publication
01	Fluid Power with Application	A. Esposito	Pearson
02	Oil Hydraulic System- Principle and Maintenance	S.R. Majumdar	Tata McGraw Hill
03	Pneumatics Systems- Principles and Maintenance	S.R. Majumdar	Tata McGraw Hill
04	Hydraulic and Pneumatic Control	K. Shanmuga Sundaram	S. Chand
05	Hydraulics and Pneumatics, A technician's and engineer's guide	Andrew Parr	Butterworth-Heinemann
06	Fluid Power Generation, Transmission & Control	Jagadeesha T., Thammaiah Gowda	Wiley
07	Pneumatic Controls	P. Joji	Wiley
08	Introduction to Hydraulics and Pneumatics	Ilango & Soundararajan	Prentice Hall India
09	Hydraulics and Pneumatics	Stewart	Taraporewala Publication
10	Hydraulic System & Maintenance	Farel Bradbury	ILIFFE Books, London
11	Industrial Fluid Power	Charles Hedges	Womack Educational Publications
12	Industrial Hydraulic Control	Peter Rhoner	Prentice Hall India
13	Industrial Hydraulics	Hicks Pippenger	McGraw Hill International

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Name of the Course: **Diploma in Mechanical Engineering**	
Category: HS	**Semester : Sixth**
Code No.: HS302	**Full Marks : 100**
Course Title: Entrepreneurship and Start-ups	**Examination Scheme:**
Duration : 17 weeks(Total class hour/week = 3)	(v) **External Assessment**: **60** marks (End Semester Examination)
Total lecture class/week: 3	
Credit : 3	(vi) **Internal Assessment**:**40** marks [Class Test : 20 marks Assignment/ viva voce: 10 marks Class attendance : 10 marks]
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

1. Course Learning Objectives

a. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
b. To motivate and inspire students toward an entrepreneurial career.
c. To understand venture creation process and to develop generic entrepreneurial competences.
d. To introduce students to the basic steps required for planning, starting and running a business.
e. To familiarise students with the different exit strategies available to entrepreneurs.

2. Course Outcomes (COs):

After completing the course students will able to:

CO 1	Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
CO 2	Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
CO 3	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
CO 4	Make a growth plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

3. Theory Components:

Unit	Name of the Topic	Hours

Unit 1: Entrepreneurship: Introduction and Process	• Concept, Competencies, Functions and Risks of entrepreneurship
	• Entrepreneurial Values& Attitudes and Skills
	• Mind set of an employee/manager and an entrepreneur
	• Types of Ownership for Small Businesses
	  ○ Sole proprietorship
	  ○ Partnerships
	  ○ Joint Stock company- public limited and private limited companies
		10

	• Difference between entrepreneur and Intrapreneur	
Unit 2: Preparation For Entrepreneurial Ventures	• Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. • Feasibility Study – Concept, Location, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard Feasibility Study Report • Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan • Project Report- Concept, its features and components • Basic components of Financial Statements- Revenue, Expenses (Revenue & capital expense), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. *<u>They **may not** be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.</u>*	20
Unit 3: Establishing Small Enterprises	• Legal Requirements and Compliances needed for establishing a New Unit- o NOC from Local body o Registration of business in DIC o Statutory license or clearance o Tax compliances	03
Unit 4: Start-Up Ventures	• Concept & Features • Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical • Problems and challenges faced by start-ups. • Start-up ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. *<u>No questions are to be set from the case studies.</u>*	04
Unit 5: Financing Start-Up Ventures In India	• Communication of Ideas to potential investors – Investor Pitch • Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups • Govt. Initiatives including incubation centre to boost start-up ventures • MSME Registration for Start-ups –its benefits.	06
Unit 6: Exit Strategies For Entrepreneurs	• Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – *<u>Basic Concept only.</u>*	02
Sub Total : Total Lecture Classes		**45**
No. of classes required for conducting Internal Assessment examination		**6**
Grand Total:		**51**

4. Suggested Scheme for Question Paper Design for Conducting Internal Assessment:
(Duration: 45 Minutes)

Questions to be set as per following Bloom's Taxonomy				
Internal Assessment	Distribution of Theory Marks			
	Level 1 (Remember)	Level 2 (Understand)	Level 3 (Apply & above)	Total
Class Test: 1	4	8	8	20
Class Test: 2	4	8	8	20

5. Suggested Scheme for End Semester Examination: (Duration: 2.5 hours)

Multiple Choice Type Questions (Carrying 1 mark each)				
Group	Unit	To be Set	To be Answered	Total Marks
A	1, 2 & 3	18	20	20 x 01 = **20**
	4, 5 & 6	07		
	Sub-Total [A]:	**25**	**20**	**20**
Subjective Type Questions (Carrying 8 marks each)				
Group	Unit	To be Set	To be Answered	Total Marks
B	1 & 2	05	05 (At least two from each group)	05 x 08 = **40**
C	3, 4, 5 & 6	04		
	Sub-Total [B+C]:	**09**	**05**	**40**
			Total [A+B + C]:	**60**

6. Suggested Learning Resources:

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of India Learning Private Ltd
2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Caseson Entrepreneurship	Anjan RaiChaudhuri	Prentice Hall of India Learning Private Ltd
6.	How to Start a Business in India	Simon Daniel	Buuks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development and Business Ethics	Abhik Kumar Mukherjee & Shaunak Roy	Oxford University Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

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Name of the Course: **Diploma in Mechanical Engineering**	
Category: Open Elective (Compulsory)	**Semester : Sixth**
Code No.: OE302	**Full Marks : 100**
Course Title: Engineering Economics & Project Management	**Examination Scheme:** (i) **External Assessment**: **60** marks (End Semester Examination) (ii) **Internal Assessment**: **40** marks [Class Test : 20 marks Assignment/ viva voce: 10 marks Class attendance : 10 marks]
Duration : 17 weeks (Total class hour/week = 3)	
Total lecture class/week: 3	
Credit : 3	
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

1. Course Outcomes (COs):

After completing the course students will able to:

CO 1	To acquire knowledge of basic economics to facilitate the process of economic decision making.
CO 2	To acquire knowledge on basic financial management aspects
CO 3	To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved
CO 4	To develop an understanding of key project management skills and strategies

2. Theory Components:

Unit	Name of the Topic	Hours
Unit 1: Introduction, Theory of Demand & Supply	1.1 Introduction to Engineering Economics, the relationship between Engineering and Economics. 1.2 Resources, scarcity of resources, and efficient utilization of resources. 1.3 Opportunity cost, rationality costs, and benefits. 1.4 Theory of Demand: the law of demand, different types of demand, determinants of demand, demand function, price elasticity of demand. 1.5 Theory of Supply: determinants of supply, supply function. 1.6 Market mechanism: Equilibrium, basic comparative static analysis (Numerical problems)	**9**
Unit 2: Theory of Production & Costs	2.1 Concept of production (goods & services), Different factors of production (fixed and variable factors), Short-run Production function (Graphical illustration), and Long run production function (returns to scale). 2.2 Theory of Cost: Short-run and long-run cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost etc.	**10**

	2.3 Economic concept of profit, profit maximization (numerical problems)	
Unit 3: Different Types of Market and Role of Government	3.1 Perfect Competition: Features of Perfectly Competitive Market. 3.2 Imperfect Competition: Monopoly, Monopolistic Competition, and Oligopoly. 3.3 Role of government in Socialist, Capitalist and Mixed Economy structure with example.	**04**
Unit 4: Concept of Project	2.1 Definition and classification of projects). 2.2 Importance of Project Management. 2.3 Project life Cycle -[Conceptualization → Planning → Execution → Termination]	**04**
Unit 5: Feasibility Analysis of a Project	5.1 Economic and Market analysis. 5.2 Financial analysis: Basic techniques in capital budgeting– Payback period method, Net Present Value method, Internal Rate of Return method. 5.3 Environmental Impact study–adverse impact of the project on the environment. 5.4 Project risk and uncertainty: Technical, economical, socio-political, and environmental risks. 5.5 Evaluation of the financial health of a project–Understanding the basic concept of Fixed & Working Capital, Debt & Equity, Shares, Debentures etc., and different financial ratios like Liquidity Ratios, Activity Ratios, Debt-equity ratio & Profitability Ratio (Basic concept only). *N.B: Knowledge of financial statements is not required; for the estimation of ratios the values of the relevant variables will be provided.*	**10**
Unit 6: Project Administration	6.1 Gantt Chart– a system of bar charts for scheduling and reporting the progress of a project (basic concept only). 6.2 Concept of Project Evaluation and Review Technique (PERT) and Critical Path method (CPM): basic concept and application with real-life examples.	**08**
Sub Total : Total Lecture Classes		**45**
No. of classes required for conducting Internal Assessment examination		**6**
Grand Total:		**51**

3. Suggested Home Assignments / Student Activities:

Guideline for Assignment -

Students should be instructed to prepare a report on a project (preferably the Major Project they prepare in 6th Semester), using a popular project management software in IT/ Computer Laboratory, under the guidance of the Lecturer in Computer Science & Technology and Lecturer in Humanities.

4. Suggested Scheme for Question Paper Design for Conducting Internal Assessment:
(Duration: 45 Minutes)

Questions to be set as per following Bloom's Taxonomy				
Internal Assessment	Distribution of Theory Marks			
	Level 1 (Remember)	Level 2 (Understand)	Level 3 (Apply & above)	Total
Class Test: 1	4	8	8	20
Class Test: 2	4	8	8	20

3. Suggested Scheme for End Semester Examination: (Duration: 2.5 hours)

Multiple Choice Type Questions (Carrying 1 mark each)				
Group	Unit	To be Set	To be Answered	Total Marks
A	1, 2 & 3	13	20	20 x 01 = **20**
	4, 5 & 6	12		
	Sub-Total [A]:	**25**	**20**	**20**
Subjective Type Questions (Carrying 8 marks each)				
Group	Unit	To be Set	To be Answered	Total Marks
B	1, 2 & 3	05	05 (At least two from each group)	05 x 08 = **40**
C	4, 5 & 6	04		
	Sub-Total [B+C]:	**09**	**05**	**40**
			Total [A+B +C]:	**60**

6. Suggested Learning Resources:

Sl. No.	Title of Book	Author	Publication
1.	Principles of Economics	Case and Fair	Pearson Education Publication
2.	Principles of Economics	Mankiw	Cengage Learning
3.	Project planning, analysis, selection, implementation and review	Prasanna chandra	Tata McGraw Hill.
4.	Project Management	Gopala Krishnan	McMillan India Ltd

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Name of the Course: **Diploma in Mechanical Engineering**	
Category: Open Elective	**Semester : Sixth**
Code No.: OE304/1	**Full Marks : 100**
Course Title: Electrical Machines & Controls	**Examination Scheme:**
Duration : 17 weeks (Total class hour/week = 3)	(i) **External Assessment**: **60** marks (End Semester Examination)
Total lecture class/week: 3	(ii) **Internal Assessment**: **40** marks [Class Test : 20 marks Assignment/ viva voce: 10 marks Class attendance : 10 marks]
Credit : 3	
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

1. Course Outcomes (COs):

After completing the course students will able to:

CO 1	Identify suitable transformer & DC motors for an intended application.
CO 2	Analyze the input and output characteristics curves of a motor to determine its aptness for an application.
CO 3	Recommend suitable fractional kW motor for a planned project.
CO 4	Obtain an accurate yet compact mathematical model of a dynamical system.
CO 5	Determine a suitable control algorithm for an intended application.

2. Theory Components:

The following topics / subtopics should be taught and assessed in order to develop unit outcomes for achieving the identified course outcome.

Unit		Topics and Sub-topics	Hours
Unit 1: DC Machines & Transformers	1.1	Mechanism of Electro – Mechanical Energy Conversion	**11**
	1.2	Basics of DC Machines: • Identify the different parts with functions • Working / Operating principles of Motor & Generator • Types of DC Machines • General circuit diagram / representation of DC Motor • Applications of different types of DC Motors in industrial sector	

	1.2	Brief concept of DC Motors: • Back – EMF – concept and necessity for starting • DC starter – necessity and types (only names) • Speed & Torque equation. (only expression) • Numerical on torque – speed equation	
	1.3	. Basic concept of Transformers: • Identify main constructional parts with their functions • Types of transformers • Operating principle of Transformer • EMF equation and Transformation Ratio (expressions only) • Simple numerical on EMF equation & Transformation ratio	
	1.4	Various losses in transformer, OC and SC Test of transformer for finding the parameters.	
	1.5	Basic concept of Auto – transformer: • Working concept • Volt – Ampere relationship • Application in industrial sector	
Unit 2: **A C Machines**	**A: Induction Motor**		**11**
	2.A.1	Basics of Induction Motor: • Identify the constructional parts with their functions • Outline the constructional differences between SQIM & Wound rotor	
	2.A.2	Terminology and expressions related to Induction Motor: • Synchronous Speed & Rotor Speed • Slip • Stator & Rotor frequency	
	2.A.3	Working principle of an Induction Motor (Brief idea).	
	2.A.4	Expression of Torque developed in an Induction Motor (only equation). Simple numerical on torque equation.	
	2.A.5	Characteristics of Induction Motor: • Speed – Torque Characteristics • Slip – Torque Characteristics	
	2.A.6	Control of Induction Motor: • Reversal of rotation • Voltage & frequency control method (comprehensive) • Stator & Rotor resistance control method (brief idea) • Pole changing control method (brief idea)	
	2.A.7	Concept of different types of Braking method of Induction Motor.	
	2.A.8	Industrial applications of Squirrel Cage & Wound – Rotor type Induction Motors.	

	B: Synchronous Machines		
	2.B.1	Basics of Synchronous Machines: • Identify main constructional parts with their functions • Operating principle of Synchronous Motor	
	2.B.2	Terminology related to Synchronous Motor: • Concept of starting • Hunting • Damper winding	
	2.B.3	Applications of Synchronous Motor.	
Unit 3: Fractional kW Motors	3.1	Basics of Permanent Magnet Synchronous Motor (PMSM) • Identify different constructional parts • Describe operating principle • Control of PMSM • Applications	**07**
	3.2	Basics of Brushless DC Motor (BLDC) • Define the constructional parts • Describe operating principle • Closed loop Control of BLDC • Applications	
	3.3	Brief concept and applications: • Stepper Motor • Universal Motor • Single phase Induction Motors	
Unit 4: Introduction to Control System	4.1	Introduction to control system, Classification of control system.	**09**
	4.2	Control system components: Synchro, D.C Servomotor, A.C Servo motor, AC Tachometer (only basic operating principle & construction and diagram. (no deduction)	
	4.3	Concept of transfer function, poles and zeroes, transfer function of first & second order system. (no deduction)	
	4.4	Signals (unit step, unit ramp, unit impulse) and their mathematical representation and characteristics.	
	4.5	Modelling of mechanical systems, force-voltage and force-current analogy.	
	4.6	Block Diagram Representation of control system, Transfer function from Block diagram reduction technique, State space representation of continuous time systems, State equations, Transfer function from State Variable representation.	
Unit 5:	5.1	Time response characteristics of first and second order system to unit step excitation (no deduction).	**07**

Time response analysis, Stability and Process control	5.2	Stability concept: characteristic equation, Deciding stability from pole zero concept, Routh Hurwitz criteria (Numerical), Applications and limitations.	
	5.3	Control action of a system with ON/OFF, P, PI, PD, PID controller, Practical application of these controllers (with block diagram only).	
Total Lecture Classes (Sub Total):			**45**
No. of classes required for conducting Internal Assessment:			**06**
Grand Total :			**51**

3. Suggested Home Assignments/ Student Activities: (Any Four)

i) Visit a small motor manufacturing industry and make a report based on their observation.
ii) Prepare a Power – Point Presentation on the working of DC Motors, Induction Motors, Transformers, Synchronous Motor, PMSM and BLDC.
iii) Prepare a Power – Point Presentation on the parts of DC Motors, Induction Motors, Transformers, Synchronous Motor, PMSM and BLDC.
iv) Make a market survey and submit a report on the basis of the following:
a. Types of Machines, b. Manufacturer, c. Name Plate details, d. Applications.
v) Visit a Transformer manufacturing factory and observe the various routine tests on Transformers and submit a report.
vi) Make a model or simulation type project using BLDC and PMSM.
vii) Deduce mathematical modelling of different mechanical and electrical systems.
viii) Make a power point presentation on block diagram reduction technique.
ix) Make a power point presentation on different controllers.
x) Prepare a power point presentation on Programmable Logic Controllers.

4. Suggested Scheme for Question Paper Design for Conducting Internal Assessment: (Duration:45 Minutes)

Questions to be set as per Bloom's Taxonomy				
Internal Assessment	Distribution of Theory Marks			
	Level 1 (Remember)	Level 2 (Understand)	Level 3 (Apply & above)	Total
Class Test – 1	4	4	12	20
Class Test – 2	4	4	12	20

5. Suggested Scheme for End Semester Examination: (Duration: 2 hrs. 30 minutes.)

<table>
<tr><th colspan="5">Multiple Choice Type Questions (Carrying 1 mark each)</th></tr>
<tr><td>Group</td><td>Unit</td><td>To be set</td><td>To be Answered</td><td>Total Marks</td></tr>
<tr><td rowspan="3">A</td><td>1 & 2</td><td>12</td><td rowspan="3">20</td><td rowspan="3">20 X 1 = 20</td></tr>
<tr><td>3</td><td>03</td></tr>
<tr><td>4 & 5</td><td>10</td></tr>
<tr><td colspan="2">Total:</td><td>25</td><td>20</td><td>20</td></tr>
<tr><th colspan="5">Long Answer Type Questions (Carrying 5 mark each)</th></tr>
<tr><td>Group</td><td>Unit</td><td>To be set</td><td>To be Answered</td><td>Total Marks</td></tr>
<tr><td>B</td><td>1 & 2</td><td>04</td><td rowspan="2">05 (At least two from each group)</td><td rowspan="2">05 X 08 = 40</td></tr>
<tr><td>C</td><td>3, 4 & 5</td><td>05</td></tr>
<tr><td colspan="2">Total: (B + C)</td><td>09</td><td>05</td><td>40</td></tr>
<tr><td colspan="4">Sub – Total (A) Marks:</td><td>20</td></tr>
<tr><td colspan="4">Sub – Total (B+C) Marks:</td><td>40</td></tr>
<tr><td colspan="4">Total (A+B+C) Marks for End Semester:</td><td>60</td></tr>
</table>

6. Rubrics for the Assessment of Student's Activity:

Sl. No.	Performance Indicators	Weightage in %
01.	Originality of completing the Assigned task / micro-project work.	50
02.	Presentation Skill.	30
03.	In time submission of assignment work / micro- project work.	10
04.	Viva voce	10
	Total:	100

7. Suggested Learning Resources:

Sl. No.	Title of Book	Author	Publication
01.	Principle of Electrical Machines	V. K. Mehta Rohit Mehta	S. Chand & Co. Pvt. Ltd., New Delhi
02.	Electrical Technology Vol – II	B. L. Thereja A. K. Thereja	BPB Publication, New Delhi
03.	Electrical Machinery	P. S. Bimbhara	Khanna Publishers, New Delhi

Name of the Course: **Diploma in Mechanical Engineering**	
Category: Open Elective	**Semester : Sixth**
Code No.: OE304/2	**Full Marks : 100**
Course Title: Environment Engineering & Science	**Examination Scheme:**
Duration : 17 weeks (Total class hour/week = 3)	(iii) **External Assessment**: **60** marks (End Semester Examination)
Total lecture class/week: 3	
Credit : 3	(iv) **Internal Assessment**: **40** marks [Class Test : 20 marks Assignment/ viva voce: 10 marks Class attendance : 10 marks]
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

1. Course Outcomes (COs):

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

CO 1	Recognize the relevance and the concept of Environmental Science and Engineering and different world-wide activities on this area.
CO 2	Illuminate the different types of environmental pollutant, their effects and their sustainable solutions.
CO 3	Discuss the environmental regulations act. and standards.
CO 4	Gather basic idea about conventional and non-conventional energy resources.
CO 5	Demonstrate the broad perspective of Environmental Science practices by utilizing engineering knowledge and principles

2. Theory Components:

Unit	Name of the Topic	Hours
Unit 1: Environment and Ecology	1.1 Classification of Environment 1.2 Environmental descriptors 1.3 Environmental quality and descriptive parameters 1.4 Ecology: Definition and classification 1.5 Environmental impact on ecology	**08**
Unit 2: Water pollution and pollutants (Natural and Anthropogenic)	2.1 Ground water: Sources and quality analysis 2.2 Surface water: Sources and quality analysis 2.3 Quality parameters in water treatment along with flow-sheets 2.4 Basic processes for potable water supply (Detailed technology not necessary) 2.5 Water pollution: Surface and ground water pollution, types of pollutants 2.6 Mode of water pollution 2.7 Parameters to be assessed for water pollution (Turbidity, pH, total suspended solids, total solids, BOD and COD: Definition, calculation) 2.8 Chemistry aspect for water pollution	**11**

	2.9 Control of water pollution (Description only) 2.10 Fundamental of water treatment techniques.	
Unit 3: **Air quality, Air Pollution and Control, Noise Pollution**	3.1 Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler) 3.2 Air Pollutants: Types, Units of air pollutants 3.3 Atmospheric physics for air pollution 3.4 Particulate Pollutants: Effects and control strategies (Bag filter, Cyclone separator, Electrostatic Precipitator) 3.5 Advanced air pollution control methods 3.6 Noise pollution: sources of pollution, measurement of noise pollution 3.7 Noise measuring devices and their demonstration.	**10**
Unit 4: **Solid waste and Soil pollution**	4.1 Definition of solid waste 4.2 Classification of solid waste 4.3 Overview on municipal, industrial, hazardous, hospital, plastic, E-waste. etc. 4.4 Solid waste management and disposal process. 4.5 Soil pollution, Poor Fertility, Septicity, Concentration of Infecting Agents in Soil 4.6 Leaching and its impact on soil pollution.	**06**
Unit 5: **Renewable sources of Energy**	5.1 Energy Resources: Energy scenario, national and international status. 5.2 Solar Photovoltaic: Solar radiation and types, basic working principle of solar PV, solar cells and types, water pumping and applications of solar PV. 5.3 Solar Thermal system: basic working principle and applications of solar thermal energy, solar water heater and types, solar cooking, solar pond, Solar still etc. 5.4 Wind energy systems: basic principle, types of wind turbines, application of wind energy, 5.5 Bio-energy systems: bio thermal and chemical basic principle, gasifier and digesters. 5.6 Hydro energy systems: small and micro hydro systems and its basic working. 5.7 Geothermal energy: Basic working principle, types and application of geothermal energy. 5.8 Ocean & Tidal Energy: Basic working principle, applications and types of different types of energy generation through ocean and tidal systems.	**08**
Unit 6: **Environment Legislation system and Rules**	6.1 Environmental protection rules 6.2 Sustainable environmental management.	**02**
	Sub Total : Total Lecture Classes	**45**
	No. of classes required for conducting Internal Assessment examination	**6**
	Grand Total:	**51**

3. Suggested Scheme for Question Paper Design for Conducting Internal Assessment:
(Duration: 45 Minutes)

Questions to be set as per following Bloom's Taxonomy				
Internal Assessment	Distribution of Theory Marks			
	Level 1 (Remember)	Level 2 (Understand)	Level 3 (Apply & above)	Total
Class Test: 1	4	8	8	20
Class Test: 2	4	8	8	20

4. Suggested Scheme for End Semester Examination: (Duration: 2.5 hours)

Multiple Choice Type Questions (Carrying 1 mark each)				
Group	Unit	To be Set	To be Answered	Total Marks
A	1, 2 & 3	17	20	20 x 01 = **20**
	4, 5 & 6	8		
	Sub-Total [A]:	**25**	**20**	**20**
Subjective Type Questions (Carrying 8 marks each)				
Group	Unit	To be Set	To be Answered	Total Marks
B	1, 2 & 3	06	05 (At least two from each group)	05 x 08 = **40**
C	4, 5 & 6	03		
	Sub-Total [B+C]:	**09**	**05**	**40**
			Total [A+B+C]:	**60**

5. Suggested Learning Resources:

Text Books:

1. Environmental Studies- By N.N. Basak
2. Environmental Studies-By D .Srivastava
3. Introduction to Environmental Engineering— By Dr. Manindra Nath Patra.
4. Environmental Engineering- By A.K. Jain

Reference Books:

1. Environmental Engineering---By G.Killy
2. Environmental Engineering--- By Peavy, Rowe
3. Water and Waste Water Engineering— By S.Garg
4. Waste Water Engineering--By -Panmia
5. Non-conventional Energy Sources-4th Edition, By Prasad Rajesh K and Ojha
6. Non-conventional Energy Resources—By Chauhan and Srevastava
7. Non-conventional Energy Sources---By G.D.Rai (Khanna Publisher)
8. Ecology --By -Odum
9. Ecology---By -Das & Das
10. Environmental Law ---By -Gurdip Sing
11. Environmental Law----By Jaiswal Jaiswal Jaiswal
12. Environmental Law in India ---By -P. Leela Krishnan
13. Environment Impact Assessment Guidelines, Notification of Government of India, 2006
14. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998
15. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System.

<table>
<tr><th colspan="4">Name of the Course: Diploma in Mechanical Engineering</th></tr>
<tr><td>Category: Program Elective</td><td colspan="3">Semester: Sixth</td></tr>
<tr><td>Code No.: MEPE 304/1</td><td colspan="3">Full Marks: 100</td></tr>
<tr><td rowspan="6">Course Title: Mechatronics Lab</td><td colspan="3">Sessional Examination Scheme:</td></tr>
<tr><td colspan="3">External Assessment
(End Semester Sessional Examination)</td></tr>
<tr><td>Assignment on the day of Viva Voce:</td><td>20</td><td rowspan="2">40 marks</td></tr>
<tr><td rowspan="3">Duration : 17 weeks (2 hours per week)</td><td>Viva Voce (before Board of Examiners):</td><td>20</td></tr>
<tr><td colspan="3">Internal Assessment</td></tr>
<tr><td>Continuous assessment of class performance and in time submission of Assignments:</td><td>30</td><td rowspan="3">60 marks</td></tr>
<tr><td rowspan="2">Total practical classes / week: 2</td><td>Viva Voce:</td><td>20</td></tr>
<tr><td>Class Attendance:</td><td>10</td></tr>
<tr><td>Credit: 1</td><td colspan="2">Total Marks:</td><td>100</td></tr>
<tr><td colspan="4">Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.</td></tr>
<tr><td colspan="4">Pre-requisite: Knowledge of Mechatronics [Code No.: MEPE 302/1].</td></tr>
</table>

1. Course Outcomes (COs):

The theory and practical experiences associated with this subject are to be taught and implemented, so that the student demonstrates the following industry oriented course outcomes:

a) The Students should be able to identify and understand the function of various components of a Mechatronics Systems.

b) The Students should be able to demonstrate the working of a given Mechatronics System.

c) The Students should be able to understand the basic concept of CNC machines and Part Programming.

2. Suggested Assignments / Practical for Continuous Assessment:

The list of practical to be completed by the students towards attainment of the required competency:

Sl. No.	List of Practical
01	Identification, demonstration of working principle and application of different sensors and transducers.
02	Verification or calibration or measurement different mechanical quantity with suitable setup comprising of different sensor(s) and / or transducer(s): **(Any two of the following)** i. Measurement of strain by using a basic strain gauge and determination of the stress induced. ii. Measurement of velocity of compressible fluid across a duct using Anemometer. iii. Speed Measurement by using Stroboscope / Magnetic / Inductive Pick Up. iv. Measurement of flow of fluid by using Rotameter. v. Calibration of given LVDT. vi. Temperature control using Thermal Reed switch & Bimetal switch. vii. Temperature measurement using Thermocouple. viii. Measurement of force & weight by using a load cell. ix. Liquid Level Measurement by using floats/ differential pressure cell system.

	x. Verify characteristics of photo transducer & photo diode.
03	Demonstration of basic working principle and application of various digital to analog and analog to digital converters.
04	Simulation or design and develop program using PLC / Microcontroller for the following purpose: (Any two) i. Measurement of speed of a motor. ii. Motor start and stop by using two different sensors. iii. Simulation of a pedestrian traffic controller. iv. Simulation of four-road junction traffic controller. v. Lift / elevator control. vi. Washing machine control. vii. Tank level control. viii. Soft drink vending machine control. ix. Speed control of servo motor / DC motor x. Temperature & humidity measurement and control xi. Measurement of distance using suitable sensor
05	Identification of different components, interpretation of their function and demonstration of working of a given hydraulic system as assigned by the concern teacher.
06	Identification of different components, interpretation of their function and demonstration of working of a given pneumatic system as assigned by the concern teacher.
07	Design and demonstration of Meter-in and Meter-out Circuits.
08	Design and demonstrate a suitable sequencing Circuit for sequential operation two actuators.
09	Identification of different components, interpretation of their function and demonstration of working of a CNC machine as specified by concern teacher.
10	Preparation of a chart containing commonly used word address codes, G-codes, M-codes and their interpretation as used in manual part programming of CNC machine tool.
11	Prepare a Part Program by using different codes for a specific job as assigned by the concern teacher, which is to be digitally manufactured or manufactured in CNC Turning Centre (CNC Lathe).
12	Prepare a Part Program by using different codes for a specific job as assigned by the concern teacher, which is to be digitally manufactured or manufactured in CNC Machining Centre (CNC Milling).

Note:
A suggested list of Practical is given in the above table. The concerned faculty member may add similar Practical Assignment also. **Any five (05)** practical are needed to be performed during the course, so that the student achieves the desired level of competency as generally required by the industry.

3. Suggested Scheme for Internal Assessment: [Total Marks: 60]

Involvement	Total Marks
Continuous assessment of class performance and in time submission of Assignments.	30
Viva Voce on to the Laboratory Practice at the end of the semester.	20
Class attendance.	10
Total Internal Assessment:	60
Pass criterion for Internal Assessment = 24 Marks [Minimum]	

4. Suggested Scheme for End Semester Examination: [Total Marks: 40]

Involvement	Total Marks
Assignment on the day of End Semester Exam.	20
Viva Voce on to the Laboratory Practice on the day of End Semester Exam.	20
Total External Assessment:	40
Pass criterion for Internal Assessment = 16 Marks [Minimum]	

During conducting such Practical (laboratory / field based) work, the following social Skills / attitudes which are to be developed through the experiences:

a) Follow the safety practices.
b) Practice good housekeeping.
c) Demonstrate working as a leader / team member.
d) Maintain tools and equipment in good working condition.
e) Follow ethical practice.

5. Suggested Learning Resources:

Sl. No.	Title of Book	Author	Publication
01	Mechatronics - Electronic Control Systems in Mechanical and Electrical Engineering	Bolton W.	Pearson Education Ltd.
02	Introduction to Mechatronics and Measurement Systems	Histand B.H. and Alciatore D.G.	Tata McGraw Hill
03	Programmable Logic Controllers	John W. Webb and Ronald Reis	Prentice Hall of India
04	Programmable Logic Control – Principles and Applications	NIIT	Prentice Hall of India
05	Programmable Logic Controller & Industrial Automation	Mitra & Sengupta	Penram International Publishing (India) Pvt. Ltd.
06	Sensors for Mechatronics	Paul P.L. Regtien	Elsevier
07	Introduction to Mechatronics	Appu Kuttan K.K.	Oxford
08	Process Control Principles & Applications	Surekha Bhanot	Oxford
09	Mechatronics Systems Design	Kolk R.A. and Shetty D.	Vikas Publishing, New Delhi
10	Mechatronics Principles, Concepts and Applications	Mahalik N.P.	Tata McGraw Hill
11	A Text book of Mechatronics	R.K.Rajput	S. Chand
12	Mechatronics	H.M.T.	Tata McGraw Hill
13	Mechatronics	Ramachandran	Wiley

Name of the Course: Diploma in Mechanical Engineering			
Category: Program Elective	**Semester: Sixth**		
Code No.: MEPE304/2	**Full Marks: 100**		
Course Title: Oil Hydraulics and Pneumatics Lab	**Sessional Examination Scheme:**		
	External Assessment (End Semester Sessional Examination)		
	Assignment on the day of Viva Voce:	20	**40 marks**
Duration : 17 weeks (2 hours per week)	Viva Voce (before Board of Examiners):	20	
	Internal Assessment		
	Continuous assessment of class performance and in time submission of Assignments:	30	**60 marks**
Total practical classes/week: 2	Viva Voce:	20	
	Class Attendance:	10	
Credit: 1	**Total Marks:**		**100**
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.			
Pre-requisite: Knowledge of Oil Hydraulics and Pneumatics **[Code No.: MEPE 302/2]**.			

1. Course Outcomes (COs):

The theory and practical experiences associated with this subject are to be taught and implemented, so that the student demonstrates the following industry oriented course outcomes:

a) The Students should be able to identify and understand the function of various components of Oil Hydraulic & Pneumatic Systems.

b) The Students should be able to understand and demonstrate the working principle of various components used for Oil Hydraulic & Pneumatic Systems.

c) The Students should be able to develop simple Oil Hydraulic and Pneumatic Circuits for specific requirement.

2. Suggested Assignments / Practical for Continuous Assessment:

The list of practical to be completed by the students towards attainment of the required competency:

Sl. No.	List of Practical	Unit No. with Subject Code
01	Study of external gear pump and / or an unbalance vane pump and / or a bent axis type piston pump generally used in oil hydraulic systems and prepare report with suitable diagrams explaining its working principle and applications.	02 [MEPE 302/2]
02	Study of receiver mounted reciprocating air compressor generally used in pneumatic systems and prepare report with suitable diagrams explaining its working principle and function of its mandatory mountings and accessories.	04 [MEPE 302/2]
03	Study of rotary compressor (screw and / or vane compressor) generally used in pneumatic systems and prepare report with suitable diagrams explaining its working principle and applications.	04 [MEPE 302/2]
04	Study of pressure control valves generally used in oil hydraulic / pneumatic system and prepare report on its type, working principle, symbol and application.	02 & 04 [MEPE 302/2]

05	Study of flow control valves generally used in oil hydraulic / pneumatic system and prepare report on its type, working principle, symbol and application.	02 & 04 [MEPE 302/2]
06	Study of direction control valves generally used in oil hydraulic / pneumatic System and prepare report on its type, working principle, types of actuation, specification, symbol and application.	02 & 04 [MEPE 302/2]
07	Examine the cut-section model of check valve and needle valve and prepare report with suitable diagrams explaining its working principle and applications.	02 [MEPE 302/2]
08	Study of rotary / linier (single /double acting) actuators generally used in oil hydraulic / pneumatic system and prepare report on its working principle, symbol and application.	02 & 04 [MEPE 302/2]
09	Study of FRL Unit used in pneumatic system and prepare a report with suitable diagrams on working principle and function of its individual components.	04 [MEPE 302/2]
10	Identify and operate different components of oil hydraulic trainer system and prepare a report comprising list of components, function with symbol of each components and overall utility of the system.	02 & 03 [MEPE 302/2]
11	Identify and operate different components of pneumatic trainer system and prepare a report comprising list of components, function with symbol of each components and overall utility of the system.	04 & 05 [MEPE 302/2]
12	Prepare and operate an oil hydraulic circuit as specified by the concern teacher in a hydraulic trainer system. Observe, record pressure gauge readings at different stages of operation and prepare a report on working and setting ofsafety equipment(s) of hydraulic trainer system.	02 & 03 [MEPE 302/2]
13	Design, prepare, operate and submit a report on Control circuits of single acting and double acting linear actuators.	03 & 05 [MEPE 302/2]
14	Design, prepare, operate and submit a report on Meter-in and Meter-out Circuits.	03 & 05 [MEPE 302/2]
15	Design, prepare, operate and submit a report on Sequencing Circuit.	03 & 05 [MEPE 302/2]
16	Design, prepare, operate and submit a report on a suitable oil hydraulic Circuit which may be used to drive a shaping machine.	03 [MEPE 302/2]
17	Design, prepare, operate and submit a report on a suitable pneumatic circuit for Speed Control of pneumatic motor which may be used to drive pneumatic drill machine.	05 [MEPE 302/2]

Note:
A suggested list of Practical is given in the above table. The concerned faculty member may add similar Practical Assignment also. Any five (05) practical are needed to be performed during the course, so that the student achieves the desired level of competency as generally required by the industry.

3. Suggested Scheme for Internal Assessment: [Total Marks: 60]

Involvement	Total Marks
Continuous assessment of class performance and in time submission of Assignments.	30
Viva Voce on to the Laboratory Practice at the end of the semester.	20
Class attendance.	10
Total Internal Assessment:	60
Pass criterion for Internal Assessment = 24 Marks [Minimum]	

4. Suggested Scheme for End Semester Examination: [Total Marks: 40]

Involvement	Total Marks
Assignment on the day of End Semester Exam.	20
Viva Voce on to the Laboratory Practice on the day of End Semester Exam.	20
Total External Assessment:	40
Pass criterion for Internal Assessment = 16 Marks [Minimum]	

During conducting such Practical (laboratory / field based) work, the following social Skills / attitudes which are to be developed through the experiences:

f) Follow the safety practices.
g) Practice good housekeeping.
h) Demonstrate working as a leader / team member.
i) Maintain tools and equipment in good working condition.
j) Follow ethical practice.

5. Suggested Learning Resources:

Sl. No.	Title of Book	Author	Publication
01	Fluid Power with Application	A. Esposito	Pearson
02	Oil Hydraulic System- Principle and Maintenance	S.R. Majumdar	Tata McGraw Hill
03	Pneumatics Systems- Principles and Maintenance	S.R. Majumdar	Tata McGraw Hill
04	Hydraulic and Pneumatic Control	K. Shanmuga Sundaram	S. Chand
05	Hydraulics and Pneumatics, A technician's and engineer's guide	Andrew Parr	Butterworth-Heinemann
06	Fluid Power Generation, Transmission & Control	Jagadeesha T., Thammaiah Gowda	Wiley
07	Pneumatic Controls	P. Joji	Wiley
08	Introduction to Hydraulics and Pneumatics	Ilango & Soundararajan	Prentice Hall India
09	Hydraulics and Pneumatics	Stewart	Taraporewala Publication
10	Hydraulic System & Maintenance	Farel Bradbury	ILIFFE Books, London
11	Industrial Fluid Power	Charles Hedges	Womack Educational Publications
12	Industrial Hydraulic Control	Peter Rhoner	Prentice Hall India
13	Industrial Hydraulics	Hicks Pippenger	McGraw Hill International

<table>
<tr><td colspan="4">Name of the Course: Diploma in Mechanical Engineering</td></tr>
<tr><td colspan="2">Category: Major Project</td><td colspan="2">Semester: Sixth</td></tr>
<tr><td colspan="2">CodeNo.:PR302</td><td colspan="2">FullMarks:100</td></tr>
<tr><td colspan="2">Course Title: Major Project</td><td colspan="2">Sessional Examination Scheme:</td></tr>
<tr><td rowspan="5">Duration:17weeks(total hours per week=6)</td><td colspan="3">External Assessment
(End Semester Sessional Examination)</td></tr>
<tr><td>Evaluation of final report of the major project</td><td>20</td><td rowspan="2">40 marks</td></tr>
<tr><td>Viva voce (before Board of Examiner(s))</td><td>20</td></tr>
<tr><td colspan="3">Internal Assessment</td></tr>
<tr><td rowspan="4">Total Practical class / week: 6</td><td>Continuous assessment of class Performance and in time submission of final report of the major project</td><td>30</td><td rowspan="4">60 marks</td></tr>
<tr><td>Seminar presentation and viva voce</td><td>20</td></tr>
<tr><td rowspan="2">Credit:3</td><td>Class attendance</td><td>10</td></tr>
<tr><td>Total marks</td><td>100</td></tr>
<tr><td colspan="4">Pass Criterion: Students must obtain at least 40 % marks (pass marks) in both the internal assessment and end semester examination separately.</td></tr>
<tr><td colspan="4">Note: Most of the departmental faculties / teaching staff (as per availability) have to be involved to conduct number of different Major Projects by grouping the students of Semester 5 / Semester 6.</td></tr>
</table>

1. **Course Outcomes (COs):**
   Depending upon the nature of the projects undertaken, some of the following major course outcomes can be attained:

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

   a) Implement the planned activity individually and / or as team.
   b) Select, collect and use required information / knowledge to solve the identified problem.
   c) Take appropriate decisions based on collected and analyzed information.
   d) Communicate effectively and confidently as a member and leader of team.
   e) Prepare project report following proper guidelines using appropriate tools (if any).

2. **Course details:**
   At the end of 5th semester 'progress report' was submitted by the student based on the progress of project work done by him / her. The project work started in 5th semester is to be continued in 6th semester to attain the course outcomes as mentioned above. Such major project work must be completed in 6th semester and a 'Final report' is to be prepared based on the project work executed by the students. At the end of 6th semester, each student must present a 'Seminar' presentation (in ppt format) in presence of the faculties and students of the respective department.

This Seminar presentation will be entirely based on the project work done and the 'Final Report' prepared by the student. Evaluation of 'viva voce' part will be based on the question-answer part at the end of the seminar presentation. The questions may be asked by any faculty or students.

3. Suggested contents of the project Final Report:

a) Title page (Containing Project Title along with Polytechnic name and Logo (if any), names of team members and guide teacher(s)).
b) Certificate (in the format given in this document as Annexure- A).
c) Acknowledgement
d) Abstract (within 200 to 250 words)
e) Content (Introduction, Objective of the project, Methodology / Procedure Followed, Results and Discussions, Conclusions, Appendix if any, and References)
f) Abbreviations (if any)

4. Suggested Scheme for End Semester External Assessment: [Total Marks: 40]

Involvement	**Total Marks**
Evaluation of Final report on the day of End Semester External Exam.	20
Viva Voce on to the major project work (done by the student) on the Day of End Semester External Exam.	20
Total External Assessment:	**40**
Pass criterion for Internal Assessment = 16 Marks[Minimum]	

5. Suggested Scheme for Internal Assessment: [Total Marks: 60]

Involvement	**Total Marks**
Continuous assessment of performance, contribution and in time submission of Final report of the major project.	30
Seminar Presentation and Viva Voce on to the projects work at the end of the semester.	20
Class attendance	10
Total Internal Assessment:	**60**
Pass criterion for Internal Assessment = 24 Marks [Minimum]	

Annexure - A

CERTIFICATE

This is to certify that the project work entitled "(***Title of the project work***)" being submitted by (*Student's name*) to *(Polytechnic name*) for the award of the degree of Diploma in Mechanical Engineering is a record of his project work carried out under my supervision and guidance. The student is fully responsible for the results and discussion presented in this report.

This work, in my opinion, has reached the standard of fulfilling the requirements for the award of the degree of Diploma in Mechanical Engineering.

Name and signature of the Project Guide(s)

Name and signature of the HOD,

Mechanical Engineering Dept.

Name and signature of the

Principal/Principal-in-Charge

<table>
<tr><th colspan="4">Name of the Course: Diploma in Mechanical Engineering</th></tr>
<tr><td>Category: Seminar</td><td colspan="3">Semester: Sixth</td></tr>
<tr><td>Code No.: SE302</td><td colspan="3">Full Marks: 100</td></tr>
<tr><td rowspan="3">Course Title: Seminar</td><td colspan="3">Sessional Examination Scheme:</td></tr>
<tr><td colspan="3">External Assessment
(End Semester Sessional Examination)</td></tr>
<tr><td>Final presentation of Seminar</td><td>30</td><td rowspan="2">40 marks</td></tr>
<tr><td rowspan="2">Duration : 17 weeks (1 hour per week)</td><td>Viva Voce (before Board of Examiners / fellow students):</td><td>10</td></tr>
<tr><td colspan="3">Internal Assessment</td></tr>
<tr><td rowspan="3"></td><td>Continuous assessment of class performance and in time submission of report</td><td>30</td><td rowspan="3">60 marks</td></tr>
<tr><td>Total classes/week: 1</td><td>Viva Voce:</td><td>20</td></tr>
<tr><td></td><td>Class Attendance:</td><td>10</td></tr>
<tr><td>Credit: 1</td><td colspan="2">Total Marks:</td><td>100</td></tr>
<tr><td colspan="4">Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.</td></tr>
<tr><td colspan="4">Pre-requisite: Knowledge of project work / emerging field of Mechanical Engineering etc.</td></tr>
<tr><td colspan="4">Note: Most of the departmental faculties (as per availability) have to be involved to act as mentor / guide for presenting seminar by each student.</td></tr>
</table>

1. Course Outcomes (COs):

CO1 - Establish motivation for any topic of interest and develop a thought process for technical presentation.
CO2 - Organize a detailed literature survey and build a document with respect to technical publications.
CO3 - Analysis and comprehension of proof of concept and related data.
CO4 - Effective presentation and improve soft skills.
CO5 - Make use of new and recent technology for creating technical reports

2. Suggested activities for effective presentation:

This one credit point course is meant to make ready the students for Effective presentation in front of the scientific audience and improve soft skills and to explore topics in detail. The students will be allowed to opt a seminar topic in the beginning of the session (Semester – 6) based on their departmental subjects / Assigned major project / emergent field etc.

During practice, to prepare himself / herself as a speaker, each student will have to receive feedback from the fellow students and the mentor faculty (s).

Students will research topics and organize presentations on the topic before an internal committee constituted by the concerned department of the institute and other students. Each student will have to give 10-15 minute presentations on seminar topic.

On the final seminar date (s), attendance of all students enrolled is mandatory. It is expected that students will actively participate by asking questions to the speaker. The effort by students to meet these expectations will be considered in the determination of their final grade. Before due date of seminar, students have to submit a detailed outline of their presentation and also a brief abstract describing their

presentation to his or her mentor. Abstracts should be concise well written and free of grammatical and typographical errors. The abstract will also serve as an announcement and should include the time, date, and location of the seminar

Students may choose to use PowerPoint to present their seminar, or the chalkboard is also acceptable media for visual aids. It is the responsibility of the students to arrange for any additional equipment he or she feels required to present seminar. Visual aids should look professional and be readable in the entire room.

Proposal Seminar Format:

- Introduce the advisor/mentor and committee members present in the seminar hall.
- Give an introduction and background information on your topic.
- Clearly state the objectives to choose the topic.
- Describe the seminar topic thoroughly.
- Questioner session

The final grade of the students will be determined for seminar as per following criteria.

Sl. No.	Criteria for evaluation of students for seminar
1	Quality of content presented
2	Proper planning for presentation
3	Effectiveness of presentation
4	Quality of the report
5	Depth of knowledge and presentation skill
6	Viva – voce / Questioner session

3. Suggested Scheme for Internal Assessment: [Total Marks: 60]

Involvement	Total Marks
Continuous assessment of class performance and in time submission of report.	30
Viva Voce	20
Class attendance	10
Total Internal Assessment:	60
Pass criterion for Internal Assessment = 24 Marks [Minimum]	

4. Suggested Scheme for End Semester Examination: [Total Marks: 40]

Involvement	Total Marks
Final Presentation of Seminar topic	30
Viva Voce on the day of final presentation	10
Total External Assessment:	40
Pass criterion for Internal Assessment = 16 Marks [Minimum]	

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Mechanical Engineering (Production) [MEP]

Part-III (6th Semester)

2023

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Medical Laboratory Technology [MLT]

Part-III (6th Semester)

2023

Curriculum Structure of MLT 6th Semester

MLT / SEMESTER – 6th													
SNo	Course Code	Course Name	Credit	Contact Hr./Week			Evaluation / Assessment Scheme						Full Marks
							Internal				External		
				L	T	P	CA	TA	MST	P	P	ESE	
Theoretical													
1	MLTPC616	Installation & Maintenance of Medical Equipment	3	2	1	-	10	10	20	-	-	60	100
2	MLTPE64#	Elective-IV:	3	3	-	-	10	10	20	-	-	60	100
3	*OE611	Open Elective-I:	3	3	-	-	10	10	20	-	-	60	100
4	*OE62#	Open Elective-II :	3	3	-	-	10	10	20	-	-	60	100
5	*HS604	Entrepreneurship and Start-ups	3	2	1	-	10	10	20	-	-	60	100
Sessional													
6	MLTPC616P	Installation & Maintenance ofMedical Equipment Lab.	1	-	-	2	-	-	-	60	40	-	100
7	*PR603	Major Project	4		-	6	-	-	-	60	40	-	100
8	*SE601	Seminar	1	-	-	2	-	-	-	60	40	-	100
		TOTAL:	21										

Syllabus of Installation Maintenance of Medical Equipment

Course Introduction:

Program:	Medical Laboratory Technology	Semester:	6th
Course Title:	Installation Maintenance of Medical Equipment	Course Code:	MLT PC 616
Course Category:	Theory; Program Core	Full Marks & Duration:	100; (15+2) Weeks
Credit:	3	Contact Hr./Week	L-2, T-1

Course Objective:

Sr. No	Course Objective
1	To acquire the basic knowledge of Installation of medical Instruments
2	To be familiar with the Layout of installation site.
3	To acquire the basic knowledge Maintenance and Care of medical instruments
4	To acquire the basic knowledge requirements for the installation.

Course Content:

Unit	Topic	Hrs.
1	**Electrical Power Supply:** Concept of single phase & three phase power supply system, Voltage, wattage, Earthing method, Open ground problem, Shielding, Electrical rules & regulation, switch, fuse, UPS	4
2	**Electrical Shock Hazard & safety :** Electrical Shock, Type of shock, Gross shock, Micro Shock, Let-go-current, Physiological effect of electrical shock, electrical safety, Prevention of shock, Isolation circuit, leakage current, code & regulation for the medical Instrument, Patient safety,	6
3	**Installation:** Checklist, Requirement for the installation of medical Instruments - Power , Room size, construction & others, drawing of Layout and Requirement for the installation of X-ray, USG, CT, MRI, Laboratory Instruments – colorimeter, Spectrophotometer, Semi analyzer, Auto-analyzer, Electrophoresis machine, ECG, EEG, EMG , Computed Spirometer etc.	15
4	**Maintenance:** Function of the instruments**,** Use of manual **,** maintenance, Troubleshooting – fault, possible cause, solution, Approach of fault analysis, Preventive maintenance& annual maintenance of different medical instruments such - X-ray, USG, CT, MRI, Laboratory Instruments – colorimeter, Spectrophotometer, Semi analyzer, Auto-analyzer, Electrophoresis machine, ECG, EEG, EMG , Computed Spiro meter, BP Instrument, Stethoscope etc.	15
5	**Condemnation & Disposal:** Introduction, Reason for condemnation of equipment, Constitution of "Condemnation & Disposal Board", Concept of unserviceable equipment, General principle & procedure to declare an item as unserviceable, Determination of floor/Reserve price, Disposal procedure, legislation relevant to disposal, scrap item, sale Procedure.	5
Total Teaching Hrs. : (3 hrs. x 15 Weeks)		45
Assessment : **(** 3hrs. x 2 Weeks)		06
Total: (3hrs. x 17 Weeks)		**51**

Course Outcomes (COs):

COs	***At end of the course, students would be able to***
CO1	State the electric power supply, electric shock hazards & safety.
CO2	Demonstrate the installation of biomedical equipment.
CO3	Demonstrate the maintenance of medical equipment.
CO4	Explain the condemnation & disposal of item.

End Semester Exam:

End Semester Exam Scheme (Weightage 60 %, FM – 60):								
Sr No	Question Type	Group	Unit	No of question to be Set	No of question to be Answered	Allotted Marks	Total Marks	Time (Hrs.)
1.	**Objective Type:** MCQ/ Fill-in-the blanks	A	All	25	20	1 x 20	20	
2.	**Short Answer Type:**	B	All	12	10	1 x 10	10	
3.	**Subjective Type:**	C - I	1,2	3	Any **Five** taking at least **One** from each group	6 x 5	30	
		C - II	3	3				
		C - III	4, 5	3				
	Total (A+B+C) :						**60**	

Reference Book:

Sr No	Book	Author	Publisher
1	Medical Equipment Maintenance Management & Oversight	Binseng Wang	
2	Servicing Biomedical Equipment	Elliott S. Kanter	
3	Biomedical Equipment Technology	Joseph J. Carr & John M. Brown	
4	Biomedical Instrumentation	R. S. Khandpur	Tata Mc
5	The hand book of Biomedical Engineering	Josep D. Bronzino	CRC Press
6	Medical Equipment Maintenance (Guidelines by Ministry of Health)		

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Syllabus of Installation Maintenance of Medical Equipment Lab

Course Introduction:

Program:	Medical Laboratory Technology	Semester:	6th
Course Title:	Installation Maintenance of Medical Equipments Lab	Course Code:	MLTPC 616P
Course Category:	Sessional; Program Core	Full Marks & Duration:	100; (15+2) Weeks
Credit:	1	Contact Hr./Week	T-0: P-2

Course Objective:

Sr. No	Course Objective
1	To acquire the basic knowledge of Installation of Medical equipment
2	To be familiar with the Layout
3	To be familiar with the requirements for the installation
4	To acquire the basic knowledge of the preventive and annual maintenance

Course Details:

Expt. No	Experiment	Hrs.
1	Introduction to tools for installation & maintenance of biomedical equipment.	
2	Draw the layout for installation of ECG machine.	
3	Demonstration of ECG machine maintenance.	
4	Draw the layout for installation of EEG machine.	
5	Demonstration of EEG machine maintenance.	
6	Draw the layout for installation of X-ray machine.	
7	Demonstration of X-ray machine maintenance.	
8	Draw the layout for installation of CT machine.	
9	Demonstration of CT machine maintenance.	
10	Draw the layout for installation of USG machine.	
11	Demonstration of USG machine maintenance.	
12	Draw the layout for installation of bio-chemistry analyzer.	
13	Demonstration of bio-chemistry analyzer maintenance.	
14	Demonstration of BP instrument maintenance.	
Total Teaching Hrs. : (2 hrs. x 15 Weeks)		30
Assessment : **(**2hrs. x 2 Weeks)		04
Total: (2hrs. x 17 Weeks)		**34**

Course Outcomes (Cos):

COs	***At end of the course, students would be able to***
CO1	Identify the tools for installation & maintenance.
CO2	Draw the layout for biomedical equipment.
CO3	Demonstrate installation of biomedical equipment.
CO4	Demonstrate the maintenance of biomedical equipment.

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Elective-IV (*Any one course to be selected*)

Sl	**Course Code**	**Program Elective-IV:**	**Credit**	**Semester**	**Full Marks**
4.1	MLTPE 641	Power & Control System	3	6th	100
4.2	MLTPE 642	Micro Electro Mechanical System	3	6th	100

Code System:
Program (i.e. MLT) _Course Category (i.e. PE) _Semester (i.e. 6) _ Elective Course No (i..e 4)_Course No (i.e. 1, 2,)

Syllabus of Power & Control System

Course Introduction:

Program:	Medical Laboratory Technology	Semester:	6 th
Course Title:	Power & Control System	Course Code:	MLT PE 641
Course Category:	Theory; Program Elective-IV	Full Marks & Duration:	100; (15+2) Weeks
Credit:	3	Contact Hr./Week	L-3: T-0

Course Objective:

Sr. No	Course Objective
1	To introduce application of power electronic.
2	To acquire the knowledge of control system.
3	To develop the concept of time & frequency domain analysis.

Course Details:

Unit	Topic	Hrs.
1	**Thyristor:** Introduction to Thyristor Family, Principle of operation of SCR, Two transistor analogy and turn on & off mechanism of SCR, Firing of thyristor, Gate trigger circuits, Brief of modern power semiconductor devices- DIAC, TRIAC, GTO, RCT, SIT, LASCR, IGBT, MOSFET, UJT	7
2	**Phase Control Rectifiers and Inverters:** Introduction, Phase angle control,1- phase half and full wave control rectifier, 3-phase half and full controlled bridge converter, Thyristor Inverter classification- Series Inverter, Parallel Inverter,1-phase and 3-phase bridge inverter	7
3	**Choppers and AC regulators:** Principle of operations, Step up/down chopper, Chopper Configuration, AC Chopper, 1-phase and 3-phase AC Regulator	5
4	**Control System Components:** Basic concept on Laplace and Fourier, Error sensing devices, potentiometer, tachometer, servomotor, stepper motor, pneumatic system, P, PI and PID controller	13
5	**Time and Frequency Domain:** Introduction, Time response of 1st and 2nd order systems, Effect of adding pole zeros to TFMR-H criteria, Root locus method, Frequency response plot: Polar Plots, Bode Plot, Nyquist Criteria	13
Total Teaching Hrs. : (3 hrs. x 15 Weeks)		45
Assessment : **(3** hrs. x 2 Weeks)		06
Total: (3 hrs. x 17 Weeks)		**51**

Course Outcomes (COs):

COs	*At end of the course, students would be able to*
CO1	Develop the concept of Power electronics
CO2	Demonstrate various applications of Power electronic devices
CO3	Develop the basic concept of Control system
CO4	Develop the concept of Time and frequency domain

End Semester Exam:

End Semester Exam Scheme (Weightage 60 %, FM – 60):								
Sr No	Question Type	Group	Unit	No of question to be Set	No of question to be Answered	Allotted Marks	Total Marks	Time (Hrs.)
A	**Objective Type:** MCQ/ Fill-in-the blanks	A	All	25	20	1 x 20	20	
B	**Short Answer Type:**	B	All	12	10	1 x 10	10	
C	**Subjective Type:**	C-I	1	3	Any **Five** taking at least **One** from each group	6 x 5	30	
		C-II	2, 3	3				
		C-III	4, 5	3				
	Total (A+B+C) :						**60**	

Reference Book:

Sr No	Book	Author	Publisher
1	Power Electronics	MD Singh, KB Khanchandi	TMG
2	Modern Power Electronics	P.C Sen	S. Chand & Company
3	Power Electronics	B.R Gupta	S.K Kataria & Sons
4	Automatic Control System	Kuo	PHI
5	Control System Engineering	Nagrath & Gopal	New Age
6	Control Systems	A.K Jairath	CBS Publications

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Syllabus of Micro Electro Mechanical System

Course Introduction:

Program:	Medical Laboratory Technology	Semester:	6 th
Course Title:	Micro Electro Mechanical System	Course Code:	MLT PE 642
Course Category:	Theory; Program Elective-II	Full Marks & Duration:	100; (15+2) Weeks
Credit:	3	Contact Hr./Week	L-3: T-0

Course Objective:

Sr. No	Course Objective
1	Introduce to Micro-electro mechanical system (MEMS) and its applications.
2	To acquire the basic concept of MEMS Fabrication methods.
3	To be familiar with cell handling & characterization.
4	To be familiar with micro-sensors.

Course Details:

Unit	Topic	Hrs.
1	**Micro-electromechanical Systems (MEMS):** Introduction, what is MEMS? Classification, Transducer, sensor, actuator, Applications.	5
2	**MEMS Fabrication Methods:** Photolithography, Materials for Micromachining: *Substrates, Additive Films and Materials***,** Bulk Micromachining*: Wet Etching, Dry Etching***,** Surface Micromachining**:** *Fusion Bonding,* High-Aspect-Ratio Micromachining (HARM): *LIGA,* Assembly and System Integration, Packaging	10
3	**MEMS AND Microfluidic System:** Biomaterials and Biocompatibility Issues: Microfluidics, Micro total analysis system (μTAS): Fluid control components, μ-TAS: Sample handling, μ-TAS: Separation components, μ-TAS: Detection.	12
4	**Cell Handling and Characterization**: Systems for PCR, Polynucleotide arrays and genetic screening.	8
5	**MEMS Transducers:** MEMS transducer, Micro-sensors and Micro-actuators: Miniature Biosensors, Biosensors arrays and implantable devices, Neural interfaces, microsurgical tools, Micro needles, and drug delivery, and Microsystems for tissue engineering, Tissue scaffolds, Optical biosensors.	10
Total Teaching Hrs. : (3 hrs. x 15 Weeks)		45
Assessment : **(3** hrs. x 2 Weeks)		06
Total: (3 hrs. x 17 Weeks)		**51**

Course Outcomes (COs):

COs	***At end of the course, students would be able to***
CO1	State the MEMS and its applications.
CO2	Demonstrate the principle of MEMS Fabrication methods.
CO3	Explain microfluidic system, cell handling & characterization.
CO4	State working of MEMS transducer, micro-sensor.

End Semester Exam:

End Semester Exam Scheme (Weightage 60 %, FM – 60):								
Sr No	Question Type	Group	Unit	No of question to be Set	No of question to be Answered	Allotted Marks	Total Marks	Time (Hrs.)
A	**Objective Type:** MCQ/ Fill-in-the blanks	A	All	25	20	1 x 20	20	
B	**Short Answer Type:**	B	All	12	10	1 x 10	10	
C	**Subjective Type:**	C-I	1, 2	3	Any **Five** taking at least **One** from each group	6 x 5	30	
		C-II	3, 4	3				
		C-III	5	3				
	Total (A+B+C) :						**60**	

Reference Book:

Sr No	Book	Author	Publisher
1	Microsystem Technology in Chemistry and Life Sciences	Manz and H. Becker, Eds	Spronger-Verlag
2	Fundamental of Bio-MEMS and Medical Microdevice	Steven S. Saliterman	springer
3	Bio-MEMS and Biomedical Nanotechnology	A. P. Lee, Abraham P. Ed Lee	
4	Biomedical Transducers and Instruments	T. Togawa, T. Tamura and P. Ake Oberg	
5	Biomedical Engineering and Design Hand book,	J. M. Pallis	
6	Handbook of Biomedical Engineering.	Kline Jacob	Academic press (N.Y)
7	Introduction to Bio-Medical Engineering	John D. Enderle, Susan M. Blanchard	Elsevier, Academic Press

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Open Elective-I

(*Any one course to be selected form the common list of Open Elective)*

Sl	**Course Code** (OE 61#)	**Open Elective-I :**	**Credit**	**Semester**	**Full Marks**
1			2	6^{th}	100
2			2	6^{th}	100

 # Please find the course content form the common list of Open Elective-I

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Open Elective-II

(*Any one course to be selected form the common list of Open Elective*)

Sl	**Course Code** (OE 62#)	**Open Elective-II:**	**Credit**	**Semester**	**Full Marks**
1			2	6 th	100
2			2	6 th	100
3			2	6 th	100
4			2	6 th	100

 # Please find the course content form the common list of Open Elective-II

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Syllabus of Entrepreneurship and Start-ups

 # Please find the course content form the common list.

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Syllabus of Major Project

Course Introduction:

Program:	Medical Laboratory Technology	Semester:	6 th
Course Title:	Major Project	Course Code:	* PR 603
Course Category:	Sessional; Project Work	Full Marks & Duration:	100; (15+2) Weeks
Credit:	4	Contact Hr./Week	L-0: T-0: P-6

Course Objective:

Sr. No	Course Objective
1	To build up the creativity & innovation.
2	To enhance the decision making capability
3	To face the problems and solution
4	To allow to do a job as their choice/interest
5	Project report preparation

Course Details:

Unit	Topic	Hrs.
1.	A project work (relevant Entitle) should be completed and submitted with Project Report.	
	Total Teaching Hrs. : (6 hrs. x 15 Weeks)	90
	Assessment : **(6** hrs. x 2 Weeks)	12
	Total: (6 hrs. x 17 Weeks)	**102**

Course Outcomes (Cos):

Cos	***At end of the course, students would be able to***
CO1	Explain the working principle of the project and requirement for the project.
CO2	Identify the components, tools, problems & solution etc.
CO3	Design the project
CO4	Demonstrate the application, advantage, limitation of the project.
CO5	Develop the project report.

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Syllabus of Seminar

Course Introduction:

Program:	Medical Laboratory Technology	Semester:	6th
Course Title:	Seminar	Course Code:	* SE 601
Course Category:	Sessional; Seminar	Full Marks & Duration:	100; (15+2) Weeks
Credit:	1	Contact Hr./Week	L-0: T-0: P-2

Course Objective:

Sr. No	Course Objective
1	To build up the creativity & innovation.
2	To develop the soft skill ability.
3	To develop the skill of presentation.
4	To allow to make a ppt on their choice/interest/ poject work
5	Seminar report preparation

Course Details:

Unit	Topic	Hrs.
1.	A seminar topic presentation to be prepared and to be presented & submitted.	
	Total Teaching Hrs. : (4 hrs. x 15 Weeks)	60
	Assessment : **(4** hrs. x 2 Weeks)	8
	Total: (4 hrs. x 17 Weeks)	**68**

Course Outcomes (Cos):

Cos	*At end of the course, students would be able to*
CO1	Demonstrate the seminar topic.
CO2	Develop the skill of PPT presentation.
CO3	Develop communication skill
CO4	Develop the seminar report

Evaluation Scheme of Theory Courses:

Examination Scheme					
Course	Internal Assessment (40 Marks)			External Assessment (60 Marks)	Full Marks
	Mid Sem.Test	Quiz / Assignment	Attendance	End Semester Exam (Council)	
Theory	20	10	10	60	100
Pass Marks: Students have to obtain at least 40% marks (pass marks) in both Internal assessment and External separately.					

Evaluation Scheme of Sessional Courses:

Examination Scheme								
Course	Continuous Internal Assessment (60)					External Assessment (40)		Full Marks (100)
	Performance (30)			Viva-Voce (20)	Attendance (10)	Assignment (On day of External sessional)	Viva-Voce (Before Board of Examiners with Lab Report)	
	Job/ Expt.	Assignment	Lab report	VV	ATT			
Sessional	20	5	5	20	10	20	20	100
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both continuous assessment and end semester Assessment separately.								

Note: Course Outcomes may be fixed as per subject teacher of the Institute.

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Metallurgical Engineering
[MET]

Part-III (6th Semester)

2023

PROPOSED DRAFT SYLLABUS

DIPLOMA IN METALLURGICAL ENGINEERING
2022 – 23

Semester – VI

Sl. No	Category of Course	Code No.	Course Title	Hours per week			Total contact hrs/ week	Credits	Marks
				L	T	P			
1.	Program Core Course – XXIII	MTPC302	Secondary Steel Making Process	2	1	0	3	2	100
2.	Program Core Course – XXIV	MTPC304	Metallurgy of Non – Ferrous & Precious Metals.	1	1	0	2	2	100
3.	Program Core Course – XXV	MTPC306	Welding Technology	2	1	0	3	2	100
4.	Program Core Course – XXVI	MTPC308	Welding Technology Lab	0	0	2	2	2	100
5.	Program Elective course – IV	MTPE302	Advance Foundry & Forging Technology	2	1	0	3	3	100
6.	Humanities and Social Science Course	MTHS302	Entrepreneurship and Start-ups	2	1	0	3	3	100
7.	Open Elective – I (Compulsory)	MTOE302	Engineering Economics & Project Management	2	1	0	3	3	100
8.	Open Elective – II	MTOE304	Any one out of three	2	1	0	3	3	100
9.	Major Project	MTPR302		0	0	3	3	2	100
10.	Seminar	MTSE302		0	0	2	2	2	100
	Total			**13**	**7**	**7**	**27**	**24**	**1000**

Open Elective - II : (Any one out of following four)

1. Renewable Energy : Code : MTOE304/1
2. Industrial Management : Code : MTOE304/2
3. Industrial Safety : Code : MTOE304/3
4. Energy & Environment Control in Metallurgical Industries : Code : MTOE304/4

COURSE : Secondary Steel Making Process

Course Code	MTPC302
Course Title	Secondary Steel Making Process
Number of Credits	2
Course offered in	Part - III , 6th. Semester
Course Category	Program Core Course – XXIII
Hours / Week	3 (Lecture – 2 : Tutorial : 1) ; Total 15 weeks / Sem
Full Marks	100

Marks Distribution: Full Marks =100

	Internal assessment		End Semester Exam	
Sl No	Type	Marks	Question Type	Marks
1	Mid Semester Tests (Two best out of three)	20	Objective type questions carrying 1 mark for 20 questions(Qs) out of 25 Qs throughout the syllabus	1x20=20
2	Quizzes, viva-voce, Assignments	10	Question carrying 8 marks for 5 Qs out of 9 Qs .	8 x 5=40
3	Class Attendance	10		
	Total	**40**		**60**

Course Objectives :

1. Gather knowledge about various process of Secondary steel making .
2. Clear understanding about process of Ingot preparation , defects , and remedies.
3. Understanding injection metallurgy for Desulfurization and Degassing and Decarburization in liquid steel by inert Gas Stirring treatment.

Course Outcomes (COs) :

Course	Statement
MTPC302.1	Understand fundamentals of physico-chemical principles of Secondary Steel Making processes.
MTPC302.2	Explain about application of scientific fundamentals for producing clean steel.
MTPC302.3	Explain and understand about different secondary steel refining processes .
MTPC302.4	Explain about different casting practices .

UNIT WISE DIVISION OF THE SYLLABUS

UNIT	TOPIC	CONTACT PERIODS
1	Objectives of Secondary Steel making.	3
2	Secondary Refining Process & Furnaces	9
3	De-oxidation , Dephosphorization and Desulfurization in Secondary Steel making .	12
4	Vacuum Degassing and Decarburization in liquid steel .	12
5	Casting Practice.	9
	Total =	45

REFERENCE BOOKS:

1. Modern Steel Making --- Dr. R.H.Tupkary
2. Iron Making & steel Making - Theory and Practice – Ahindra Ghosh , Amit Chatterjee - PHI .
3. Steel Making -- A.K.Chakrabarty -- PHI .
4. Manufacture of Iron & steel , Iron Production – Vol – I ,II & III --- G.R.Bashforth.
5. Making Shaping & Treating of Steel --- United States Steel .
6. Physical Chemistry of Iron & Steel making --- R.G.Ward .
7. Iron & Steel industry in India --- M.R.Chaudhuri .
8. Secondary Steelmaking – A. Ghosh

DETAIL COURSE CONTENT

1.0 Objectives of secondary steel making process : 3 PERIODS

1.1 Physico-chemical principles of Secondary Steel making
1.2 Secondary steel making equipment and Various processes .
1.3 Preheating and recycling of ladles.

. .

2.0 Secondary Refining Process & Furnaces : 9 PERIODS

2.1 Ladle Furnace (LF) - brief outline .
2.1.1 ASEA-SKF Furnace

.

3.0 De-oxidation, Dephosphorization and Desulfurization in secondary steel making. 12 PERIODS

3.1 De-oxidation by metallic deoxidizers - Killed steels , Semi-killed steels , Rimmed steels –
3.2 De-oxidation by vacuum .
3.3 Diffusion de-oxidation
3.4 Basis conditions and methods of dephosphorization & desulfurization with thermodynamics aspects.
3.5 Injection metallurgy for desulfurization [ladle desulfurization by injection of active agents, Powder injection, calcium treatment (cored wire injection), plunging technique]- brief outline
3.6 Electroslag Remelting (ESR) - brief outline.
3.7 Non-metallic Inclusion control, clean steel, use of synthetic slag.

4.0 Vacuum Degassing and Decarburization in liquid steel : 12 PERIODS

4.1 Ladle Degassing
4.2 Stream Degassing
4.2.1 Ladle-to-mold degassing - brief outline .
4.2.2 Ladle to Ladle degassing- brief outline
4.3 Recirculation Degassing
4.3.1 R.H.Degassing Process
4.3.2 D.H Degassing Process
4.4 Vacuum Oxygen Decarburization (VOD) - brief outline
4.5 Argon - oxygen decarburization (AOD) – basic principle and application .
4.6 Vacuum Arc Degassing (VAD), basic principle and application .

5.0 Casting Practice : 9 PERIODS

5.1 Ingot casting practice
5.1.1 Tapping & teeming of killed, semi-killed & rimming steels .
5.1.2 Types of Ingots & Ingot models .
5.1.3 Ingot defects — their causes & remedies.
5.2 Continuous casting practice
5.2.1 Definition ,
5.2.2 Types of continuous casting machine & diagram ,
5.2.3 Tundish – brief outline.
5.2.4 Common defects in concast products and remedies

COURSE : METALLURGY OF NON FERROUS & PRECIOUS METALS

Course Code	MTPC304
Course Title	METALLURGY OF NON FERROUS & PRECIOUS METALS
Number of Credits	2
Course offered in	Part - III, 6th. Semester
Course Category	Program Core Course – XXIV
Hours / Week	2 (Lecture – 1 : Tutorial : 1) ; Total 15 weeks / Sem
Full Marks	100

Marks Distribution: Full Marks =100

	Internal assessment		End Semester Exam	
Sl No	Type	Marks	Question Type	Marks
1	Mid Semester Tests (Two best out of three)	20	Objective type questions carrying 1 mark for 20 questions(Qs) out of 25 Qs throughout the syllabus	1x20=20
2	Quizzes, viva-voce, Assignments	10	Question carrying 8 marks for 5 Qs out of 9 Qs .	8 x 5=40
3	Class Attendance	10		
	Total	**40**		**60**

Course Objectives :

Students will have knowledge , skill and attitude on following topic in higher order learning as per Blooms Taxonomy .

Course Outcomes (COs):

Subject: METALLURGY OF NON FERROUS & PRECIOUS METALS

Course	Statement
MTPC304.1	Interpret about different types of Non Ferrous metals & its Industries.
MTPC304.2	Demonstrate about various types of Copper alloys, its properties & application.
MTPC304.3	Demonstrate about various types of Aluminium alloys, its properties & application.
MTPC304.4	Compare about different types of Babbitts, its properties & application.
MTPC304.5	Interpret about different types precious metals and its processing

UNIT WISE DIVISION OF THE SYLLABUS

UNIT	TOPIC	CONTACT PERIODS
1	Non Ferrous metals & its industries	4
2	Copper & its alloys	8
3	Aluminium & its alloys	8
4	Babbitt Metals	4
5	Precious metals	6
	Total =	30

Reference Books : -

1. Engineering Physical Metallurgy - Y. Lakhtin .
2. Metallurgy for Engineers -- E. C. Rollason
3. Metal News --- The Indian. Institute of Metals .
4. Introduction to Physical Metallurgy – Avner

DETAIL COURSE CONTENT

1.0 Introduction

1.1 Review of Important Non Ferrous Metals & its ore.
1.2 Important properties & applications of Pure Copper, Zinc, Tin, Silicon, Nickel, Magnesium, Lead, Titanium, Chromium.
1.3 Review & Listing of Top ten Non Ferrous industries in India

2.0 Copper & its alloys

2.1 Composition, Properties, uses of Cartridge Brass
2.2 Composition, Properties, uses of Muntz metal
2.3 Effect of Alloying addition in Brass, Admiralty Brass, Aluminium Brass, Naval Brass
2.4 Season cracking & Dezincification of Brass.
2.5 Composition, Properties & uses of Phosphor Bronze.
2.6 Composition, Properties & uses of Gun Metal.
2.7 Composition, Properties & uses of Silicon Bronze & Aluminium Bronze.

3.0 Aluminium & its alloys

3.1 Equilibrium Diagram of Al-Cu Binary system & its different phases .
3.2 Composition, Properties & application of Duralumin alloy
3.3 Strengthening mechanism of Duralumin alloy.
3.4 Equilibrium Diagram of Al-Si Binary system & its different phases.
3.5 Composition, Properties & application of Silumin alloy.
3.6 Modification of Silumin alloys

4.0 Babbitt Metal

4.1 Babbitt metals & its properties, Microstructure.
4.2 Types of Babbitt
4.3 Composition, Properties, Microstructure & application of Tin Base Babbitt
4.4 Composition, Properties, Microstructure & application of lead Base Babbitt

5.0 Precious metals & its alloys

5.1 Periodic Table position & significance of Gold, Silver, Platinium, Palladium, Iridium, Ruthenium, Osmium & Rhenium.
5.2 Important physical & mechanical properties of Gold, Silver, Platinium, Palladium, Iridium, Ruthenium, Osmium & Rhenium.
5.3 Extraction techniques of Gold , Silver, Platinium & Palladium.

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COURSE: WELDING TECHNOLOGY

Course Code	MTPC306
Course Title	Welding Technology
Number of Credits	2
Course offered in	Part - III, 6th. Semester
Course Category	Program Core Course – XXV
Hours / Week	3 (Lecture – 2 : Tutorial : 1) ; Total 15 weeks / Sem
Full Marks	100

Marks Distribution: Full Marks =100

	Internal assessment		End Semester Exam	
Sl No	Type	Marks	Question Type	Marks
1	Mid Semester Tests (Two best out of three)	20	Objective type questions carrying 1 mark for 20 questions(Qs) out of 25 Qs throughout the syllabus	1x20=20
2	Quizzes, viva-voce, Assignments	10	Question carrying 8 marks for 5 Qs out of 9 Qs .	8 x 5=40
3	Class Attendance	10		
	Total	**40**		**60**

Course Objectives:

Students will acquire knowledge, skill and attitude to have following attributes.

1. Concept about welding technology
2. Understanding about principles and techniques of welding
3. Knowledge about use of different types of welding processes
4. Gather concept of metallurgical phenomenon regarding welding
5. Knowledge about advance process of welding
6. Know how of different defects and remedial measures in welding process

Course Outcomes (COs):

Subject: Welding Technology

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

Course	Statement
MTPC306.1	Describe welding as a joining process
MTPC306.2	Explain basic principles and techniques of welding.
MTPC306.3	Describe different welding processes and equipment .
MTPC306.4	Explain metallurgical phenomenon regarding welding.
MTPC306.5	Describe advance process of welding.
MTPC306.6	Explain defects and remedial measures in welding process.

UNIT WISE DIVISION OF THE SYLLABUS

UNIT	TOPIC	CONTACT PERIODS
1	Introduction	3
2	Gas Welding	6
3	Arc Welding	12
4	Special Welding Process	9
5	Brazing and Soldering	6
6	Metallurgy of Welding	9
	Total =	45

Reference Books: -

1. Welding Technology----- O.P. Khanna.
2. Welding Technology by Richard Little, Publisher- Mc Graw Hill

DETAIL COURSE CONTENT

1.0 Introduction. **3 PERIODS**

1.1 History of welding.
1.2 Classification of different welding process.

2.0 Gas Welding. **9 PERIODS**

2.1 Principles, techniques & sketch of gas welding process.
2.2 Explain different types of welding flames.
2.3 Advantages, disadvantages and application of gas welding.

3.0 Arc Welding. **12 PERIODS**

3.1 Classification of different arc-welding process & Basic physics of Arc .
3.2 Manual metal Arc Welding Process with different types of flux coating.
3.3 Submerged-arc welding, brief idea, its application.
3.4 TIG process, brief idea, its application.
3.5 MIG process, brief idea, its application.

4.0 Special Welding Process. **9 PERIODS**

4.1 Resistance welding- brief idea, its application.
4.2 Thermo-chemical welding- brief ideas, its application.
4.3 Solid state welding -brief idea, its application.
4.4 Underwater welding-brief idea, its application.

5.0 Brazing and Soldering. **6 PERIODS**

5.1 Principles and techniques of brazing.
5.2 Principles and techniques of soldering.

6.0 Metallurgy of Welding. **9 PERIODS**

6.1 Define weldability.
6.2 Thermal effects of welding on parent metal.
6.3 Different zones, definition of HAZ.
6.4 Defects in welds & its remedies.
6.5 Control of HAZ by controlling heat input.
6.6 Preheat and post weld heat treatment .

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COURSE : Welding Technology Lab

Course Code	MTPC308
Course Title	Welding Technology Lab
Number of Credits	2
Course offered in	Part - III, 6th. Semester
Course Category	Program Core Course – XXVI
Hours / Week	2 (Practical – 2); Total 15 weeks / Sem
Full Marks	100

EXAMINATION SCHEME

Marks Distribution: Full Marks =100

	Internal assessment		End Semester Exam	
Sl No	Type	Marks	Type	Marks
1.	Continuous Internal Assessment is to be carried out by the teachers throughout the Third Semester. Distribution of marks for Internal Assessment : Performance of Job – 20, Notebook – 20.	40	External Assessment of 40 marks shall be held at the end of the Third Semester on the entire syllabus. Distribution of marks for External Assessment : On spot job – 10 Viva - voce – 30	40
2.	Class Attendance	20		
	Total	**60**		**40**

Course Objectives:

Students will acquire knowledge, develop skill and right attitude to adopt the following attributes:

1. Laboratory experiment on Sketch & Practice on Gas welding.
2. Laboratory experiment on Sketch & Practice on Arc welding.
3. Laboratory experiment on Study of strength & microstructure in HAZ.
4. Laboratory experiment on Charts on Failure & remedies of weld structure.

Course Outcomes (COs):

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

Course	Statement
MTPC308.1	Demonstrate about the hands on procedure of working with gas welding.
MTPC308.2	Demonstrate about the hands on procedure of working with arc welding.
MTPC308.3	Analysis and optimization of suitable welding method studying their strength and microstructure in HAZ.
MTPC308.4	Identify common welding defects and propose remedy

REFERENCE BOOKS:

1. Welding Technology --- O.P.Khanna .
2. Welding & Welding Technology --- L.K.Little .

PRACTICAL: LIST OF LABORATORY EXPERIMENTS:

SI. NO.	NAME OF EXPERIMENT CONTACT	CONTACT PERIODS
1.0	**Sketch & Practice on Gas welding.**	**9**
1.1	Sketch chart of essential Gas welding equipments	
1.2	Practicing of reducing, oxidizing & neutral Gas welding process.	
2.0	**Sketch & Practice on Arc welding.**	**9**
2.1	Sketch chart of essential Arc welding equipments	
2.2	Practicing arc welding, studying problems encountered & avoidable remedies.	
2.3	Studying about straight polarity / Reverse polarity.	
2.4	Draw the TIG welding set up and Sketch the penetration pattern for various shielding gases	
3.0	**Study of strength & microstructure in HAZ.**	**9**
3.1	Studying tensile strength & hardness in HAZ.	
3.2	Studying microstructure in HAZ	
4.0	**Charts on Failure & remedies of weld structure.**	**3**
4.1	Charts on different defects in welds, such as cracks, distortion, inclusion, blow holes, poor fusion, under cutting, overlapping etc. & remedies.	
	Total =	**30**

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COURSE: ADVANCE FOUNDRY & FORGING TECHNOLOGY

Course Code	MTPE302
Course Title	Advance Foundry & Forging Technology
Number of Credits	3
Course offered in	Part - III, 6th. Semester .
Course Category	Program Elective Course – IV
Hours / Week	3 (Lecture – 2 : Tutorial : 1) ; Total 15 weeks / Sem
Full Marks	100

Marks Distribution : Full Marks = 100

	Internal assessment		End Semester Exam	
Sl No	Type	Marks	Question Type	Marks
1	Mid Semester Tests (Two best out of three)	20	Objective type questions carrying 1 mark for 20 questions(Qs) out of 25 Qs throughout the syllabus	1x20=20
2	Quizzes, viva-voce, Assignments	10	Question carrying 8 marks for 5 Qs out of 9 Qs .	8 x 5=40
3	Class Attendance	10		
	Total	**40**		**60**

Course Objectives :

Course Outcomes (COs):

Subject: ADVANCE FOUNDRY & FORGING TECHNOLOGY

Course	Statement
MTPE302.1	Demonstrate about different categories of Foundry tools, methods & patterns.
MTPE302.2	Compare different types of Non Ferrous casting production processes.
MTPE302.3	Analyze different types of Precision casting process & its applications in foundry.
MTPE302.4	Demonstrate about different categories of Forging methods
MTPE302.5	Interpret forging processes of various non ferrous metals & special alloys.

UNIT WISE DIVISION OF THE SYLLABUS

UNIT	TOPIC	CONTACT PERIODS
1	Foundry Tooling & Methoding	9
2	Non Ferrous Casting Production	9
3	Precision Casting Process	9
4	Basics of Forging	9
5	Forging of Non Ferrous & Special Alloys	9
	Total =	45

Reference Books: -

1. Mechanical Metallurgy ---- George E Dieter.
2. Principles of Metal Casting-Heine, Loper & Rosenthal. .

DETAIL COURSE CONTENT

1.0 Foundry Tooling & Methoding : 9 PERIODS

1.1 Pattern, Pattern Materials, Pattern accessories & allowances.
1.2 Principles of Solidifications in Castings; Directional & Progressive Solidifications.
1.3 Design and Positioning of Risers,
1.4 Gating system, Design, ratio, Presssurized & Unpressurized Gating system

2.0 Non Ferrous Casting Production : 9 PERIODS

2.1 Composition, Structure, properties and application of Aluminium, Copper, Mg, Zn based alloys.
2.2 CO_2 process, Hot Box process, Pit Moulding.
2.3 No Bake Binder.
2.4 Full Moulding, Magnetic Moulding, Vacuum sealed moulding, High pressure Moulding, Impact & Explosion Moulding .
2.5 Investment, Die, Centrifugal, Frozen Mould Casting
2.6 Salvaging of Castings

3.0 Precision Casting process. : 9 PERIODS

3.1 Principle, process details, Process variables.
3.2 Economics & Comparative study of precision casting process
3.3 Shell Investment Casting.
3.4 Ceramic Moulding, Plaster Moulding.
3.4 Rheo Casting, Squeeze Casting and Centrifuging.

4.0 Basics of Forging : 9 PERIODS

4.1 Forging- Definition, Classification, Advantages, Limitations.
4.2 Open Die & Closed Die Forging
4.3 Hammer & Press Forging
4.4 Isothermal Forging, Superplastic Forging, Powder Forging
4.5 Precision Forging , ,Liquid Forging, Rheo Forging, Flashless Forging.
4.6 Macrostructure to study breakdown of cast dendritic structure into homogeneous one due to Forging.
4.7 Forging reduction ratio calculation and it's importance .
4.8 Forging defects & its remedies .

5.0 Forging of Non Ferrous & Special alloys : 9 PERIODS

5.1 Forging of Aluminium & its alloys.: Forging Characteristics, Methods
5.2 Forging of Copper & its alloys.: Forging Characteristics, Methods
5.3 Forging of Ti & Mg alloys.: Forging Characteristics, Methods
5.5 Forging of Stainless Steel.
5.6 Forging of Cast High Speed Steel

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Course Title	Entrepreneurship and Start-ups
Course Code	MTHS302
Number of Credits	3
Total Contact Hours	3 (L: 2; T: 1) / Week = 45 hrs
Course Category	Humanities and Social Science course

Course Learning Objectives

1. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
2. To motivate and inspire students toward an entrepreneurial career.
3. To understand venture creation process and to develop generic entrepreneurial competences.
4. To introduce students to the basic steps required for planning, starting and running a business.
5. To familiarise students with the different exit strategies available to entrepreneurs.

Course Outcomes:

After completing the course students will able to:

MTHS302.1	Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
MTHS302.2	Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
MTHS302.3	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
MTHS302.4	Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

Detailed Course Content

Unit	Name of the Topic	Hours
1.	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS** • Concept, Competencies, Functions and Risks of entrepreneurship • Entrepreneurial Values& Attitudes and Skills • Mindset of an employee/manager and an entrepreneur • Types of Ownership for Small Businesses o Sole proprietorship o Partnerships o Joint Stock company- public limited and private limited companies • Difference between entrepreneur and Intrapreneur	10
2.	**PREPARATION FOR ENTREPRENEURIAL VENTURES** • Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. • Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard Feasibility Study Report • Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan • Project Report- Concept, its features and components • Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. <u>They **may not** be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.</u>	20
3.	**ESTABLISHING SMALL ENTERPRISES** • Legal Requirements and Compliances needed for establishing a New Unit- o NOC from Local body o Registration of business in DIC o Statutory license or clearance o Tax compliances	03
4.	**START-UP VENTURES**	04

	• Concept & Features • Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical • Problems and challenges faced by start-ups. • Start-up Ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. No questions are to be set from the case studies.	
5.	**FINANCING START-UP VENTURES IN INDIA** • Communication of Ideas to potential investors – Investor Pitch • Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups • Govt Initiatives including incubation centre to boost start-up ventures • MSME Registration for Start-ups –its benefits	06
6.	**EXIT STRATEGIES FOR ENTREPRENEURS** • Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – **Basic Concept only**	02

Examination Scheme

- **End Semester Examination: 60 marks**

Suggested Question Paper Scheme for End Semester Examination

Group A: 20marks

Question Type	Number of questions to be set	Number of questions to be answered
MCQ, Fill in the blanks, True or False (Carrying 1 mark each)	25	20

Group B: 40marks

Question Type	Number of questions to be set	Number of questions to be answered
Subjective Type questions (Carrying 8 marks each)	10	5

- **Internal Assessment: 40 marks**
  - Class test : 20 marks
  - Assignment: 10 marks
  - Class attendance: 10 marks

Suggested Learning Resources

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of IndiaLearning Private Ltd
2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Caseson Entrepreneurship	Anjan Raichaudhuri	Prentice Hall of India Learning Private Ltd
6.	How to Start a Business in India	Simon Daniel	Buuks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development and Business Ethics	Abhik Kumar Mukherjee & Shaunak Roy	Oxford University Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

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Course : Engineering Economics & Project Management

Course Code:	MTOE302
Course Title:	Engineering Economics & Project Management
No. of Credits:	3 (L:3, T:0,P: 0) ; 45 Hours
Course Category:	Open Elective – I (Compulsory for all branches)

Course Objectives:

- To acquire knowledge of basic economics to facilitate the process of economic decision making.
- To acquire knowledge on basic financial management aspects.
- To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

Group-A

Unit - I (INTRODUCTION , THEORY OF DEMAND & SUPPLY) [9 hours]

1.1 Introduction to Engineering Economics, the relationship between Engineering and Economics

1.2 Resources, scarcity of resources, and efficient utilization of resources.

1.3 Opportunity cost, rationality costs, and benefits

1.4 Theory of Demand: the law of demand, different types of demand, determinants of demand, demand function, price elasticity of demand.

1.5 Theory of Supply: determinants of supply, supply function.

1.6 Market mechanism: Equilibrium, basic comparative static analysis (Numerical problems)

Unit-II (THEORY OF PRODUCTION & COSTS) [10 hours]

2.1 Concept of production (goods & services), Different factors of production (fixed and variable factors), Short-run Production function (Graphical illustration), and Long run production function (returns to scale).

2.2 Theory of Cost: Short-run and long-run cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost etc.

2.3 Economic concept of profit, profit maximization (numerical problems)

UNIT-III (DIFFERENT TYPES OF MARKET AND ROLE OF GOVERNMENT) [4 hours]

3.1 Perfect Competition: Features of Perfectly Competitive Market.

3.2 Imperfect Competition: Monopoly, Monopolistic Competition, and Oligopoly.

3.3 Role of government in Socialist, Capitalist and Mixed Economy structure with example.

Group-B

Unit-I (CONCEPT OF PROJECT) [4 hours]

1.1 Definition and classification of projects)

1.2 Importance of Project Management.

1.3 Project life Cycle [Conceptualization→Planning→Execution→Termination]

Unit-II (FEASIBILITY ANALYSIS OF A PROJECT) [10 hours]

2.1 Economic and Market analysis.

2.2 Financial analysis: Basic techniques in capital budgeting– Payback period method, Net Present Value method, Internal Rate of Return method.

2.3 Environmental Impact study–adverse impact of the project on the environment.

2.4 Project risk and uncertainty: Technical, economical, socio-political, and environmental risks.

2.5 Evaluation of the financial health of a project–Understanding the basic concept of Fixed & Working Capital, Debt & Equity, Shares, Debentures etc., and different financial ratios like Liquidity Ratios, Activity Ratios, Debt-equity ratio & Profitability Ratio (Basic concept only).

N.B: Knowledge of financial statements is not required; for the estimation of ratios the values of the relevant variables will be provided.

Unit-III (PROJECT ADMINISTRATION) [8 hours]

3.1 Gantt Chart– a system of bar charts for scheduling and reporting the progress of a project (basic concept).

3.2 Concept of Project Evaluation and Review Technique (PERT) and Critical Path method (CPM): basic concept and application with real-life examples.

Examination Scheme:

A. Semester Examination pattern of 60 marks :

1. Objective type Question (MCQ, Fill in the blanks, and Very Short question-1 mark each): At least five questions from each unit. [Total marks: 20]

2. Subjective questions: Eight questions to be answered taking at least three from each group. (Two questions should be given from each unit). [Total marks: 40]

B. Assignment (10Marks)

Guideline for Assignment (10 Marks)

Students should be instructed to prepare a report on a project (preferably the Major Project they prepare in 6th Semester), using a popular project management software in IT/ Computer Laboratory, under the guidance of the Lecturer in Computer Science & Technology and Lecturer in Humanities.

C. Class Test: Two examinations 20 marks each. Take best of two.

D. Attendance: 10 Marks

Suggested reference books:

1 *Principles of Economics – Case and Fair, Pearson Education Publication*
2 *Principles of Economics – Mankiw, Cengage Learning*
3 *Project planning, analysis, selection, implementation and review – Prasannachandra–Tata McGraw Hill.*
4 *Project Management – Gopala Krishnan – Mcmillan India Ltd*

Course : Renewable Energy

Semester	:	VI	
Course Code	:	MTOE304/1	
Course Title	:	Renewable Energy	
Number of Credits	:	3 (L: 3, T: 1 , P: 0) ; 45	
Course Category	:	Open Elective – II	
Course Objective			
Following are the objectives of this course			
	To provide basic knowledge of different sources of renewable energy and Renewable energy plants		
Course Content			Hrs/Unit
Module 1	Unit 1	Introduction	6
		1.1 Classification of energy: Primary and secondary energy, Commercial and non-commercial energy, Renewable and Non-renewable energy, Conventional and Non-conventional energy. 1.2 Advantage of Renewable energy 1.3 Sources of Renewable Energy: Solar Energy, Wind Energy, Biomass Energy, Hydro Energy, Geothermal Energy, Tidel and Ocean energy (only brief idea on all these)	
	Unit II	Solar energy	9
		2.1 Units of solar power and solar energy 2.2 Essential subsystem in solar energy plant: Solar collector or concentrator, energy transport medium, energy storage, energy conversion plant, power conditioning control and protection system, alternative or standby power supply. 2.3 Solar Electric System: Solar water Heater, Solar lighting system, Solar cooker, Electric vehicle charging station (Working principle only) 2.4 Idea on Photovoltaic Technology	
Module 2	Unit III	Bioenergy	9
		3.1 Introduction on Biogas, Sources of Bioenergy 3.2 Different forms of Biomass, their composition & fuel properties 3.3 Production of Biogas: working principle of fixed- dome type and floating gas holder type biogas plant 3.4 Idea of gasifier, digester 3.5 Use of Biogas	
	Unit IV	Wind Energy	6
		4.1 Basic working principle of Wind energy production 4.2 Speed and power relation, Average power of the wind 4.3 System components of wind Energy (e.g. Tower, Turbine, Blades etc). 4.4 Control of rotor speed	
Module 3	Unit V	Hydropower	6
		5.1 How hydropower plant works 5.2 Main components of Hydropower plant: Gate, penstock, surge tank, turbine, transformer etc. 5.3 Types of hydropower: Run-of-River power plant (no active storage), Plant with significance storage, Pumped storage, Tidal plant (Only basic idea)	

	Unit VI	Measuring Instruments	9
		6.1 Basic principle of Pyranometer for solar radiation measurement. 6.2 Idea on different instrument used in Hydroelectric power plant, Solar thermal plant, Wind power plant, Biogas plant (name of instruments and where to use in that plant.)	

Suggested Learning resources		
Title	Author	Publisher
Non-Conventional Energy	ShobhNath Singh	Pearson
Renewable and Efficient Electric Power Systems	Gilbert M. Masters	Wiley
Alternative Energy Systems & Applications	B.K.Hodge	Wiley
Renewable Energy Technologies,	J.C.Sabonnadiere,	Wiley
Introduction to Renewable Energy	Vaughn Nelson	CRC Press
Renewable Energy: Power for a Sustainable Future	Godfrey Boyle	
Renewable Energy Technology	Jha, Sen, Tiwari, Kothari	New Age International
Renewable Energy Technology	Chetan Singh Solanki	PHI
Non-Conventional Energy Resources	S.H.Saeed, D.K.Sharma	S.K.Kataria& Sons
Energy Techonology: Nonconventional, Renewable & conventional	Rao, Parulekar	Khanna Publisher
Non-conventional Energy Sources	G.D. Rai	Khanna Publisher
Non-Conventional Energy Resources	B. H. Khan	McGraw Hill Publications.
Solar Energy – Principles of Thermal Collection and Storage	S. P. Sukhatme, J.K. Nayak	Tata McGraw-Hill, New Delhi
Solar Energy, Fundamentals and Applications	Garg, Prakash	Pearson
Solar energy	A.M. Rehman	Scitech Pblications(India) Pvt. Ltd
Introduction to solar principles	Thomas E. Kissell	Pearson
Biogas Systems, Principle and	Mital KM.	New Age International Ltd.

Course Outcome	
At the end of the course student will be able to:	➢ Classify different energy sources ➢ Understand basics on solar energy, bioenergy, wind energy, and hydropower. ➢ Identify different parts of solar energy plant. ➢ Know various sources of biomass, and construction of biogas production plant ➢ Understand concepts of wind energy, components and functions of it ➢ Grow critical thinking and problem-solving skills to overcome obstacles to use renewable energy system. ➢ Identify different measuring instruments related to specific renewable energy plant.

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Course : Industrial Management

<table>
<tr><td colspan="4">Course Title : Industrial Management</td><td colspan="3">Semester : Sixth</td></tr>
<tr><td colspan="4">Category: Open Elective – II</td><td colspan="3">Full Marks: 100</td></tr>
<tr><td colspan="4">Code no. : MTOE304/2</td><td colspan="3">Examination Scheme:</td></tr>
<tr><td colspan="4" rowspan="2">Duration : 15 weeks</td><td colspan="3">External Assessment</td></tr>
<tr><td colspan="2">End Semester Examination</td><td>60</td></tr>
<tr><td colspan="4" rowspan="4">Teaching Scheme</td><td colspan="3">Internal Assessment</td></tr>
<tr><td>Class Test :</td><td>20</td><td rowspan="3">40</td></tr>
<tr><td>L</td><td>T</td><td>Total</td><td>Credit</td><td>Assignment/Student activity</td><td>10</td></tr>
<tr><td>2</td><td>1</td><td>3</td><td>3</td><td>Class attendance</td><td>10</td></tr>
<tr><td colspan="5">Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.

Assignment / Student Activity: Submission of Home assignment, submission of report after conducting site visit/ industry visit/ micro-project / market survey / internet search on specific topic, preparation of chart, creation of innovative model or present seminar on specific topic which is suitable for the given subject as per instruction of subject teacher.</td><td>Total</td><td>100</td></tr>
</table>

1. **Course Outcomes:**

    1. Explain the importance of management process in Business.
    2. Understand different types of organization, Objectives and functions of management.
    3. Understand the functional areas of management relating human resources, Materials, Finance.
    4. Apply various rules and regulations concerned with Business & Social Responsibilities of the Technician
    5. Identify various components of management
    6. Find the economic order quantity (EOQ) for given situation.
    7. Apply beak even analysis for optimum production
    8. Apply principles of safety in industrial activities.

2. **Theory Components:**

Unit	Topics	Teaching Hours
Unit: 1 Overview Of Business	1.1. Types of Business -Service -Manufacturing -Trade 1.2. Industrial sectors Introduction to: -Engineering industry	04

	-Process industry -Textile industry -Chemical industry -Agro industry 1.3 Globalization Introduction - Advantages & disadvantages w.r.t. India 1.4 Intellectual Property Rights (I.P.R.)	
Unit: 2 Management Process	2.1 What is Management? -Evolution - Various definitions - Concept of management -Management is the combination of art and science - Levels of management -Administration & management - Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management -Planning -Organizing -Directing -Controlling 2.4 Social responsibility and Environmental dimension of management.	05
Unit: 3 Organizational Management	3.1 Organization :- - Definition -Steps in organization 3.2 Types of organization - Line - Line & staff - Functional - Project 3.3 Departmentation - Centralized & Decentralized -Authority & Responsibility - Span of Control 3.4 Forms of ownership - Proprietorship -Partnership - Joint stock - Co-operative Society - Govt. Sector	06
Unit: 4 Human Resource Management	4.1 Personnel Management - Introduction - Definition -Objectives -Functions 4.2 Staffing - Introduction to HR Planning -Recruitment Procedure 4.3 Personnel– Training & Development - Types of training - Induction -Skill Enhancement	08

	4.4 Grievance handling 4.5 Leadership, Leadership quality, Leadership style -Motivation - Maslow's Theory of Motivation 4.6 Introduction to -ESI Act -Workmen Compensation Act	
Unit: 5 Financial Management	5.1. Financial Management - Objectives & Functions 5.2. Break Even Analysis -Introduction -Graphical representation -Significance -Limitations 5.3. Introduction to – -Excise Tax - Income Tax -GST -Custom Duty	06
Unit: 6 Materials Management	6.1 Objectives and function of Materials Management 6.2. Purchase Procedure - Objects of Purchasing - Functions of Purchase Dept. - Steps in Purchasing 6.2 Economic Order Quantity(EOQ) - Introduction & Graphical Representation 6.3 Inventory Management. -Meaning & Objectives 6.4 ABC Analysis, VED Analysis 6.5 Stores function, -BIN card, -Pricing of materials -Store verifications	08
Unit: 7 Sales and Marketing Management	7.1 Introduction 7.2 Difference between Selling and Marketing 7.3 Functions of Marketing 7.4 Market Survey 7.5 Sales promotions 7.6 Recent trends	04
Unit: 8 Safety Engineering	8.1 Accidents -causes of accidents 8.2 Need for safety 8.3 Organization for safety 8.4 Safety committee 8.5 Safety programmes 8.6 Safety measures	04
	Total Lecture Classes	45

Assignments: (any five)-

1. Preparation of chart for fire safety.
3. Preparation of chart for personal, Tools & Equipment and products safety.
4. Preparation of chart to avoid accident.
5. Preparation of chart to show the different financial ratios.
6. Preparation of chart to show the different types of organization.
7. Preparation of EOQ model.
8. Preparation of beak even analysis model
9. Prepare charts for showing steps of recruitment, training and performance appraisal

Suggested scheme for question paper design for conducting internal assessment examination: (Duration:45minus)

Questions to be set as per Bloom's Taxonomy				
	Distribution of Theory Marks			
	Level 1(Remember)	Level 2(understand)	Level3 (Apply &above)	Total
Class Test -1	4	8	8	20
Class Test -2	4	8	8	20

4. Suggested Scheme for End Semester Examination [duration: 2 hours 30 minutes]

A: Multiple Choice Type Questions (Carrying 1mark ach)				
Group	Unit	To be Set	To be Answered	Total Marks
A1	1 & 2	07	20	20x01=20
A2	3,4 &5	10		
A3	6,7 & 8	08		
	Total:	25	20	20
B: Subjective Type Questions (Carrying 8 marks each)				
Group	Unit	To be Set	To be Answered	Total Marks
B1	1 & 2	02	05	08x05=40
B2	3,4 &5	04		
B3	6,7 & 8	03		
	Total:	09	05	40
			Sub-Total[A]:	20
			Total[A+B]:	60

6. Suggested Learning Resources:

Sl. No.	Title of Book	Author	Publication
1.	Industrial Engineering and Management	O.P. Khanna	Dhanpat Rai & Sons
2	Management Principles, Processes & Practices	A.Bhattaraya & A.Kumar	Oxford University Press
3	The process of Management	W.H. Newman E.Kirby Warren Andrew R. McGill	Prentice-Hall of India, New Delhi 2004.
4	Industrial Engineering & Management,	V.Arun Viswanath, Anoop. S. Nair, S.L.Sabu	SCITECH Publication(s) Pvt. Ltd
5	Industrial Management	Rustom S. Davar	Khanna Publication
6.	Industrial Engg & Management	N V S Raju	Cengage
7.	Industrial Management	Jhamb & Bokil	Everest Publication , Pune

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Course : Industrial Safety

Category: Open Elective – II	Semester : Sixth
Code No. : MTOE304/3	Theory : 100 Marks
Course : Industrial Safety Duration :15 weeks Total lecture class / week : 3 Credit : 3	Examination Scheme : (i) External Assessment : 60 marks (End Semester Examination) (ii) Internal Assessment: 40 marks [Class test : 20 marks Assignment, viva voce : 10 marks Class attendance : 10 marks]
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

1. Course outcomes (COs):

By the end of this course, a student should be able to:

1. Understand the various basic concepts of Hazard, Risk, and Accidents in various industries and their management.
2. Understand the various effects of physical hazards on human health and the various control measures to rectify the same.
3. Understand and identify various hazards in industries and the impact of damages in these areas.
4. Understand the various fire prevention techniques to be followed in various industries.
5. Evaluate workplace to determine the existence of occupational safety and health hazards.
6. Explain important legislations related to Health, Safety and Environment
7. Understand and implement statutory requirements mentioned in factories act for the prevention of accidents.

Besides the above this course would equip the students to effectively employ hazard analysis techniques in Industry and helpful to prevent the accidents in Industry.

2. Theory Components:

The following topics/subtopics should be taught and assessed for achieving the course outcomes to attain the identified competency.

UNIT	Topics & Sub-topics	Teaching Hour
UNIT 1 INTRODUCTION TO INDUSTRIAL SAFETY	History and Development of Safety Movement, Importance of Safety, Safety Policy: Safety Organization and Its Responsibilities, Accident Sequence Theory, Causes of Accidents, Accident Prevention and Control Techniques Including Near Misses. Risk, Hazards and Dangerous Occurrences. First Aid. Financial Costs-Direct And Indirect Costs of Accidents.	6

UNIT 2 INDUSTRIAL HYGIENE	Industrial Hygiene – Principles and its Control Measures. Permissible Limits. Stress, Exposures to Heat, Heat Balance, Effects of Heat Stress, Chemical Agents, Flammables, Explosives - Types, Water Sensitive Chemicals, Oxidants, Gases Under Pressure, Chemicals Causing Health Hazards: Irritants, Asphyxiates, Anaesthetics, Poisons and Carcinogens. Air Sampling, Types of Airborne Contaminants and Their Evaluation Methods, Housekeeping and its Importance.	**6**
UNIT 3 WORKPLACE HAZARDS AND ITS CONTROL	Physical Hazards - Illumination - Principles and Purpose of Good Illumination. Standards of Illumination. Ventilation – Principle and Purpose of Ventilation. Classification of Ventilation (Natural and Artificial), Heat Stress – Various Indexes, Different Controls (Including Air Conditioning), Vibration and its Control, Noise Pollution and its Control, Noise Mapping, Personal Protective Aids. Safe Weight Lifting Procedure. Safe Start Up, Shut Down and Emergency Shut Down Procedures. Permit to Work System. Chemical Hazards - Hazardous Chemicals – Classification and its Properties, Common Hazard and Precautions for Each Class. Safety in Transportation and Bulk Storage of Hazardous Materials. Corrosion Prevention and Preventive Maintenance of Vulnerable Equipment. Safe Entry Into Confined Spaces. Permit to Work System. Electrical Hazards - Dangers from Electricity. Safe Limits of Voltage and Amperage. Safe Distance from LT and HT Lines. Means of Cutting of Power Overload and Short Circuit Protection. Methods and Importance of Earthing. Earth Fault Protection. Earth Insulation and Continuity Tests. Protection Against Overvoltage. Lighting Arrester, Flame Proof and Intrinsic Electrical Equipment, Precautions in Their Selection, Installation, Maintenance and Use. Control of Hazards due to Static Electricity. Permit to Work System. Fire Hazards - Chemistry of Fire, Classification of Fire. Common Causes of Industrial Fire. Statutory Provisions Regarding Fire Safety, Factors Contributing Towards Fire. Determination of Fire Load. Fire Resistance of Building Materials. Design of Industrial Plant for Fire Safety. Prevention of Fire: Portable Extinguishers- Water Type Extinguisher, Carbon dioxide Type Extinguisher, Foam Type Extinguisher, Dry Chemical Type Extinguisher. Sprinkle Systems, CO_2 Flooding System Foam Flooding System. Industrial Fire Detection and Alarms. Special Precautionary Measures in Handling/Processing Flammable Liquids, Gases, Vapours, Mists and Dusts. Emergency Action Plan. Construction Hazards - Safe Operating Procedure (SOP) and Code of Practice (COP) for Various Civil Works, Works at Heights and Various Safe Conditions Including Fall Protection and Preventive Measures. Personal Protective Aids for Working at Construction Site. Permit to Work System. Mining Hazards - Mine Rules and Regulations (CMR 2017 and MMR 1961), Specific Statutory Provisions from DGMS Circulars, Mine Act, Bye Laws for Safe Mining. Permit to Work System.	**15**

UNIT 4 OCCUPATIONAL HEALTH	History of Occupational Health, Concept of Occupational Health, Occupational and Work Related Diseases, Levels of Prevention, Health Examination (Initial and Periodic), Essentials of Occupational Health Services (OHS), Personal Protective Equipment (Respiratory and Non-Respiratory), Ergonomic Controls, Risk Assessment, Risk Management and Risk Tolerance.	**6**
UNIT 5 INDUSTRIAL SAFETY LEGISLATIONS	The Factories Rules, Functions of Safety Management, Legislative Measures in Industrial Safety: Factories Act, 1948, Workmen's Compensation Act, 1943, Employees State Insurance Act, 1948. Water (Prevention and Control) Pollution Act, 1974, Boiler Vessels Act. Child Labour and Women Employee Act. ILO Convention and Recommendations in the Furtherance of Safety, Health and Welfare. Occupational Safety, Health and Environment Management: Bureau of Indian Standards on Safety and Health 14489 - 1998 and 15001 – 2000 OSHA (Occupational Safety and Health Administration).	**6**
UNIT 6 INDUSTRIAL SAFETY MANAGEMENT	Industrial Safety: History of Safety Movement in India and Abroad. Accident- Nature & Size. Need for Safety, Legal, Humanitarian, Economic and Social Considerations. Total Loss Control Concept, Introduction to Productivity, Quality, Reliability, and Safety (PQRS) Theory. Safety Management- Principles & Practices With Case Studies, Role of Management in Industrial Safety. Process Safety Management (PSM). Safety Organization: Role of Safety Committee and its Formation, Safety Awareness Programme: Motivation, Education and Training, Appraisal of Industrial Safety and Measurement of Safety Performance.	**6**
	Total Lecture Classes	**45**

3. Suggested Home Assignments/Students' Activities: (any Five)

i. What do you understand by safety, risks and hazards? Differentiate between risks and hazards.
ii. What are the various causes of dangerous occurrences arising due to dust, fire and chemicals refereeing different types of industries?
iii. Can you measure some control measures to limit the degree of hazards for factories highlighting the "permissible limits" of different pollutants?
iv. Draw charts to impose upon safety in chemical/power/construction/mining or any other heavy industries (any two types of industries). While doing these, highlight the role of top and middle management of these organization.
v. Draw an emergency response action plan in case of fire in any heavy industry.
vi. Draw schematic diagram of any fixed firefighting system (sprinkler/CO2 total flooding/foam flooding system) and describe it.
vii. Draw the labelled schematic diagram of portable fire extinguishers (showing all internal components) of DCP type, water type, CO2 type and foam type.
viii. Classify hazardous chemical and describe the hazards associated with them.
ix. Draw a labelled diagram of lighting arrester fitted on a multi-storied building and describe its functional procedure.
x. Briefly describe Factories Act, 1948 and Employees State Insurance Act, 1948.

4. **Suggested scheme for question paper design for conducting internal assessment examination: (Duration: 45 minutes)**

Questions to be set as per Bloom's Taxonomy				
	Distribution of Theory Marks			
	Level 1 (Remember)	Level 2 (understand)	Level 3 (Apply & above)	Total
Class Test - 1	04	08	08	20
Class Test - 2	04	08	08	20

5. **Suggested Scheme for End Semester Examination [duration 3 hours]**

A: Multiple Choice Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
A1	1& 2	04	10	10 x 01 = 10
A2	3	06		
A3	4, 5 & 6	05		
	Total:	**15**	**10**	**10**
B: Fill-in the Blank Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
B1	1& 2	04	10	10 x 01 = 10
B2	3	06		
B3	4, 5 & 6	05		
	Total:	**15**	**10**	**10**
C: Short Answer Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
C1	1& 2	04	10	10 x 01 = 10
C2	3	06		
C3	4, 5 & 6	05		
	Total:	**15**	**10**	**10**
			Sub-Total [A+B+C]:	**30**
D: Subjective Type Questions (Carrying 2 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
D1	1 & 2	2	06	06 x 02 = 12
D2	3	4		
D3	4, 5 & 6	4		
	Total:	**10**	**06**	**12**
E: Subjective Type Questions(Carrying 6 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
E1	1 & 2	2	03	06 x 03 = 18
E2	3	4		
E3	4, 5 & 6	3		
	Total:	**09**	**03**	**18**
			Sub-Total [D+E]:	**30**
			Total [A+B+C+D+E]:	**60**

6. Rubrics for the Assessment of Students Activity: (20 marks)

Sl. No.	Performance Indicators	Weightage in %	
1	In time submission of home assignment or submission of report after conducting site visit/ industry visit/ micro-project / market survey / internet search on specific topic, preparation of chart, creation of innovative model etc.		40
2	Viva voce or present seminar on submitted report.		60
2a	Communication skill	10	
2b	Technical interpretation skill	10	
2c	Answering / Conclusion with justification	40	
		Total:	100

7. Suggested Learning Resources:

Sl. No.	Title of Book	Author	Publication
1	Industrial Safety, Health and Environment Management Systems	R. K. Jain and Sunil S. Rao	Khanna Publishers
2	A Handbook On Industrial Safety and Fire Management	Ravi Kant Pandey	Chetan Prakashan
3	Principles of Industrial Safety Management	Akhil Kumar Das	PHI Learning Pvt Ltd
4	Industrial Safety Management	L M Deshmukh	McGraw Hill Education
5	Industrial Safety & Environment	Anupama Prashar	S.K. Kataria & Sons
6	Fundamentals of Occupational Safety and Health	Mark A. Friend and James P. Kohn	Government Institutes An imprint of The Scarecrow Press, Inc.
7	Safety in Industry	Brij Mohan Bansal	Woodhead Publishing India Pvt. Ltd.

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COURSE: Energy and Environment Control in Metallurgical Industries

Course Code	MTPC304/4
Course Title	Energy and Environment Control in Metallurgical Industries
Number of Credits	2
Course offered in	Part - III, 6th. Semester
Course Category	Open Elective – II
Hours / Week	2 (Lecture – 1 : Tutorial : 1) ; Total 15 weeks / Sem
Full Marks	100

Marks Distribution: Full Marks =100

	Internal assessment		End Semester Exam	
Sl No	Type	Marks	Question Type	Marks
1	Mid Semester Tests (Two best out of three)	20	Objective type questions carrying 1 mark for 20 questions(Qs) out of 25 Qs throughout the syllabus	1x20=20
2	Quizzes, viva-voce, Assignments	10	Question carrying 8 marks for 5 Qs out of 9 Qs .	8 x 5=40
3	Class Attendance	10		
	Total	**40**		**60**

Course Objectives:

Students will acquire knowledge, skill and attitude to have following attributes.

1. Gather concept about energy control and its importance
2. Understand about different energy considerations in metallurgical industries
3. Gather knowledge about energy audit
4. State about different processes of energy conservation and recovery

Course Outcomes (COs):

Subject: Energy and Environment Control in Metallurgical Industries

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

Course	Statement
MTPC304.1	Describe energy control and its importance
MTPC304.2	Explain different energy considerations in metallurgical industries
MTPC304.3	Describe energy audit and its importance.
MTPC304.4	Explain different processes of energy conservation and recovery.

UNIT WISE DIVISION OF THE SYLLABUS

UNIT	TOPIC	CONTACT PERIODS
1	Introduction	3
2	Energy consideration in metallurgical industries	9
3	Energy conservation and recovery	9
4	Energy audit	9
	Total =	30

Reference Books: -

1. Energy Management in Iron & Steel works - The Iron & Steel Institute,1988.
2. New Energy Saving Technologies Operation Experience – I.I.S.I.
3. Statistics on Energy in Steel Industry – I.I.S.I.
4. Steel & Energy -- I.I.S.I.
5. National Seminar on Energy for Steel Industry,23-29 Sep 1977, Rourkela,IIM.
6. National Seminar on Specific Energy Consumption in the Iron & Steel Industry,10-12 Dec.1982, Jamshedpur, IIM.
7. Seminar on Energy Conservation in Steel Industry, 14, Dec, 1991, :Bhilai IIM.
8. Symposium on Exploring - Alternative Source of Energy Conservation in Steel Industuy, 14-15 Dec, 1984, Bhadravati, IIM.

DETAIL COURSE CONTENT

1.0 Introduction : 3 PERIODS

1.1 Concept of Energy control and auditing
1.2 Its importance in industries under present scenario, cost control
1.3 Concept of energy management

2.0 Energy consideration in metallurgical industries : 9 PERIODS

2.1 Energy consumption in Metallurgical Industries
2.2 Application of thermodynamic principles and energy balance
2.3 Different types of Fuels and their utility
2.4 Energy consumption in electrometallurgical extraction processes, Rolling mill, Forging shop, Blast furnace, Arc furnace, L-D furnace, Induction furnace, Cupola, Heat treatment furnace etc.

3.0 Energy conservation and recovery : 9 PERIODS

3.1 Concept of energy conservation
3.2 Different types & utility
3.3 Recovery processes

4.0 Energy audit : 9 PERIODS

4.1 Theory & concept of Energy audit & its management
4.2 Conventional and non-conventional energy sources, their utility

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COURSE : MAJOR PROJECT

Course Code	MTPR302
Course Title	MAJOR PROJECT
Number of Credits	1
Course offered in	Part - III , 6th. Semester
Course Category	MAJOR PROJECT
Hours / Week	3 (Lecture – 0 : Practical – 3) ; Total 15 weeks / Sem
Full Marks	100

EXAMINATION SCHEME

Marks Distribution: Full Marks = 100

	Internal assessment		End Semester Exam	
Sl No	Type	Marks	Type	Marks
1.	Continuous Internal Assessment is to be carried out by the teachers throughout the Sixth Semester. Distribution of marks for Internal Assessment : Performance of Job – 20, Notebook – 20.	40	External Assessment of 40 marks shall be held at the end of the Sixth Semester on the entire syllabus. Distribution of marks for External Assessment : On spot job – 10 Viva - voce – 30	40
2.	Class Attendance	20		
	Total	**60**		**40**

Course Objectives :

Students will have knowledge , skill and attitude on following topic in higher order learning as per Blooms Taxonomy .

1. Idea about Project Work .
2. Laboratory experiment & Life long learning .
3. Development of brain storming , new ideas and new initiatives .
4. Development of group activities .
5. Development of communication ability .
6. Development of report writing ability .

Course Outcomes (COs) :

Course	Statement
MTPR302.1	Describe and explain about the topic of the project .
MTPR302.2	Demonstrate about details of project .
MTPR302.3	Demonstrate about the laboratory and infrastructural facilities used .
MTPR302.4	Demonstrate the project in digitized format .
MTPR302.5	Understand the theme of the project.

Course Contents : Major project may be carried out in one or more form of following:

1. Working / non-working models, prototype development .

2. Laboratory experiment development, process modification /development, simulation, software development.

3. Statistical data analysis, survey, creating awareness in society.

4. The student is required to submit a report based on the work.

5. The evaluation of the project shall be on continuous basis.

6. Students should select a problem which addresses some basic home, office or other real life applications.

7. 5-10 pages report to be submitted by students.

8. Group of maximum three students can be permitted to work on a single mini project.

9. Department may arrange demonstration with poster presentation of all mini projects developed by the students at the end of semester.

10. Work as an individual or in a team in development of technical projects.

11. Communicate and report effectively project related activities and findings.

LIST OF MAJOR PROJECTS :

1. Process Flow sheet for preparation of Aluminium Smelting Plant.
2. Process Flow sheet for preparation of Aluminium Refining Plant.
3. Modelling of a Hot Rolling Mill along with accessories.
4. Modelling of a Cold Rolling Mill along with accessories.
5. Model preparation of Crystal Structure like BCC, FCC, HCP,.
6. Model preparation of Metallurgical Microscope with demonstration.
7. Visual demonstration/ Videography of Sample preparation or Metallography.
8. Modelling and demonstration of Vickers Hardness Testing Machine for getting VHN
9. Modelling and demonstration of Rockwell Hardness Testing Machine.
10. Preparation of Iron Carbon Diagram with different phases, Invariant Reactions , Critical Temp with Demonstration.
11. Preparation of Ellingham Diagram with Demonstration .
12. To prepare a knowledge book of all testing equipment : containing photograph of machine , Video of operations, model no, SL. no of machine,specifications, dimensions, work instructions for operation of the machine, DO's and DON'Ts.
13. Change in microstructure due to cooling rate change of steel heat treatment.
14. Effect of hardness on different heat treatment process like Annealing and Normalising.
15. To prepare the jominey hardenability curve of few popular steel.
16. To write Operating procedures for ultrasonic testing to detect internal soundness of forged or rolled steel.
17. Report writing after checking a material for chemical composition, mechanical testing, metallurgical testing, ultrasonic testing, magnetic particle testing and any other testing.
18. Preparation and study of the microstructure of pure metals like iron, copper and aluminium.
19. Heat Treatment of different type of steel (whichever steel is available in laboratories).
20. Recovery, recrystallization and grain growth.
21. Micro-hardness testing of various ferrous alloys.
22. Beneficiation of Metal Ores (e.g., Iron Ore).
23. Phase diagram analysis.
24. Pulverized coal injection in blast furnace.
25. Materials Characterization.
26 Study of different types of welding process.
27. Grain size measurement.
28. Process flow sheet of hot rolling, cold rolling, forging.
29. Process flow sheet of extraction of non ferrous alloys.
30. Deformation of aluminium sheet by rolling machine.
31. Solidification of aluminium in induction furnace.
32. Identify defect on various metallic component by using NDT techniques (ultrasonic test, liquid penetration, etc).
33. Collection of different ferrous and non ferrous metal samples and complies the metallographic data with photographs.
34. Design, drawing and fabrication of small proto type metallurgical engineering equipment such as
    i) Blast furnace ii) Cupola Furnace iii) Open hearth furnace iv) Electric arc furnace v) Induction furnace vi) Muffle furnace vii) Crucible furnace viii) Model making of BCC,FCC & HCP crystal structure.
35. Hardenability of Steel and the effect of alloying elements on hardenability of steels.
36. Structure - property correlation of carbon – steel .
37. Study on High strength Low alloy steel.
38. Study on different Heat treatment practices .
39. Detail report on the production of Mn Steel Crossing (used in railway crossings) from melting to machining after casting

40. Proximate analysis of different grades of coal from different source and identifying best suitable grade for metallurgical application.
41. Identifying different refractory materials.
42. Microscopic examination and microstructural comparison of : steels, copper alloys and aluminium alloys, cast irons.
43. Observation and drawing of different morphologies of grains: equiaxed dendrites, columnar dendrites, cellular structure, equiaxed grains, polygonal grains, elongated grains.
44. Grain size measurement by ASTM comparison method, Heyn's Intercept method, Jefferies planimetric method.
45. Study of etching mechanism of single phase and two phase alloys and preparation of etching reagents for plain carbon steel, cast iron, copper base alloys and aluminium alloys.
46. Preparation of specimens for microscopic examination by hot mounting and cold mounting methods.
47. Rolling Pass Design-A Comparative Study.
48. Studying Reducibility of Iron Ores.
49. Studying Limitations of the Ellingham Diagram.
50. Effect of strain on Cold Worked microstructure-A Microstructural Study.
51. Development of Austempered Ductile Iron.
52. Development of High Chromium based Cast Iron.
53. Cupola furnace: an Over view.
54. Project report on application of Sintering in ferrous industries.
55. Project report on Powder Metallurgy.
56. Project report on Thermo Mechanical Treatment.
57. Project report on Sponge Iron Production.
58. A report on production of sponge iron using solid reductants for direct reductions of iron ore.
59. Techniques of revealing Austenitic grain size and evaluation of ASTM grain size number by comparison method.
60. Effect of rate of straining on tensile test results of any grade of steel.
61 Preparation of Presentation on 'Familiarisation with Industrial standardisation procedure as per ISO 9001 explaining its objective, principle and relevance'.
62. Preparation of standard operating procedure and detailed work instruction for testing hardness by Brinell Hardness Tester in line with any international standard. Use audio-visual means for demonstration.6763.
63. Preparation of standard operating procedure and detailed work instruction for testing hardness by Rockwell Hardness Tester in line with any international standard. Use audio-visual means for demonstration.
64. Preparation of standard operating procedure and detailed work instruction for testing hardness by Vickers Hardness Tester in line with any international standard. Use audio-visual means for demonstration.
65. Preparation of standard operating procedure and detailed work instruction for tensile testing in line with any international standard. Use audio-visual means for demonstration.
66. Preparation of a plan for improvement of present laboratory layout of the department.
67. Selection of appropriate probes for ultrasonic testing of components of different shape and size.
68. Importance of skin pass process for cold rolled steel sheet production.
69. Calculate the critical temperatures of any two grades of alloy steel using empirical formulae or any other authentic data source and propose reheating temperature for forging/rolling, annealing temperature, normalising temperature, hardening and tempering temperature.
70. Preparation of album of rolling and forging defects with cause and remedies.
71. Temperature calibration of a F/C with Thermocouple.
72. Hardenability Determination by Jominy End Quench Test.
73. Reduction of Fe ore with charcoal in Laboratory.
74. Grain size estimation.
75. Effect of Carbon on Annealing, normalizing, Oil Quenching, Water Quenching.
76. Effect of Cooling Rate on Annealing, normalizing, Oil Quenching, Water Quenching.

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COURSE : SEMINAR

Course Code	MTSE302
Course Title	SEMINAR
Number of Credits	2
Course offered in	Part - III , 6TH. Semester
Course Category	SEMINAR
Hours / Week	2 (Lecture – 0 : Practical – 2) ; Total 15 weeks / Sem
Full Marks	100

EXAMINATION SCHEME

Marks Distribution: Full Marks = 100

	Internal assessment		End Semester Exam	
Sl No	Type	Marks	Type	Marks
1.	Continuous Internal Assessment is to be carried out by the teachers throughout the Sixth Semester. Distribution of marks for Internal Assessment : Performance in Seminar - 40 .	40	External Assessment of 40 marks shall be held at the end of the Sixth Semester on the entire syllabus. Distribution of marks for External Assessment .	40
2.	Class Attendance	20		
	Total	**60**		**40**

SEMINAR ON PROJECT WORK

Few Example :

1. Practice of giving seminar on Project project work .
2. Practice of using audio visual aids in seminar .
3. Practice of using charts , sketches , datas in support of seminar .
4. Practice of speech presentation in English .
5. Entertain Questioning - Answering as a part of seminar .

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West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Mine Surveying [MIS]

Part-III (6th Semester)

2023

Semester 6								
Sl. No.	**Category of Course**	**Code no.**	**Course Title**	**Class level work**			**Credit**	**Marks**
				L	**T**	**P**		
1	PC	MSPC302	Dip, Fault and Other mine Problems	2	0	0	2	100
2	PC	MSPC304	Total Station Survey Lab	0	0	4	2	100
3	PE	MSPE302	Any one from the list of courses	3	0	0	3	100
4	HS	HS302	Entrepreneurship and Start-ups	2	1	0	3	100
5	OE-I	MSOE302	Engineering Economics and Project Management	3	0	0	3	100
6	OE-II	MSOE304	Any one from the list	3	0	0	3	100
7	Major Project	PR302		0	0	6	3	100
8	Seminar	SE302		2	0	0	2	100
	Total			15	1	10	21	800

Students contact hours per week: 26 Hours.

Each Theory and Practical period is of one hour.

L- Lecture, T- tutorial, P-Practical, PC- Program Core Course, PE-Program Elective Course, AU-Audit Course, OE-Open Elective Course

Sl. No.	**Program Elective Courses (PE302)**
1	Stope and Opencast Mine Surveying
2	Map Projection

Sl. No.	**Open Elective II Courses (MSOE304)**
1.	Industrial Management
2.	Disaster Management

3.	Industrial Safety
4.	Renewable Energy
5.	Soft Computing Techniques
6.	Environmental Engineering & Science
7.	Operations Research

Course-1 (Semester-6)	
Course Code	**MSPC302**
Course Title	Dip, Fault and other mine problems
No. of Credits	**2 (L: 2 , P: 0, T: 0)**
Course Category	PC

Course objectives

Objectives of this course are to learn about :

dip, strike, types of dip and derivation of formula

how to solve different types of dip and strike problems

different terms associated with the fault and other geological disturbances

how to solve different types of numerical problems on faults

Mass-haul diagram in detail

problems on percentage extraction of pillars and measurement of coal in coal heap / stock

Course Content	
Unit-1	**Dip and strike:** **Definitions**: Dip, Strike, Coal seam or bed, Gradient etc. Types of dip Expression of dip as ratio, percentage and gradient Rules involving the number 57 Relation between dip and strike Relation between true dip and apparent dip Simple numerical problems
Unit-2	**Different types of dip problems** Problems type-1: Bearings and apparent dips of two roadways in a seam are given and rate and direction of full dip of the seam is required to be computed. Problems type-2: Cross measure drifts problems Problems type-3: Problems on true or stratigraphical thickness of a seam Problems type-4: Problems on direction and amount of dip from boreholes Numerical problems on each type.
Unit-3	**Fault Problems** Brief description of some important terms: Outcrop, Fold, Anticline, Syncline, Washout, Roll, Swilley, Fault; Basic terms associated with the fault: Fault plane, Direction of the fault, Hade, Throw, Want, Excess, Down- throw fault, Up-throw fault; Type of Faults such as Normal fault, Reverse fault, Transcurrent fault, Strike fault, Dip fault etc.; Numerical problems on down-throw faults Numerical problems on up-throw faults

	Miscellaneous problems
Unit-4	**Other type problems** Mass -haul Diagram Introduction Uses of Mass-haul diagram Important terminology: Haul distance, average haul distance, Overhaul, Borrow, Waste, Limit of economical haul, Lead, Lift, Balancing line, Shrinkage factor, Bulking factor etc. Problems on percentage extraction of pillars during development and depillaring in underground coal mines. Measurement of amount of coal in coal heaps / stocks of different geometrical shapes. Numerical problems

Course learning outcomes

After completion of this course students will be able to:

explain dip, strike, types of dip and derivation of formula

solve different types of dip and strike problems

develop concept about fault and other geological disturbances

solve different types of numerical problems on faults

explain mass-haul diagram and its uses.

solve problems on percentage extraction of pillars and measurement of coal in coal heap / stock

Title of the Book	**Name of Author**	**Name of the Publisher**
Mine Surveying and Levelling (Vol-I)	S. Ghatak	Coalfield Publishers
A Textbook of Geology	P. K. Mukerjee	World Press
Fundamentals of Surveying and Levelling	R. Subramanian	Oxford

Plane Surveying	Dr.Alak De	S. Chand &CompanyPvt. Ltd.
Surveying (Vol-1)	Dr. K. R. Arora	Standard Book House

Course-2 (Semester-6)	
Course Code	**MSPE304**
Course Title	Total Station Survey Lab
No. of Credits	**2 (L: 0 , P: 4, T: 0)**
Pre requisites	Basic knowledge of Mathematics ,Engineering Drawing , Computer Fundamentals
Course Category	PC

Course objectives:

Objectives of this course are to learn about:

- Different Components of Total Station and its function
- Diagram of Total Station
- Safety part and Care of Total station Operation
- Setting of Total station
- Operational Flow Chart of Setting the Instrument for Data Collection
- Meridian setting
- BS Setting operation
- Resection Operation
- Stake out Operation
- Down loading of Total station Data in Supporting Software
- Potting of Data in Auto Cad

- Plotting of Data by hand in Drawing Sheet
- Scale determination for Hand Plotting
- Area , Perimeter calculation from plan within a block

Course Content	
Experiment No.	**Name of Experiment**
1.	**Study of Total Station:** Function of Different Parts with Diagram, Safety and care aspect of Total Station operation.
2.	**Normal Setting of Total Station :** Flow Chart of Total station for reading Taking- Meridian Setting, Occupied Station Input, Instrument ht setting and Reflector ht setting.
3.	**Advanced Setting of Total station:** Back Sighting for meridian setup, Resection Operation for instrument setup with Error acceptance in considerable limit for resection. Stake out operation for finding a station on the ground from Plan.
4.	**Data Collection:** Data recording as per station number and attributes, Captured Data Viewing.
5.	**Down loading of Total station data:** Down loading Flow chart for Civil Cad Software .
6.	**Plan preparation by Total station data in Sheet by hand:** Determination of Scale from the co-ordinate data for Plotting it in Sheet , Joining of same attributes Data for Plan Preparation, Area and perimeter calculation on the plan for a given block,
7.	**Plan preparation by Total station data in Auto Cad/ Civil Cad:** Joining of same attributes Data for Plan Preparation, Area and perimeter calculation on the plan for a given block.

Course outcomes:

After completion of this course students will be able to:

- Describe different Components of Total Station and its function
- Draw diagram of Total Station
- Follow safety part and Care of Total station Operation
- Set Total station for reading Taking
- Draw operational Flow Chart of Setting the Instrument for Data Collection
- Perform Meridian setting
- Perform BS Setting operation
- Perform Resection Operation
- Perform Stake out Operation
- Perform Down loading of Total station Data in Supporting Software
- Plot data in Auto Cad
- Plot Data by hand in Drawing Sheet
- Determine Scale for Hand Plotting
- Calculate Area , Perimeter from plan given a block

Title of the Book	**Name of Authors**	**Name of the Publisher**
Surveying (Volume-II)	S.Duggal	Tata McGraw Hill
Advanced Surveying	Satheesh Gopi, R Sathikumar, N Madhu	Pearson
Surveying & Levelling (Volume-II)	T.P Kanetkar	Pune Vidyarthi Griha Prakashan
Surveying (Volume-II)	Dr. K.R. Arora	Standard Book House

Surveying (Volume-II)	Dr. B.C. Punamia	Laxmi Publication

Course-3(1) Program Elective Course (Semester-6)	
Course Code	**MSPE302**
Course Title	Stope and Opencast Mine Surveying
No. of Credits	**2 (L: 3 , P: 0, T: 0)**
Pre requisites	Basic knowledge of elementary surveying
Course Category	PE

Course objectives:

Objectives of this course are to learn about :

- Stope surveying with its purposes and factors to be considered before selecting any method;
- Classification and equipments required for stope surveying;
- Details of different methods of stope surveying;
- Plotting of stope faces and its transfer to mine plans;
- Different underground mining activities that require accurate surveying;
- Introduction and purposes of opencast mine surveying ;
- Control points- primary, secondary and survey control points for opencast mine surveying;
- Different opencast mine surveying methods including trench surveying;
- 3D laser scanner and its application in opencast mine surveying;
- Land reclamation survey and its different parameters.

Course Content	
Unit-1	**Stope Survey** Introduction and definition of stoping and stope surveying Purposes of stope surveying Factors to be considered for the selection of stope surveying Classification of stope surveying methods Equipments required for stope surveying Methods of stope surveying (a) Tying-in method (b) Tape triangulation (c) Triangle method (d) Ray method Detailed method of surveying for (a) Shrinkage stope (b) Rill stope
Unit-2	Plotting of stope faces Transfer of stope faces to the mine plan by triangle method Estimation of volume of ore removed in the stopes Various underground mining activities vis-à-vis role of surveying like: (a)Primary development and underground exploration (b)Designing of stope layout (c)Secondary development (d)Vertical development (e)Production drilling (f)Mining Crown pillars (g)Development of finger raises (h) Holes for drainage and cable etc.
Unit-3	**Opencast Mine Surveying** Introduction Purposes of opencast survey Duties of opencast mine surveyor Control points- Primary and secondary: Accuracy to be achieved Establishment of Bench Marks: Accuracy to be achieved Spacing of survey control points Methods of establishing survey control points within opencast mines Detailed survey of opencast mines- Features to be located Common methods of detailed survey with field of application of and instrument used in each method Trench Surveying

Unit-4	Types of plans and sections to be kept for planning and working of opencast mine Base line in opencast mine Measurement procedure(insitu) of overburden removed during a period **3D Laser Scanner:** Introduction Working principle and measuring methods Application of Laser scanner in (a)slope stability assessment (b)volumetric calculation **Land Reclamation(Dump) survey in opencast mine**: Introduction and objectives of land reclamation Stability of dumps-Factors affecting dump stability Surveying during different phases of dump reclamation - Flattening of slopes, surface water diversion, plantation and aftercare

Course outcome

After completion of this course students will be able to:

- Define different terminologies connected to stope surveying , mention purposes and factors affecting stope surveying and explain suitable method of stope survey in a given condition ;
- Outline the uses of surveying for different underground metalliferous mining activities;
- Mention the steps to establish control points and describe different opencast mine surveying methods ;
- Name the plans and sections and the steps to calculate the volume of overburden removed during a span of time;
- Explain the working principle of Laser Scanner and surveying procedures followed during different phases of dump reclamation;

Title of the Book	Name of Authors	Name of the Publisher
Metalliferous mine surveying	Frederick Winiberg	Mining Publication
ICCMS-94(Seminar Volume)		Institution of Survey
Coal Mines Regulation,2017		DGMS
Advances in Mine Surveying(seminar volume)		Dept. of MiningEngg.ISM Dhanbad
Modern trends in Mine Surveying(seminar volume)		Dept. of MiningEngg.ISM Dhanbad

Course-3(2) Program Elective Course (Semester-6)	
Course Code	**MSPE302**
Course Title	Map Projection
No. of Credits	**2 (L: 3 , P: 0, T: 0)**
Pre requisites	Basic knowledge of Mathematics ,Engineering Drawing
Course Category	PE

Course objectives:

Objectives of this course are to learn about:

- Definition of Map Projection
- Basic Principles of Map projection
- Conditions for transformation Function
- Ideal Map Projection
- Types of Map Projections
- Scale and Scale factor
- Geometrical relations of Spheres and cones as used in map projections

- Simple equidistant Projections
- Salient features and properties of different projections

Course Content	
Unit-1	Introduction Basic Map Projection Ideal Map projection Scale Scale Factor
Unit-2	Geometry of Sphere Geometry of the cone Simple Equidistant Projection Modification of Equidistant Projection
Unit-3	Geonomic Projection Stereographic Projection Orthographic Projection
Unit-4	Albert's Equal Area Projection Polyconic Projection Conformal Projection
Unit-5	Lambert Projection Mercator Projection Traverse Mercator Projection

Course outcomes:

After completion of this course students will be able to:

- Define Map Projection
- Narrate Basic Principles of Map projection
- Illustrate Conditions for transformation Function
- Describe Ideal Map Projection

- Classify Types of Map Projections
- Calculate Scale and Scale factor
- Describe Geometrical relations of Spheres and cones as used in map projections
- Illustrate Simple equidistant Projections
- Explain Salient features and properties of different projections

Title of the Book	**Name of Authors**	**Name of the Publisher**
Surveying (Volume-II)	S.Duggal	Tata McGraw Hill
Advanced Surveying	Satheesh Gopi, R Sathikumar, N Madhu	Pearson
Surveying & Levelling (Volume-II)	T.P Kanetkar	Pune Vidyarthi Griha Prakashan
Surveying (Volume-II)	Dr. K.R. Arora	Standard Book House
Surveying (Volume-II)	Dr. B.C. Punamia	Laxmi Publication
Fundamental of Surveying and Levelling	R. Subramanian	Oxford University Press
Plane Surveying	Dr. Alak De	S. Chand &Company
Surveying (Volume-II)	Dr. B.C. Punamia	Laxmi Publication
Fundamental of Surveying and Levelling	R. Subramanian	Oxford University Press
Plane Surveying	Dr. Alak De	S. Chand &Company

Course-4 (Semester-6)	
Course Code	**HS302**
Course Title	Entrepreneurship and Start-ups
No. of Credits	**3 (L: 2 , P: 0, T: 1)**
Pre requisites	Detail Course content as per WBSCTVESD Portal
Course Category	HS

Course-5 (Semester-6)	
Course Code	**MSOE302**
Course Title	Engineering Economics and Project Management
No. of Credits	**3 (L: 3 , P: 0, T: 0)**
Pre requisites	Detail Course content as per WBSCTVESD Portal
Course Category	OE-I

Course-6 (Semester-6)	
Course Code	**MSOE304**
Course Title	Soft computing Techniques
No. of Credits	**3 (L: 3 , P: 0, T: 0)**
Pre requisites	Detail Course content as per WBSCTVESD Portal
Course Category	OE-II

Course- 7 Major Project (Semester-6)	
Course Code	**PR302**
Course Title	Major Project
No. of Credits	**3(L:0 , P: 6, T: 0)**
Pre requisites	Basic idea about surveying methodologies
Course Category	Major Project

Course objectives:

Objectives of Project work

Project Work is intended to provide opportunity for students to develop understanding of the interrelationship between different courses learnt in the entire diploma programme and to apply the knowledge gained in a way that enables them to develop & demonstrate higher order skills. The basic objective of a project class would be to ignite the potential of students' creative ability by enabling them to develop something which will provide a taste of real life problem that a diploma-holder in mine surveying may encounter as a professional. The course further includes preparation of a Project Report which, among other things, consists of technical description of the project. The Report needs to be prepared in computer using Word and CADD software wherever necessary.

Course Content

The project content should be from any topics that the students have read or whatever practical work they have completed till last semester or the combination thereof.

Course outcome

After completion of this course students will be able to:

handle the instrument confidently

explain the types of problem that one has to face during project work

Lead a survey team with confidence

Understand the difference between theoretical discussion and its practicality.

Course- 8 Seminar (Semester-6)	
Course Code	**SE302**
Course Title	Seminar
No. of Credits	**2(L:2 , P: 0, T: 0)**
Pre requisites	Basic idea about surveying methodologies
Course Category	Seminar

Course objectives:

Objectives of Seminar to learn about :

- Slide preparation on a topic
- Explaining the problem before others
- Facing interaction with different argument on the issue
- Concluding the argument before others

Course Content

The Seminar content should be from any topics that the students have read or whatever practical work they have completed till last semester.

Course outcome

After completion of this course students will be able to:

- Prepare Slide
- Explain the problem before others
- Face interaction with different argument on the issue
- Rectify or conclude the argument before others

End

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Mining Engineering [MIN]

Part-III (6th Semester)

2023

Semester VI

Sl. No	Category	Code No.	Course Title	Hours per week			Total contact hrs/ week	Credits	Marks
				L	T	P			
1.	Program core course	MINPC 601	Mine Legislation & General Safety	3	0	0	3	3	100
2.	Program core course	MINPC 602	Mine Machinery	3	0	0	3	3	100
3.	Program core course	MINPC 611	Mine Machinery Lab.	0	0	2	2	1	100
4.	Program elective course	MINPE 62*	Elective-IV	3	0	0	3	3	100
a.	ANY ONE COURSE HAS TO BE TAKEN FROM a & b	MINPE 621	Mine Hazards-II						
b.		MINPE 622	Mineral Economics						
5.	Humanities and Social Science course		Entrepreneurship and Start- ups ^	3	0	0	3	3	100
6.	Open elective course		Engineering Economics & Project Management ^	3	0	0	3	3	100
7.	Open elective course		Open Elective- II* (ANY ONE COURSE HAS TO BE TAKEN FROM THE LIST) ^	3	0	0	3	3	100
8.	Major Project	MINPR 651		0	0	4	4	2	100
9.	Seminar	MINSE 661		0	0	2	2	1	100
	TOTAL						**26**	**22**	**900**

L- LECTURE, T- TUTORIAL, P- PRACTICAL/ LAB

^ - These courses are common for all disciplines.

*LIST OF OPEN ELECTIVE-II COURSES

S No.	Code No.	Course Title	Hours per week			Credit
			L	T	P	
1.		Internet of Things	3	0	0	3
2.		Industrial Management	3	0	0	3
3.		Disaster Management	3	0	0	3
4.		Sustainable Development	3	0	0	3
5.		Industrial Safety	3	0	0	3
6.		Artificial Intelligence	3	0	0	3
7.		Renewable Energy	3	0	0	3
8.		Soft Computing Techniques	3	0	0	3
9.		Operations Research	3	0	0	3
10.		Electric Vehicle Technology	2	1	0	3

N.B: COURSE CURRICULUM OF OPEN ELECTIVE COURSES ARE SAME FOR ALL DIPLOMA PROGRAMS OF THE WEST BENGAL COUNCIL OF TECHNICAL & VOCATIONAL EDUCATION AND SKILL DEVELOPMENT. STUDENTS ARE ADVISED TO GET THE CURRICULUM FROM THE COUNCIL WEBSITE.

Course Code	:	MINPC 601
Course Title	:	Mine Legislation & General Safety
Number of Credits	:	3 (L : 3, T : 0, P : 0)
Prerequisites	:	Basic knowledge in Mining operations
Course Category	:	PC

TOPIC WISE DISTRIBUTION OF THE COURSE:

UNIT	TOPIC	LECTURE PERIODS	TUTORIAL PERIODS
I	**CMR 2017 & MMR 1961: Provisions relating to Precautions against dangers from Fire, Dust, Gas and water**	9	0
II	**CMR 2017 & MMR 1961: Provisions relating to Ventilation, Provisions relating to Lighting and Safety lamps, Provisions relating to Explosives and Shotfiring.**	9	0
III	**Risk Management**	9	0
IV	**Mine Accidents**	9	0
V	**Miners' diseases**	3	0
VI	**Safety drives**	6	0

Course Objectives:

Following are the objectives of this course:

- To learn about different statutory provisions regarding Fire, Dust, Gas and Water in mines.
- To learn about statutory provisions regarding Ventilation, Lighting, Safety lamps, Explosives and Shotfiring in mines.
- To have introductory concepts of risk management, hazard identification, risk assessment and control in mines.
- To learn about causes and preventive measures of accidents in mines.
- To know about Notified and other Miners' occupational diseases with symptoms and preventive measures to be taken for the same.
- To become familiar with different safety drives which are practised in mines.

Course Content:

Unit I : Coal Mines Regulation 2017, Metalliferous Mines Regulations 1961:

- Provisions relating to Precautions against dangers from Fire, Dust, Gas and water

Unit II : Coal Mines Regulation 2017, Metalliferous Mines Regulations 1961:

- Provisions relating to Ventilation,
- Provisions relating to Lighting and Safety lamps,
- Provisions relating to Explosives and Shotfiring.

Unit III: Risk Management

- Hazard identification - Formation of team - Tools of risk management (Documents for considerations) - Identification of hazards;
- Risk assessment- Process, risk score – scale for consequence, scale for exposure, scale for probability;
- Risk control; Auditing;
- Safety Management Plan (SMP): Elements of SMP

Unit IV: Mine Accidents

- Mine accidents- classifications, causes and preventions;
- Place of accident not to be disturbed, Emergency response and evacuation plan;
- Accident reports after investigation;
- Accident cost, frequency rate, severity rate;

Unit V: Miners' diseases

- Notified and other Miners' occupational diseases - their symptoms and preventions;

Unit VI: Safety drives

- Safety campaign, Internal Safety Organisation, safety audit;
- Safety committee, Composition and function of safety committee;
- Workers' participation in safety management, workmen's inspectors.

Suggested learning resources:

1. Coal Mines Regulations 2017
2. Metalliferous Mines Regulations 1961
3. DGMS Circulars and orders
4. Legislation in Indian Mines: A Critical Appraisal by S.D. Prasad and Rakesh
5. The Mines Rules, 1955
6. The Mines Act, 1952
7. A study of Mine Management, Legislation and General Safety by S. Ghatak
8. Mine Management, Legislation and General Safety by L.C. Kaku

Course outcomes:

After completing this course, student will able to –

- Apply the acquired knowledge to take precautionary measures against dangers from Fire, Dust, Gas and Water in mines.
- Apply the acquired knowledge to provide adequate ventilation in mines and carry out shotfiring operations in mines with safety.
- Take part in the processes of hazard identification with risk assessment and implementation of Safety Management Plan.
- Take necessary actions to prevent accidents in mines.
- Take necessary precautions against health hazards of miners.
- Be part of the different safety drives which are practised in mines.

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Course Code	:	MINPC 602
Course Title	:	Mine Machinery
Number of Credits	:	3 (L : 3, T : 0, P : 0)
Prerequisites	:	Basic knowledge in Mathematics, Physics & Engineering Graphics
Course Category	:	PC

TOPIC WISE DISTRIBUTION OF THE COURSE:

UNIT	TOPIC	LECTURE PERIODS	TUTORIAL PERIODS
I	**Winding System in Mine**	12	0
II	**Mine Transport System-Rope Haulage**	9	0
III	**Mine Transport System-Conveyors & Locomotives**	9	0
IV	**Wire Ropes and Rope Capel**	6	0
V	**Pit top & Pit Bottom Layout**	6	0
VI	**Electric Coal Drills & Jumbo Drills**	3	0

Course Objectives:

Following are the objectives of this course:

- To have knowledge about different winding systems which are used in mines.
- To become familiar with different types of transport systems used in mines.
- To become familiar with the wire ropes used in mines.
- To understand different layouts at pit top & pit bottom for various winding systems.
- To understand the construction and operation of coal face drill and jumbo drill.

Course Content:

UNIT-I Winding System in Mine

- Purpose of Winding, Main equipment used for winding, Purpose of headgear, Height of headgear-factors for height, designing parameter; Headgear pulley, Constructional features of Headgear, Angle of fleet.
- **Cage** - Constructional Features, Cage Suspension Gear, Detaching Hook and its function, Safety Catches at Headgear, Keps, Guides used in mine shafts, Comparison between Rigid & Flexible Guide, Guide rope suspension & Tensioning arrangement, guide rope & winding rope changing.
- **Winding Drum**-Different profiles of winding drum- Their merits & demerits, attachment of winding rope to drum; Winding brakes - Mechanical-post and calliper brake, various safety devices on winding system including automatic contrivances for overwind; Over speed, slow banking etc.
- **Friction winding**- Principle, Ground mounted koepe and Tower mounted koepe- advantages and disadvantages of the system, Brief discussion on Multi-rope system of winding and its advantages; rope creep; Comparison between drum winding and koepe winding
- **Skip windin**g- Advantages and disadvantages over cage winding, Method of automatically tipping skips in an incline shaft.

UNIT-II Mine Transport System- Rope Haulage

- Different types of Rope Haulage – Description with simple sketches, Applicability, Advantages and Disadvantages.
- Different safety devices incorporated on rope haulages including Jazz rail, Back catch, Spring catch, Drop warwick, Inter-coupled stop block & Runway switch, Drags etc.
- Different types of rope clips, tub couplings.
- Size of rail sleepers & rail fastening arrangements, Fish plates, Ballast, Jim crow, Super elevation, Transition curve, Reverse curve, Goose neck curve, Diamond crossing etc.

UNIT-III Mine Transport System-Conveyors & Locomotives

- Different types of conveyors- Shakers Conveyor, Belt Conveyor, Scraper Chain Conveyor, & Armoured Flexible Conveyor ; Their principles of operation, Application, Merits and Demerits. Drive of Belt conveyor, loop take-up arrangement, troughed belt, and carrying capacity of belt conveyor, Average Loading Factor; Tensioning Arrangement.
- Different types of locomotive haulage systems: Brief on Diesel Locomotive, Electric Locomotive, Battery Locomotive and Compressed Air Locomotive; their applications merits and demerits; Safety devices of Diesel locomotives including flame trap and exhaust conditioner box.

UNIT-IV Wire Ropes and Rope Capel

- Wire- Testing of wires of rope, Contraction of various types of rope used in mining; Factor of Safety (F.O.S) of rope; Nominal and actual F.O.S. and Factors influencing the F.O.S., Space Factor, Bending Factor etc.; Laying of rope, Deterioration of rope, Care and maintenance of rope in use and also in storage; Splicing of haulage rope; Calculation of size of winding rope; Examination of rope; Life of rope and norms for discarding of a rope; Length of rope.
- Rope capel for haulage, winding and recapping.

UNIT-V Pit top & Pit Bottom Layout

- Factors affecting the pit top and pit bottom layout, Objectives of pit top and pit bottom layout.
- Pit top & Pit Bottom Layout for cage winding - Essential features of the layout, Brief discussion on different types of layouts.
- Brief discussion on Pit top & Pit Bottom Layout with skip winding.

UNIT-VI Electric Coal Drills & Jumbo Drills

- Electric coal drill- constructional features, specifications, operation & uses.
- Jumbo drills- constructional features, specifications, operation & uses.

Suggested learning resources:

1. Elements of Mining Technology , Vol-3 by D.J Deshmukh
2. Mine Transport by Kerlin
3. Introduction to Mining, G.K.Pradhan, Mintech Publications, Bhubaneswar
4. Mine Machinery by Arvind & Anand.
5. Mining Machinery-I by M. Kumaraswamy.
6. Mining Machinery-II by M. Kumaraswamy.

Course outcomes:

After completing this course, student will able to –

- Explain the design of the headgear and different safety fittings of winding arrangements in belowground mines.
- Supervise various systems of transportation of men, machines & mineral/coal in underground mines.
- Understand the uses of wire ropes and take safety precautions of its uses in mines.
- Explain pit-top & pit-bottom layouts efficiently.
- Apply the acquired knowledge to supervise drilling operations in mines.

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Course Code	:	MINPC 611
Course Title	:	Mine Machinery Lab.
Number of Credits	:	1 (L : 0, T : 0, P : 2)
Prerequisites	:	Basic knowledge in Mathematics, Physics & Engineering Graphics
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To know about different winding drum profiles used in mines.
- To inculcate knowledge about cage & shaft fittings used in mines.
- To understand the haulage transport systems used in mines including their safety features.
- To become familiar with different types of wire ropes used in mines.
- To understand the construction and operation of coal face drill used in mines.

List of practicals to be performed:

1	Study & sketch of different profiles of winding drum.
2	Study & sketch of headgear.
3	Study & sketch of safety detaching hook.
4	Study & sketch of different types of safety devices used in rope haulage systems in mines
5	Study & sketch of coal tubs, tub-couplings, haulage clips etc.
6	Study & sketch of different types of wire ropes used for mining purposes.
7	Study & sketch of different types of rope capels.
8	Study & sketch of Coal Face Drill.

Suggested learning resources:

1. Elements of Mining Technology , Vol-3 by D.J Deshmukh
2. Mine Transport by Kerlin
3. Introduction to Mining, G.K.Pradhan, Mintech Publications, Bhubaneswar
4. Mine Machinery by Arvind & Anand.
5. Mining Machinery –by M. Kumaraswamy.
6. Mining Machinery-II by M. Kumaraswamy.
7. Principle & Practices of Coal Mining, R.D. Singh

Course outcomes:

After completing this course, student will be able to-

- Understand the uses of different types of winding drums used in mines.
- Supervise the cage & shaft fittings of a belowground mine.
- Supervise the underground haulage system of a mine.
- Understand the applications of wire ropes used in mines.
- Apply the acquired knowledge to supervise drilling operations in mines.

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Course Code	:	MINPE 621
Course Title	:	Mine Hazards- II
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	Basic knowledge in Mathematics, Physics, Chemistry & Engineering Graphics
Course Category	:	PE

TOPIC WISE DISTRIBUTION OF THE COURSE:

UNIT	TOPIC	LECTURE PERIODS	TUTORIAL PERIODS
I	**The Mines Rescue Rules, 1985**	9	0
II	**Rescue apparatus**	9	0
III	**Mine Lighting**	9	0
IV	**Pollution due to Mining operations**	6	0
V	**Additional Environmental impact due to mining operations**	6	0
VI	**Safety aspects in opencast mining**	6	0

Course Objectives:

Following are the objectives of this course:

- To learn about different statutory provisions of 'The Mines Rescue Rules,1985'.
- To learn about different rescue apparatus used in rescue operations in mines.
- To be aware of the problem of lighting in mines and the standards of illumination to be maintained in mines.
- To know about different contributing factors of environmental pollution in mining operations along with control measures to be taken.
- To know about the impact on the environment by mining activities.
- To be familiar with different hazards in opencast mines and controlling measures for the same.

Unit I: The Mines Rescue Rules, 1985:

- Rescue Stations and functions of Rescue Stations
- Rescue Rooms and functions of Rescue Rooms
- Organisations and equipment in mines: Telephone communication, Rescue Tracings, Appointment of Rescue Trained Persons in mines, selection of persons for training in rescue work;
- Entry into below ground mines for rescue or recovery work
- Fresh air bases
- Rescue team

Unit II: Rescue apparatus

- Self contained breathing apparatus;
- Gas mask;
- Smoke helmets;
- Self rescuer;
- Reviving apparatus;

Unit III: Mine Lighting

- Problems of lighting in mines;
- Standard of illumination in underground coal and metalliferous mines;
- Standard of illumination in opencast coal and metalliferous mines;
- Construction and working principles of cap lamps; topping up operation and charging of cap lamp;
- Lamp room layout and organisation;
- LED cap lamp: Important features, advantages;

Unit IV: Pollution due to Mining operations

- Air pollution due to dust- smoke -fumes- gases, control measures;
- Water pollution due to mining, control measures;
- Noise pollution, control measures;
- Heat addition, control measures.

Unit V : Additional Environmental impact due to mining operations

- Land damage and land degradation;
- Damages on forest – effects on flora and fauna;
- Global warming and greenhouse effect;
- Radioactive emission;
- Cultural degradation;
- Damage to local inhabitants.

Unit VI: Safety aspects in opencast mining

- Vibration - its effects, precautionary measures to control ground vibration due to blasting in Opencast mines;
- Problems of fly rock – causes of fly rock – control of fly rock.
- Accidents in Opencast mines - cause wise and place wise (elementary ideas only) , preventive measures (elementary ideas only).

Suggested learning resources:

1. The Mines Rescue Rules, 1985
2. DGMS Circulars and orders
3. Legislation in Indian Mines: A Critical Appraisal by S.D. Prasad and Rakesh
4. Environmental effects of mining - wikipedia
5. Elements of mining technology Vol. 2. By D.J. Deshmukh

Course outcomes:

After completing this course, student will able to –

- understand different statutory provisions of 'The Mines Rescue Rules,1985'.
- use his acquired knowledge in selection and use of some rescue apparatus in need.
- take necessary steps in maintenance of illumination standards as per DGMS guidelines.
- understand the adverse impacts of mining operations on the environment and know the controlling measures.
- identify the hazards associated with some mining operations in opencast mines with controlling measures for the same.

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Course Code	:	MINPE 622
Course Title	:	Mineral Economics
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	Basic knowledge in Mathematics, Physics, Chemistry & Engineering Graphics
Course Category	:	PE

TOPIC WISE DISTRIBUTION OF THE COURSE:

UNIT	TOPIC	LECTURE PERIODS	TUTORIAL PERIODS
I	**Mineral Economics- Introduction**	6	0
II	**Mine Sampling**	6	0
III	**Resource-Reserve Dynamics**	9	0
IV	**Mine Investment Analysis**	9	0
V	**Mine Finance and Accounting**	6	0
VI	**Mineral Taxation and Pricing**	3	0
VII	**National Mineral Policy**	6	0

Course Objectives:

Following are the objectives of this course:

- To have a basic concept of economics of depleting resources.
- To choose a proper method of sampling for different ore bodies and mineral heaps.
- To estimate grade and reserves.
- To choose a proper method for valuation of any mine and also be able to determine the NPV of any mine.
- To perform various financial management aspects related to the mine.
- To have an elementary idea on National Mineral Policy.

Course Content:

Unit-I Mineral Economics- Introduction

- Mine and Mineral Economics- scope and definitions;
- Economics of Depleting Resources;
- Major Issues- availability, secondary supply and conservation.

UNIT-II Mine Sampling

- Theory of Sampling; Common Methods; Size and Spacing;
- Sample Preparation; Errors in Sampling; Interpretation of Sampling Results

Unit-III Resource-Reserve Dynamics

- Mineral Resource Classification- JORC system, UNFC;
- Methods of calculation of reserves-
    - Contour lines method
    - Mean arithmetic method
    - Polygon method
    - Section method
- Problems on calculation of average width and grade of an ore body.

Unit-IV Mine Investment Analysis

- Time Value of Money- present and future values, Basic ideas of Net Present Value (NPV) and Internal Rate of Return (IRR) with simple calculations only;
- Cash Flow and Discounted Cash Flow Analysis- discount factors, risk and uncertainty, inflation adjustments, Feasibility Analysis
- Mine Project financing, its risks and constraints
- Impact of depreciation, depletion, type of funding, reserves, life etc. on mine profitability

Unit-V Mine Finance and Accounting

- Cost of Capital; Sources of Finance- shares, debentures, fixed deposit, sinking fund, capital gearing;
- Cost Accounting; Cost-Volume-Profit Analysis, Break-even analysis;
- Depreciation and Amortisation;
- Cost control measures

UNIT-VI Mineral Taxation and Pricing

- Objectives and Principles of Mineral Taxation;
- Mineral Taxation in India;
- Mineral Pricing in brief

UNIT-VII National Mineral Policy

- Objectives and Elements;
- National Mineral Policy of India;
- Implementation Strategies in brief

Suggested learning resources:

1. Deshmukh, R. T., Mineral and Mine Economics, Mira Publication., Nagpur, 1986
2. Sinha R. K. and Sharma, N. L., Mineral Economics, Oxford & IBH Pub., 3rd ed, 1970
3. Ray S. C. and Sinha, I. N., Mine and Mineral Economics, PHI Learning, 2016
4. Arogyaswamy, R. N. P., Courses in Mining Geology, Oxford and IBH Pub., 2nd ed, 1973
5. Chatterjee K. K. 1993. An Introduction to Mineral Economics. Wiley Eastern Limited. New Delhi. 353 pages
6. Khanna, O. P., Industrial Engineering and Management, Dhanpat Rai Delhi, 1993
7. Krishnaswamy, S., India's Mineral Resources, Oxford & IBH pub., 2nd ed, 1972
8. Jain, P. K., Financial Management, Tata McGraw Hill, 1981

Course outcomes:

After completing this course, student will able to –

- understand the basic concept of economics of depleting resources.
- choose a proper method of sampling for different ore bodies and mineral heaps.
- estimate grade and reserves.
- build fundamental concepts of rate of return on mine investment which will help them to take crucial financial decisions in their future position as manager.
- perform various financial management aspects related to the mine in their future position as manager.
- identify and implement the various aspects of National Mineral Policy.

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Course Title	Entrepreneurship and Start-ups
Course Code	HS 302
Number of Credits	3
Pre Requisites	None
Total Contact Hours	3 (L: 2; T: 1) /week = 45 hrs
Course Category	HS

Course Learning Objectives

1. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
2. To motivate and inspire students toward an entrepreneurial career.
3. To understand the venture creation process and to develop generic entrepreneurial competences.
4. To introduce students to the basic steps required for planning, starting and running a business.
5. To familiarise students with the different exit strategies available to entrepreneurs.

Course Outcomes:

After completing the course students will able to:

CO 1	Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
CO 2	Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
CO 3	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
CO 4	Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

Detailed Course Content

Unit	Name of the Topic	Hours
1.	ENTREPRENEURSHIP – INTRODUCTION AND PROCESS ● Concept, Competencies, Functions and Risks of entrepreneurship ● Entrepreneurial Values & Attitudes and Skills ● Mindset of an employee/manager and an entrepreneur ● Types of Ownership for Small Businesses ● Sole proprietorship ● Partnerships ● Joint Stock company- public limited and private limited companies ● Difference between entrepreneur and Intrapreneur	10

2.	PREPARATION FOR ENTREPRENEURIAL VENTURES ● Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. ● Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard Feasibility Study Report ● Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan ● Project Report- Concept, its features and components ● Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. They may not be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report at the End of Semester Examination.	20
3.	ESTABLISHING SMALL ENTERPRISES ● Legal Requirements and Compliances needed for establishing a New Unit- ● NOC from Local body ● Registration of business in DIC ● Statutory licence or clearance ● Tax compliances	03
4.	START-UP VENTURES ● Concept & Features ● Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical ● Problems and challenges faced by start-ups. ● Start-up Ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. No questions are to be set from the case studies.	04

5.	FINANCING START-UP VENTURES IN INDIA ● Communication of Ideas to potential investors – Investor Pitch ● Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups ● Govt Initiatives including incubation centre to boost start-up ventures ● MSME Registration for Start-ups –its benefits	06
6.	EXIT STRATEGIES FOR ENTREPRENEURS ● Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – Basic Concept only	02

Examination Scheme

- End Semester Examination: 60 marks

Suggested Question Paper Scheme for End Semester Examination

Group A: 20 marks

Question Type	Number of questions to be set	Number of questions to be answered
MCQ, Fill in the blanks, True or False (Carrying 1 mark each)	25	20

Group B: 40 marks

Question Type	Number of questions to be set	Number of questions to be answered
Subjective Type questions (Carrying 8 marks each)	10	5

- Internal Assessment: 40 marks
- Class test : 20 marks
- Assignment: 10 marks
- Class attendance: 10 marks

Suggested Learning Resources

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of IndiaLearning Private Ltd

2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Cases On Entrepreneurship	Anjan Raichaudhuri	Prentice Hall of India Learning Private Ltd
6.	How to Start a Business in India	Simon Daniel	Buuks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development and Business Ethics	Abhik Kumar Mukherjee & Shaunak Roy	Oxford University Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

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Course Code	:	MINPR 651
Course Title	:	Major Project
Number of Credits	:	2 (L : 0, T : 0, P : 4)
Prerequisites	:	Knowledge of all courses of Mining Engineering
Course Category	:	PR

Course Objectives:

Following are the objectives of this course:

- To understand the inter- relationship among different courses learnt in the Diploma Program.
- To work in a team by preparing a model/ preparing a research work and making a presentation/ facing viva-voce.
- To get a platform to learn the basic idea of paper writing.

Procedures to be observed:

Students will carry out their Project Work in group or individually under the supervision of a Faculty of their department who will work as a Project Guide. Number of students per group may vary with the strength of the students and the topics provided.

The Major Project shall include preparation of a Project Report which, among other things, consists of technical description of the project. The Report should be submitted in two copies, one to be retained in the library of the institute. The students shall prepare a presentation on the project topic and deliver it and/or face viva-voce.

This project work may be the continuation of the Project Work of the previous semester.

The Major Project work will be based mainly on the topic of Mining Engineering courses.

Course outcomes:

After completing this course, student will be able to:

- To work as a team member.
- Interrelate different aspects of engineering and/ or present in a model.
- Write and present a technical research paper.

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Course Code	:	MINSE 661
Course Title	:	Seminar
Number of Credits	:	1 (L : 0, T : 0, P : 2)
Prerequisites	:	Communication skills with knowledge in all courses of Mining Engineering and allied courses
Course Category	:	SE

Course Objectives:

Following are the objectives of this course:

- To enable students to prepare and present the project/ research work by making a presentation, preferably a powerpoint presentation.
- To prepare the students for Group Discussion.

Course Content:

- Preparation of presentation, preferably power-point presentation of the projects (major/ minor) undertaken and delivering it.
- Group Discussion on several topics related to the industry/ education.

Course outcomes:

After completing this course, student will be able to:

- Present a technical project/ research paper.
- Participate in a Group Discussion (GD) in proper manner.

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West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Multimedia Technology [MT]

Part-III (6th Semester)

2023

Revised curricular structure for Diploma in MultimediaTechnology, RIPT as per AICTE 2019 norms

Multimedia Technology						Evaluation Scheme of Theoritical Paper				Evaluation Scheme of Practical/Sessional				Total Marks
						Internal Scheme				Internal Assessment		End Semester Assessment		
Semester V	L	T	P	Contact Hours	Credit	Mid Sem Test	Class Assignment	Class Attendance	End Semester Examination	Continuous Evaluation	Class Attendance	Viva-Voce	Assignment on the day of Viva-voce	
3D Modeling & Animation	3	0	0	3	3	20	10	10	60					100
Motion Graphics & Compositting	3	0	0	3	3	20	10	10	60					100
Programme Elective II: Content Generation	3	0	0	3	3	20	10	10	60					100
Programme Elective III: Film Humanities & Arts	3	0	0	3	3	20	10	10	60					100
3D Modeling & Animation Lab	0	0	4	4	2					50	10	20	20	100
Motion Graphics & Compositting Lab	0	0	3	3	1.5					50	10	20	20	100
Media Production Lab	0	0	3	3	1.5					50	10	20	20	100
Major Project	0	0	4	4	2									100
Internship II (after Sem IV)	0	0	0	0	1									100
				26	20									900

Multimedia Technology						Evaluation Scheme of Theoritical Paper				Evaluation Scheme of Practical/Sessional				Total Marks
						Internal Scheme				Continuous Assessment		End Semester Assessment		
Semester VI	L	T	P	Contact Hours	Credit	Mid Sem Test	Class Assignment	Class Attendance	End Semester Examination	Continuous Evaluation	Class Attendance	Viva-Voce	Assignment on the day of Viva-voce	
Advanced 3D Modeling & Animation	3	0	0	3	3	20	10	10	60					100
Enterpreneurship and Start-ups	3	0	0	3	3	20	10	10	60					100
Programme Elective IV: Multimedia Production & Packaging	3	0	0	3	3	20	10	10	60					100
Open Elective I: Engineering Economics & Project Management	3		0	3	3	20	10	10	60					100
Open Elective II: Industrial Management or Environmental Engineering & Science	3		0	3	3	20	10	10	60					100
Advanced 3D Modeling & Animation Lab	0	0	4	4	2					50	10	20	20	100
Major Project	0	0	6	6	3									100
Seminar	0		2	2	1									100
				27	21									800

Syllabus for Advanced 3D Modeling & Animation

Name of the Course : MUTIMEDIA TECHNOLOGY Name of the Subject: **Advanced 3D Modeling & Animation**			
Course Code:		Semester: Sixth	
Duration: 17 weeks(out of 17 weeks, 2 weeks are to be allotted for class tests)		Maximum Marks: 100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./ week		Mid Semester Test:20	
Practical: Nil		Class Attendance: 10	
Credit: 3		Class Assignments:10	
		End Semester Examination:60	
Aim: To impart knowledge of 3D virtual environment and their properties, features and managing techniques to the students with more advanced way.			
Outcome: Students will be able to			
	Describe various components present in the interface of Autodesk Maya		
	Explain various modeling techniques in this application.		
	List various materials & shaders used in Maya.		
	Describe the functions of different light & camera types.		
	Explain various rendering techniques.		
	Describe the process of creating animation & special effects.		
	Compare the modeling process created in Maya & Blender.		
Pre-Requisite:			
	Knowledge of 3D graphics is required.		
	Concept of third dimension is essential		
Content Details		**Hours/Unit**	**Marks**
Unit 1	**Basics of Advanced 3D Modeling**		
	Maya Interface Components in Maya Interface Maya workspace Controlling & Configuring View ports Comparing Polygon and NURBS object components	5	8
Unit 2	**Modeling features in Maya**		
	Various modeling techniques and tools Polygon toolset & Polygon component Features of Polygon Primitives NURBS Curves Features of NURBS Curves Comparison between Polygon and NURBS Modeling Advantage & Disadvantage of Polygon & Nurbs Modeling Basics of anatomy Basics of character modeling	12	15

Unit 3	**Materials , textures & Shaders**		
	Attributes of different Material types Various Shaders Texturing in Maya Arnold Materials	8	10
Unit 4	**Light, Camera , Rendering**		
	Various Light types in Maya Application of Lights in a scene Various Light types Camera types in Maya Various Rendering techniques in Maya Use Sky dome lights with HDR images	8	10
Unit 5	**Animation & Special Effects**		
	Various Animation tools & techniques in Maya shading and rendering Process to create Turbulence, Smoke, Collision, nParticle, nCloth Arnold Animation	8	10
Unit 6	**Blender**		
	Adding and Transforming Mesh Objects Creation of an Object with Blender Primitive Objects Editing Mesh Objects Subdivision Surface Modifier Mirror Modifier Boolean Array	4	7

References

1. 3D Modelling and Animation, Michael G. Igi Publishing
2. Maya At A Glance, George Maestri
3. The Art of Maya, Autodesk Maya Press
4. Beginning Blender: Open Source 3D Modelling, Animation, and Game Design, Lance Flavell, A press
5. Blender 3D Basics Beginner's Guide, Gordon Fisher

Syllabus for Multimedia Production and Packaging (Elective-IV)

Name of the Course : MULTIMEDIA TECHNOLOGY Name of the Subject: Multimedia Production and Packaging	
Course Code:	Semester: Sixth
Duration: 17 weeks(out of 17 weeks, 2 weeks are to be allotted for class tests)	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 3 hrs./ week	Mid Semester Test:20
Practical: Nil	Class Attendance: 10
Credit: 3	Class Assignments:10
	End Semester Examination:60

Aim:

To make the students proficient with relevant knowledge to become an entrepreneur or work as a part of a multimedia production house. They will be competent enough to manage & maintain media laws & ethics for surviving in the media world.

Outcome: Students will be able to	
	Independently handle Production & Delivery Packaging
	Accomplish the tasks involved in Production Planning
	Understand Multimedia Project Life Cycle
	Use of Content, Visual & Technical components as per Production requirement
	Basic Concept of Media Laws & Ethics
	Concept of Cyber Crime & Computer Virus
	Accomplish Multimedia Production & Post-Production Packaging & Release
Pre-Requisite -	
	Basic knowledge of multimedia production
	Idea of content, media and it's parameters

Content Details		Hours/Unit	Marks
Unit 1	**Basic Principles of Multimedia Production & Packaging**		
	Start from the End, Delivery Media & Target Audience, Content is the King, Different Production Methodology, Industry standards, Requirement Gathering and Need Analysis	8	8
Unit 2	**Production Planning**		
	Production Planning, Content Planning, Media Planning, Resource Planning, Effort Estimation, Price Calculation, Billing Milestones, Invoicing, Payment Collection, Client Servicing	8	10
Unit 3	**Project Life Cycle**		
	Definition of Project, Project Life Cycle, Pre-Production/ Planning and estimation, Project Proposal, Negotiation with Client, Project Initiation, Production Planning, Production – Project execution, Production Monitoring, Risk Analysis & Mitigation Strategy, Post Production, Quality Assurance, Packaging & Delivery, Post-delivery deployment, Client Feedback implementation, Final acceptance, Project closure	6	10
Unit 4	**Content Development & Media Integration**		

	Content is still the King, Content Development for Different Target Audience & Different Delivery Media, Product Delivery platforms and advantages of each, Social media contents- Blogging, Vlogging and podcasts.	8	10
Unit 5	**Media Laws & Ethics**		
	i)Media Laws-Meaning & Objectives .Different types of Media Laws-Intellectual Property Laws, Copyright Laws and fallouts of violations, Cyber Law, Defamation, Contempt of Court. ii)Media Ethics - Meaning and Concept, Code of Ethics& Guidelines for media professional, Freedom of Media & Freedom of Media in India, Rights and Privileges.	8	12
Unit 6	**Cyber Crime & Computer Virus**		
	i) Definition of Cyber Crime, Cyber bullying, Reasons for Cyber Crime, Cyber Criminals, Mode and Manner of Committing Cyber Crime, Classification of Cyber Crime, Plagiarism, Spam, Hacking etc. ii)Computer Virus, Different Types of Virus-Boot Sector Virus, File Virus, Multi -partite Virus, Stealth Virus, Polymorphic Virus, Macro Virus etc.	7	10

References:

1. Multimedia Production Handbook, David Isaac Ruiz
2. Media Law and Ethics, M. Neelamalar
3. Multimedia Systems Design by Prabhat K. Andleigh, Pearson Education

Syllabus for Advanced 3D Modeling & Animation Laboratory

Name of the Course: MULTIMEDIA TECHNOLOGY Name of the Subject: Advanced 3D Modeling & Animation Laboratory	
Course Code:	**Semester: Sixth**
Duration: 17 weeks(out of 17 weeks, 2 weeks are to be allotted for class tests)	**Maximum Marks: 100**
Teaching Scheme:	**Examination Scheme:**
Theory & Tutorial: Nil	Continuous Evaluation: 50
Practical: 3hrs./ week	Class Attendance: 10
Credit: 1	Viva Voce: 20
	Assignment on the day of Viva Voce and Practical Report Submission: 20

Aim: to make students master with the knowledge necessary for using advanced techniques and tools in computer-aided 3D modeling and animation. Students can use different options to improve the design techniques of 3D environments and characters.

Outcome: Students will be able to	
	Create primitive objects in Maya interface
	Create Models by using different modeling tools
	Apply different materials to the 3D environment
	Design a 3D environment by using light types in Maya
	Create animation, special effects and render the scene properly
	Create basic models in Blender
Pre- Requisite :	
	Idea of 2D & 3D Animation is required.
	Knowledge of interface of a 3D application is desirable.
Content Details	
Unit 1	**Basics of Advanced 3D Modelling**
	Maya workspaces Maya Viewports Creation of primitive Objects Saving and Opening Files Selecting Objects and Components Move, Rotate and Scale Tool Soft Selection and Symmetry Hide and Show Objects Concepts of Layers & Outliner Use of Pivot Point Group Objects
Unit 2	**Modeling in Maya**
	Application of various Modeling tools in Maya Bevel & Normals Booleans Merge Vertices

	Subdivision Bridge Polygons Target Weld Delete Vertices, Normals, Fill Image Planes Modeling Figures
Unit 3	**Materials , Maps & Shaders in Maya**
	Creation of Material Seamless Texture & Normal Map Application of Textures Uv Editor Fixing Normal Map
Unit 4	**Light, Camera & Rendering in Maya**
	Light Types Spotlight Manipulation Light Attributes Depth Map Shadows 3-point Lighting Volume Lights Render View Introduction Camera Setup Camera Motion with follow path
Unit 5	**Animation & Special Effects in Maya**
	Introduction to Animation Animation Scene Setup Setting Key frames Playback Channel Box Timeline Editing Graph Editor Set Key Motion Path Creation of Turbulence, Smoke, Collision, nParticle, nCloth
Unit 6	**Basic Modeling in Blender**
	Moving Around the Scene Adding Objects Viewport & Rendering Material Colours Editing Objects Creating Simple Models The Decimate Modifier Linked Duplicates

Syllabus for Major Project

Name of the Course: MULTIMEDIA TECHNOLOGY Name of the Subject: Major Project		
Course Code:	**Semester: Sixth**	
Duration: 17 weeks(out of 17 weeks, 2 weeks are to be allotted for class tests)	**Maximum Marks: 100**	
Teaching Scheme:	**Examination Scheme:**	
Theory & Tutorial: Nil	Internal Assessment: 60	End Semester Assessment: 40
Practical: 6 hrs./ week	Continuous Evaluation: 50	Assignment on the day of Viva voce & Practical report submission: 20
Credit: 3	Class Attendance:10	Viva Voce: 20

Methodology:
Project topic must be selected by the students in consultation with their teachers. The aim of the project work is to enhance comprehension of multimedia & its components by applying these to make a new project which may be the making of a short film/stop motion animation film/3D animation strip with a focus on creativity and industry /society needs. The progress of the project is evaluated on the basis of multiple reviews. The review committee may be constituted by the Head of the Department. A project report is compulsory at the end of the semester.

Course Outcomes:

1	Students will be able to apply their knowledge and skill to make a short film / stop motion animation film.
2	Students will be able to apply all the components of multimedia accordingly for successful completion of the project.
3	Use acquired knowledge and apply techniques in Multimedia Technology to fulfill the present need of the industry.
4	Evaluate the feasibility of the project that is to be undertaken.
5	Prepare a technical report to summarize and present the results of the project in a meaningful manner.

Evaluation Criteria:
The report submitted at the end of the course will be evaluated on the basis of following criteria (as applicable)

Sl.No.	**Criteria for evaluation of Report**
1	Originality in project idea
2	Adequate and purposeful storyboard write up

3	Story, illustrations, drawings, sketches, animation type & style, type of shots, editing, format, language
4	Practical applications and correlation with basic theory
5	Concepts taught in the course outcome
6	Attendance record, daily diary, quality of the Report
7	Ability to solve real-life industry related requirement.

Syllabus for Seminar

Name of the Course : MULTIMEDIA TECHNOLOGY Name of the Subject: Seminar	
Course Code:	**Semester: Sixth**
Duration: 17 weeks(out of 17 weeks, 2 weeks are to be allotted for class tests)	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 1 hr./ week	Evaluation through End Semester Seminar Presentation
Tutorial : Nil	
Practical: Nil	
Credit: 1	

Course Outcome:

1. Students will be able to prepare a professional presentation using software.

2. Students will be able to present their project work through effective communication skills.

Methodology:

Students will have to prepare a presentation based on their major project they have worked on during final year of study in front of panel of faculty, experts and pears at the end of the semester. During the presentation they will have to present the aim of their work, elements of the presentation, name of the softwares used, and findings or final design & scope of their work in the future.

Seminars must be arranged for the students on that topic before an internal committee constituted by the concerned departments of the institute. The evaluation of the students for seminar will be based on the following criteria:

Sl No	Criteria for evaluation of Internship Seminar
1	Quality of content presented
2	Proper planning for presentation
3	Effectiveness of presentation
4	Depth of knowledge and skills
5	Viva Voce

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Packaging Technology [PT]

Part-III (6th Semester)

2023

Semester-VI

Sl. No.	Category of Course	Code No.	Course Tile	Credit	Marks	Total Contact Hours/week		
						L	T	P
1.	Program Core Course		Package Design	3	100	2	1	0
2.	Program Core Course		Package Design **Laboratory**	1	100	0	0	2
3.	Program Elective Course IV		**Any one of the Following Subjects to be chosen** 1. Package Testing and Evaluation 2. Product Packaging	3	100	3	0	0
4.	Program Elective Course IV Lab		**Any one of the Following Laboratories to be chosen** 1.Package Testing and Evaluation Laboratory 2.Package Testing for Product Laboratory	1	100	0	0	2
5.	Humanities and Social Science	HS302	Entrepreneurship and Start-ups	3	100	3	0	0
6.	Open Elective Course-I	OE302	Engineering Economics and Project Management	3	100	3	0	0
7.	Open Elective Course-II	OE304	**Any one of the following subjects to be chosen** i. Renewable Energy ii Disaster Management iii. Environmental Engineering and Science iv. Industrial Management v. Sustainable Development vi. Industrial Safety Engineering vii. Introduction to E-Governance viii. Professional orientation ix. Medical Electronics	3	100	3	0	0
8.	Major Project	PR302		2	100	0	0	4
9.	Seminar	SE302		1	100	0	0	2
Total				20	900	14	1	10
Total Contact Hours/week=25								

Name of the course : **Package Design**	
Course code: **PT/PD/S6**	Semester: 6th
Duration: 17 Weeks	Maximum Marks: 100
Teaching Scheme:	Examination Scheme:
Theory: 3hrs/weekTutorial: Nil	Internal Examination:20 Assignment & Activity:10 Attendance:10 End semester exam : 60
Credit: 3	

Objective:

The course will enable the student

- To understand the basic concepts and influencing factors of package design.
- To know the function of graphic design in package design.
- To understand and estimate shelf life.
- To know purpose of different cushioning method.
- To know application of AutoCAD for package design.

Contents:

	Group – A		
		Hrs./unit	Marks
Unit – 1 Introduction to Package Design	Basic idea of packaging design. Factors influencing package design. Need for changes in package design. Product-package relationship, Role of advertising agency in package design.	8	20
Unit – 2 Graphic design	Packaging graphic design objective, Packaging colors,Roles of color in sales, choice of color in packaging design (Elementary idea only).	6	10
Unit – 3 Shelf life nalysis	Shelf life & factors influencing shelf life. Analysis of shelf life.	7	20
Unit – 4 Cushion design	Requirement of cushion designing. Methods of cushion designing, isolation methods. Factors of consideration for selection of cushioning material. Steps in cushion design.	8	20

Unit-5 Mould & Die Design	Designs of moulds & Tools. Injection Moulds, Blow Mould, Extrusion Die, (Elementary idea only)	6	10
Unit-6 AutoCAD in Package design	Introduction Computer Design through AutoCAD. Advantages of CAD, DRAW OPTION, MODIFY OPTION,VIEW, DIMENSION. 2-D DRAWING – (LINE, POLYGON, CIRCLE, RECTANGLES & HATCH, with DIMENSIONS ETC.)FINDING AREA, CIRCUMFERENCE	10	20
	Total	45(Lecture)	100
Internal assessment Examination and preparation for semester examination		2 weeks (6 Lecture hour)	
Total		51 Lecture hour(17 Weeks)	

Text and Reference Books:			
S.N	Name of the Author	Title of the Book	Name of the Publishers
1.	S. Natarajan M. Govindarajan B.Kumar	Fundamental of Packaging Technology	PHI Learning Private Limited.
2.		Hand book of Packaging Technology	Engineers India Research Institute
3.	Josep F.Harlon, Robert JKelsey	Hand book of Package Engineering	CRC PRESS
4.	Paine F. A	Package design & Performance	Pira 1990

Name of the course **: Package Design Lab**	
Course code: **PT/PD Lab/S6**	Semester: 6th
Duration: 17 Weeks	Maximum Marks: 100
Teaching Scheme:	**Examination Scheme:**
Practical: 2hrs/week	Continuous Internal Assessment : 60 (Performance of job (20) + Notebook (20)+ Viva (20)) External Assessment : 40
Credit: 1	
Objective:	
On satisfactory completion of the course, the student should be in a position to develop the skills & application corresponding to the knowledge acquired in the theoretical subject Package Design	
List of laboratory experiments:	
1. Estimation of Shelf Life of different package foods like Biscuit, Chips, Salt etc.	
2. Shock absorbance test of different cushioning materials.	
3. Draw basic 2D figures in AutoCAD.	
4. Draw 3D figures in AutoCAD.	
5. Design of Package drinking water bottle in AutoCAD.	
6. Design of self cushioning package in AutoCAD.	

Name of the course: **Package Testing & Evaluation**	
Course code: PT/PTE/S6	Semester: 6th
Duration: 17 Weeks	Maximum Marks: 100
Teaching Scheme:	**Examination Scheme:**
Theory: 3hrs/week Tutorial: Nil	Internal Examination:20 Assignment & Attandence:20 End semester exam:60
Credit: 3	

Objective:

- Understand the basic concepts of quality control &standards in packaging.
- To know the information regarding test procedure.
- To know the testing & evaluation of package performance.

Contents:

	Group - A		
		Hrs./unit	Marks
Unit – 1 Evaluation & Testing fundamentals	Determination of Thickness &grammage, Surface and directional properties of paper & board-substance. M/c direction, cross direction, top side and wire side determination of paper samples. Strength properties - stiffness, folding endurance, bursting strength, tear resistance.tensile strength, tear strength, bursting strength, burst factor	10	15
Unit – 2 Transit Package Testing	Drop Test, Incline impact test, stack test, vibration test. Compression test	5	15
Unit – 3 Migration test of paper	Conditioning of test specimen. Determination of Moisture content of test specimen, COBB Value, WVTR, Water vapour permeability, water proofness, water penetrations, Gas transmission rate.	8	20
Unit-4 Climatic Tests of packages	Salt Spray Test, Sand and Dust Tests, Opacity (Optical properties - gloss, brightness),Identification Tests for Plastic Films	5	16
Unit – 5 Mechanical Tests of packages	Tearing resistance-details not required Testing of plastic films-- Gloss, Haze, Impact strength of glass bottles, Thermal	10	18

	shock – (Details not required) Mechanical test of plastic- Tensile elongation, Impact strength, Edge crust test, Flat crust test, Box compression strength		
Unit -6 Quality Control& machine	Definition of Standard, standardization, specification and functions of standards. Advantage of standardization, Criteria of packaging quality control. Folding: folding to paper, lump folding, style of folding, Folding Schemes, Machine Folding - & machine direction.	7	16
	Total	45(Lecturer +Tutorial)	100
Internal assessment Examination and preparation for semester examination		2 weeks (6 Lecture hour)	
Total		51Lecture hour(17 Weeks)	

Name of the course : **Package Testing & Evaluation Lab**	
Course code: **PT/PTE/S6**	Semester: 6th
Duration: 17 Weeks	Maximum Marks: 100
Teaching Scheme:	**Examination Scheme:**
Practical: 2hrs/week	Examination Scheme: i) Internal Assessment: 60 marks [Performance of job (20) + Notebook (20)+ Viva (20)) ii) External Assessment: 40 Marks
Credit: 1	
Objective: On satisfactory completion of the course, the student should be in a position to develop the skills corresponding to the knowledge acquired in the theoretical subject Package Testing & Evaluation Lab	
Suggested List of Laboratory Assignment:(At least conduct 6 experiments)	
1	Machine direction of Paper
2	Determination of top and wire side of paper
3	Perform ring crush test
4	Determination of Water vapor transmission rate of packaging material

5	Determination of moisture content of paper.
6	Determination of gas transmission rate of packaging material.
7.	Glass Impact test procedure
8.	Gloss determination test for a packaging material

Course Code:	**OE302**
Course Title:	**Engineering Economics & Project Management**
No. of Credits:	3 (L:3, T:0,P: 0)
Prerequisites:	NIL
Course Category:	Open Elective (Compulsory for all branches)

Course Objectives:

- To acquire knowledge of basic economics to facilitate the process of economic decision making.
- To acquire knowledge on basic financial management aspects.
- To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

Group-A

Unit-I (INTRODUCTION, THEORY OF DEMAND & SUPPLY) [9 hours]

1.1 Introduction to Engineering Economics, the relationship between Engineering and Economics

1.2 Resources, scarcity of resources, and efficient utilization of resources.

1.3 Opportunity cost, rationality costs, and benefits

1.4 Theory of Demand: the law of demand, different types of demand, determinants of demand, demand function, price elasticity of demand.

1.5 Theory of Supply: determinants of supply, supply function.

1.6 Market mechanism: Equilibrium, basic comparative static analysis (Numerical problems)

Unit-II (THEORY OF PRODUCTION & COSTS) [10 hours]

2.1 Concept of production (goods & services), Different factors of production (fixed and variable factors), Short-run Production function (Graphical illustration), and Long run production function (returns to scale).

2.2 Theory of Cost: Short-run and long-run cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost etc.

2.3 Economic concept of profit, profit maximization (numerical problems)

UNIT-III (DIFFERENT TYPES OF MARKET AND ROLE OF GOVERNMENT) [4 hours]

3.1 Perfect Competition: Features of Perfectly Competitive Market.

3.2 Imperfect Competition: Monopoly, Monopolistic Competition, and Oligopoly.

3.3 Role of government in Socialist, Capitalist and Mixed Economy structure with example.

Group-B

Unit-I (CONCEPT OF PROJECT) [4 hours]

1.1 Definition and classification of projects)

1.2 Importance of Project Management.

1.3 Project life Cycle [Conceptualization→Planning→Execution→Termination]

Unit-II (FEASIBILITY ANALYSIS OF A PROJECT) [10 hours]

2.1 Economic and Market analysis.

2.2 Financial analysis: Basic techniques in capital budgeting– Payback period method, NetPresentValue method, InternalRate of Returnmethod.

2.3 Environmental Impact study–adverse impact of the project on the environment.

2.4 Project risk and uncertainty: Technical, economical, socio-political, and environmental risks.

2.5 Evaluation of the financial health of a project–Understanding the basic concept of Fixed & Working Capital, Debt & Equity, Shares, Debentures etc., and different financial ratios like Liquidity Ratios, Activity Ratios, Debt-equity ratio & Profitability Ratio (Basic concept only).

N.B: Knowledge of financial statements is not required; for the estimation of ratios the values of the relevant variables will be provided.

Unit-III (PROJECT ADMINISTRATION) [8 hours]

3.1 Gantt Chart– a system of bar charts for scheduling and reporting the progress of a project (basic concept).

3.2 Concept of Project Evaluation and Review Technique (PERT) and Critical Path method (CPM): basic concept and application with real-life examples.

ExaminationScheme:

A. SemesterExaminationpatternof60 marks:

1. Objective type Question (MCQ, Fill in the blanks, and Very Short question-1 mark each): At least five questions from each unit. [Total marks: 20]

2. Subjective questions: Eight questions to be answered taking at least three from each group. (Two questions should be given from each unit). [Total marks: 40]

B. Assignment (10Marks)

Guideline for Assignment (10 Marks)

Students should be instructed to prepare a report on a project (preferably the Major Project they prepare in 6th Semester), using a popular project management software in IT/ Computer Laboratory, under the guidance of the Lecturer in Computer Science & Technology and Lecturer in Humanities.

C. Class Test: Two examinations 20 marks each. Take best of two.

D. Attendance: 10 Marks

Suggested reference books:

1 *Principles of Economics – Case and Fair, Pearson Education Publication*
2 *Principles of Economics – Mankiw, Cengage Learning*
3 *Project planning, analysis, selection, implementation and review – Prasannachandra–Tata McGraw Hill.*
4 *Project Management – Gopala Krishnan – Mcmillan India Ltd*

Course Title	**Entrepreneurship and Start-ups**
Course Code	HS 302
Number of Credits	3
Pre Requisites	None
Total Contact Hours	3(L: 2; T: 1)/week = 45 hrs
Course Category	HS

Course Learning Objectives

1. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
2. To motivate and inspire students toward an entrepreneurial career.
3. To understand venture creation process and to develop generic entrepreneurial competences.
4. To introduce students to the basic steps required for planning, starting and running a business.
5. To familiarise students with the different exit strategies available to entrepreneurs.

Course Outcomes:

After completing the course students will able to:

CO 1	Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
CO 2	Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
CO 3	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
CO 4	Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

Detailed Course Content

Unit	Name of the Topic	Hours

1.	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS**
	• Concept, Competencies, Functions and Risks of entrepreneurship
	• Entrepreneurial Values& Attitudes and Skills
	• Mindset of an employee/manager and an entrepreneur
	• Types of Ownership for Small Businesses
	  o Sole proprietorship
	  o Partnerships
	  o Joint Stock company- public limited and private limited companies
	• Difference between entrepreneur and Intrapreneur
		10

2.	**PREPARATION FOR ENTREPRENEURIAL VENTURES** • Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. • Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard Feasibility Study Report • Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan • Project Report- Concept, its features and components • Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. <u>They **may not** be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.</u>	20
3.	**ESTABLISHING SMALL ENTERPRISES** • Legal Requirements and Compliances needed for establishing a New Unit- o NOC from Local body	03

	○ Registration of business in DIC ○ Statutory license or clearance ○ Tax compliances	
4.	**START-UP VENTURES** • Concept & Features • Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical • Problems and challenges faced by start-ups. • Start-up Ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. No questions are to be set from the case studies.	04
5.	**FINANCING START-UP VENTURES IN INDIA** • Communication of Ideas to potential investors – Investor Pitch • Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups • Govt Initiatives including incubation centre to boost start-up ventures • MSME Registration for Start-ups –its benefits	06
6.	**EXIT STRATEGIES FOR ENTREPRENEURS** • Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – **Basic Concept only**	02

Examination Scheme

- **End Semester Examination: 60 marks**

Suggested Question Paper Scheme for End Semester Examination

Group A: 20marks

Question Type	Number of questions to be set	Number of questions to be answered
MCQ, Fill in the blanks, True or False (Carrying 1 mark each)	25	20

Group B: 40marks

Question Type	Number of questions to be set	Number of questions to be answered
Subjective Type questions (Carrying 8 marks each)	10	5

- **Internal Assessment: 40 marks**
  - Class test : 20 marks
  - Assignment: 10 marks
  - Class attendance: 10 marks

Suggested Learning Resources

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of IndiaLearning Private Ltd
2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Caseson Entrepreneurship	Anjan Raichaudhuri	Prentice Hall of India Learning Private Ltd
6.	How to Start a Business in India	Simon Daniel	Buuks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development and Business Ethics	Abhik Kumar Mukherjee & Shaunak Roy	Oxford University Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

Course Code	OE304
Course Name	**ENVIRONMENTAL ENGINEERING & SCIENCE**
Number of Credits and L-T-P	3 [L – 3, T – 0, P - 0]
Course Category	OE
Prerequisites	NA

Course Objectives:

After completing this course, the students will be able

1. To increase the awareness towards Environmental Science and Engineering.
2. To recognize and apply the role of technology towards Environmental Science and Engineering.
3. To know the method and tools used for Environmental Science and Engineering.
4. To know about the environmental pollution management act.

Course Contents:

Unit No.	Description of Topic	Contact Hrs.
01	**Environment and Ecology** 1.1 Classification of Environment 1.2 Environmental descriptors 1.3 Environmental quality and descriptive parameters 1.4 Ecology: Definition and classification 1.5 Environmental impact on ecology	08
02	**Water pollution and pollutants (Natural and Anthropogenic)** 2.1 Ground water: Sources and quality analysis 2.2 Surface water: Sources and quality analysis 2.3 Quality parameters in water treatment along with flow-sheets 2.4 Basic processes for potable water supply (Detailed technology not necessary) 2.5 Water pollution: Surface and ground water pollution, types of pollutants 2.6 Mode of water pollution 2.7 Parameters to be assessed for water pollution (Turbidity, pH, total suspended solids, total solids, BOD and COD: Definition, calculation)	10

	2.8 Chemistry aspect for water pollution 2.9 Control of water pollution (Description only) 2.10 Fundamental of water treatment techniques.	
03	**Air quality, Air Pollution and Control, Noise Pollution** 3.1 Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler) 3.2 Air Pollutants: Types, Units of air pollutants 3.3 Atmospheric physics for air pollution 3.4 Particulate Pollutants: Effects and control strategies (Bag filter, Cyclone separator, Electrostatic Precipitator) 3.5 Advanced air pollution control methods 3.6 Noise pollution: sources of pollution, measurement of noise pollution 3.7 Noise measuring devices and their demonstration	10
04	**Solid waste and Soil pollution** 4.1 Definition of solid waste 4.2 Classification of solid waste 4.3 Overview on municipal, industrial, hazardous, hospital, plastic, E-waste.etc. 4.4 Solid waste management and disposal process. 4.5 Soil pollution ,Poor Fertility, Septicity, Concentration of Infecting Agents in Soil 4.6 Leaching and its impact on soil pollution.	06
05	**Renewable sources of Energy** 5.1 Energy Resources: Energy scenario, national and international status. 5.2 Solar Photovoltaics: Solar radiation and types, basic working principle of solar PV, solar cells and types, water pumping and applications of solar PV. 5.3 Solar Thermal system: basic working principle and applications of solar thermal energy, solar water heater and types, solar cooking, solar pond, Solar still etc. 5.4 Wind energy systems: basic principle, types of wind turbines, application of wind energy, 5.5 Bio-energy systems: bio thermal and chemical basic	06

	principle, gasifier and digesters. 5.6 Hydro energy systems: small and micro hydro systems and its basic working. 5.7 Geothermal energy: Basic working principle, types and application of geothermal energy. 5.8 Ocean & Tidal Energy: Basic working principle, applications and types of different types of energy generation through ocean and tidal systems	
06	**Environment Legislation system and Rules** 6.1 Environmental protection rules 6.2 Sustainable environmental management	02
Total Hours		**42**

Weightage distribution in both objective, short and broad answer type questions:

Group	Unit Number	Weightage (%)
A	1 & 2	50
B	3 & 4	30
C	5 & 6	20

Course Outcomes:

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

CO1	Recognize the relevance and the concept of Environmental Science and Engineering and different world-wide activities on this area.
CO2	Illuminate the different types of environmental pollutant, their effects and their sustainable solutions.
CO3	Discuss the environmental regulations act. and standards
CO4	Gather basic idea about conventional and non-conventional energy resources
CO5	Demonstrate the broad perspective of Environmental Science practices by utilizing engineering knowledge and principles

Text Books:

1. **Environmental Studies- By N.N.Basak**
2. **Environmental Studies-By D .Srivastava**
3. **Introduction to Environmental Engineering— By Dr.Manindra Nath Patra.**
4. **Environmental Engineering- By A.K.Jain**

Reference Books:

1. **Environmental Engineering---By G.Killy**
2. **Environmental Engineering--- By Peavy, Rowe**
3. **Water and Waste Water Engineering— By S.Garg**
4. **Waste Water Engineering--By -Panmia**
5. **Non-conventional Energy Sources-4th Edition, By Prasad Rajesh K and Ojha**
6. **Non-conventional Energy Resources—By Chauhan and Srevastava**
7. **Non-conventional Energy Sources---By G.D.Rai (Khanna Publisher)**
8. **Ecology --By -Odum**
9. **Ecology---By -Das & Das**
10. **Environmental Law ---By -Gurdip Sing**
11. **Environmental Law----By Jaiswal Jaiswal Jaiswal**
12. **Environmental Law in India ---By -P.Leela Krishnan**
13. **Environment Impact Assessment Guidelines, Notification of Government of India, 2006**
14. **Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998**
15. **ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System**

Course Code	**:**	**PR302**
Course Title	**:**	**Major Project**
Number of Credits	**:**	**2**
Prerequisites	**:**	**Knowledge of subject upto 5th Semester of Packaging Technology**
Course Category	**:**	**PR**

Course Objectives :

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Design and Development of different Packages

Project Group:

- **Formation of project group: Maximum 5 students per batch**
- **Each project group should select work by consulting the guide.**

Activity (atleast one of the following):

1. **Application of BOPP in Packaging**
2. **Importance of Cushioning materials in Packaging**
3. **Application of Aluminium in Packaging.**
4. **Active Packaging Technology**
5. **Artificial organ Packaging & Labelling.**
6. **Sustainable & Luxurious Jewellary Packaging**
7. **Reusable Packaging.**
8. **Heavy Packaging & transportation for Industrial machinery .**
9. **Packaging for Electronics goods.**
10. **Packaging for transferring domestic materials.**
11. **Packaging and labelling for transporting different types of fragile goods.**

Course Outcome:

i. Develop proper planning to achieve the project goal.

ii. Collect relevant information and resources.

iii. Identify and apply proper techniques.

iv. Analyse the performance of project output.

v. Organise the written documentation of the project work.

Examination Scheme(Sessional)

1. **Continuous Internal Assessment of 60 marks is to be carried out by the teacher throughout the sixth semester. Distribution of Marksd: Continuous evaluation: 30 marks, Project Report:20 Class Attendance:10**
2. **External Assessment (end semester examination) of 40 marks shall be held at the end of semester on the entire syllabus. Project and project report-20. Viva- Voce=20**

Course Code	**:**	**SE 302**
Course Title	**:**	**Seminar**
Number of Credits	**:**	**1**
Prerequisites	**:**	**Knowledge of subject upto 5th Semester of Packaging Technology**
Course Category	**:**	**SE**

The course 'Seminar' is intended to enable a student to read, understand, prepare and present report about an academic document. The learner shall search in the literature including various journals, books, project reports ,online resources etc. and identify an appropriate paper/ report in his/her area of interest, in consultation with his/ her seminar guide. This course can help the learner to experience how

a presentation can be made about a selected academic document and also empower him/her to prepare a technical report.

Course Objectives:

- To do literature survey in a selected area of study
- To understand an academic document from the literature and to give a presentation about it.
- To prepare a technical report

General guideline : It's advisable to choose topics for the Seminar to be closely linked with following topics:

Seminar 1: Based on any theoretical paper/ laboratory/ previous semester project or any other topics as instructed by concerned teacher.

Seminar 2 : Based on final semester project.(group/ individual student)

Every student has to submit report and presentation on Seminar 1 and Seminar 2

Course Outcomes : After successful completion of the course,the student will be able to :

- Identify academic documents from the literature which are related to his /her areas of interest.
- Read and apprehend an academic document from the literature which is related to his /her areas of interest.
- Prepare a presentation about an academic document
- Prepare a technical report

Examination Scheme(Sessional)

1. **Continuous Internal Assessment of 60 marks is to be carried out by the teacher throughout the sixth semester. Distribution of Marksd: Continuous evaluation: 30 marks, Presentation Report:20 Class Attendance:10**
2. **External Assessment (end semester examination) of 40 marks shall be held at the end of semester . Presentationt -20. Viva- Voce=20**

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Photography [PHO]

Part-III (6th Semester)

2023

Photography						Evaluation Scheme of Theoritical Paper				Evaluation Scheme of Practical/Sessional					Total Marks
						Internal Scheme			End Semester Examination	Continuous Assessment			End Semester Assessment		
Semester V	**L**	**T**	**P**	**Contact Hours**	**Credit**	**Mid Sem Test**	**Class Assignment**	**Class Attendance**		**Teacher's Assessment & Laboratory Notebook**	**Class Performance**	**Class Attendance**	**Viva-Voce**	**Assignment on the day of Viva-voce**	
Motion Picture Photography I	3	0	0	3	3	20	10	10	60						100
Videography II	3	0	0	3	3	20	10	10	60						100
Programme Elective II: Introduction to film studies	3	0	0	3	3	20	10	10	60						100
Filming and Editing Technique I	3	0	0	3	3	20	10	10	60						100
Filming and Editing Technique Lab	0	0	3	3	1.5					30	20	10	20	20	100
Videography II Lab	0	0	0	3	1.5					30	20	10	20	20	100
Multimedia and Animtion Lab II	0	0	3	3	1.5					30	20	10	20	20	100
Major Project (Video Production)	0	0	3	2	1										100
Internship II (after Sem IV)	0	0	0	0	1										100
				23	**18.5**										**900**

Photography						Evaluation Scheme of Theoritical Paper				Evaluation Scheme of Practical/Sessional					Total Marks
						Internal Scheme			End Semester Examination	Continuous Assessment			End Semester Assessment		
Semester VI	**L**	**T**	**P**	**Contact Hours**	**Credit**	**Mid Sem Test**	**Class Assignment**	**Class Attendance**		**Teacher's Assessment & Laboratory Notebook**	**Class Performance**	**Class Attendance**	**Viva-Voce**	**Assignment on the day of Viva-voce**	
Motion Picture Photography II	3	0	0	3	3	20	10	10	60						100
Filming and Editing Technique II	3	0	0	3	3	20	10	10	60						100
Light and Sound in Motion Picture Photography	3	0	0	3	3	20	10	10	60						100
Entrepeneurship and Start-ups	2	1	0	3	3	20	10	10	60						100
Open Elective I : Engineering Economics and Project Management	3		0	3	3	20	10	10	60						100
Open Elective II : Industrial Management Or Environmental Engineering & Science	3		0	3	3	20	10	10	60						100
Filming and Editing Technique Lab II	0	0	2	2	1					30	20	10	20	20	100
Major Project (Short Film Production)	0	0	3	3	1.5										100
Seminar	0		2	2	1										
				25	**21.5**										**800**

S y l l a b u s F o r
Filming & Editing Techniques –II-Theory

Name of the Course : PHOTOGRAPHY Name of the Subject: **Filming & Editing Techniques II**	
Course Code :	Semester: Sixth
Duration: 17 weeks	**Maximum Marks: 100**
Teaching Scheme :	**Examination Scheme :**
Theory: 3 contact Hour/week.	Internal Examination : 20 Marks
Tutorial : 1 contact Hour/week	Class Attendance : 10 Marks
Practical : Workshop	Teacher's Assessment: 10 Marks
Credit : 3	End Semester Examination : 60 Marks

Aim:	
1.	The student should know the techniques of handling the different types edit setup.
2.	The students should also be equipped with the ability to edit a film with the mixing of sound.
Objectives - The student will be able to	
1.	Understand the techniques of shot taking.
2.	Understand the principles of continuity record.
3.	Understand the documentary film making style.
4.	The techniques of joining of shots.
5.	The basic techniques of rough cut editing.
6.	The basic techniques of fine cut editing.
Pre-Requisite -	
1.	Basic knowledge of editing.
2.	Basic artistic and aesthetic sense.

Contents: Total Periods: 60(15Weeks) +08(2Weeks) =68(17Weeks)

GROUP-A	Content (Name of Topic)	Periods
	Filming	
Module I	1.1 To take a shot(Analyse the purpose of taking a shot**)** 1.2 Continuity record-clapperboard/slate.(To keep details records of continuity) 1.3 Documentary film.(Techniques of different styles of documentary film making.)	15
Group-B		
	Editing	
Module 2	2.1 Shot to shot transition.(Analyse the different juxtaposition of shots) 2.2 Basic techniques of building a scene.(Continuity, matching, overlapping) 2.3 Pace & Time.(Analyse the techniques of pace& time manipulation during editing) 2.4 Rough cut.(To make the primary edit following the script	30

	sequentially) 2.4 Final Cut (To make the final cut after re-viewing the rough cut. 3.1 Dub matching and track laying.(To prepare for re- recording and optical effects.) 3.2 Married Print. (Negative cutting- the last stage production.	
Total		45

EXAMINATION SCHEME

Internal Examination : Marks - 20 Marks on Attendance : 10
End Semester Examination : Marks - 60 Teacher's Assessment : 10

Group	Module	Objective Questions			Total Marks
		To be Set	To be Answered	Marks per Question	
A	1	10	Any Twenty	1	20×1=20
B	2	15			

Group	Module	Subjective Questions			Total Marks
		To be Set	To be Answered	Marks per Question	
A	1	4	Any Five Taking At Least One from Each Group	8	5 ×8 =40
B	2	6			

Text Books

Name of Authors	Title of the Book	
S. Eisenstein	Film sense	
Arthur Night	The liveliest art	
Allen and Gomery	Film history: theoryand practice	
S.E. Browne	Video editing: a post-production	
Reisz and Miller	The technique of film editing.	
Roy. Thompson	Grammar of editing	

Note 1: Teacher's assessment will be based on performance on given assignments & quizzes.
Note 2: Assignments may be given on all the topics covered on the syllabus.

S y l l a b u s F o r Motion Picture Photography -II- Theory

Name of the Course : PHOTOGRAPHY Name of the Subject:Motion Picture Photography -II		
Course Code :		Semester: Sixth
Duration: 17 weeks		**Maximum Marks: 100**
Teaching Scheme :		**Examination Scheme :**
Theory : 3 contact Hour/week.		Internal Examination : 20
Tutorial : 1 contact Hour/week		Class Attendance : 10
Practical: Project work 3 contact Hour/Week		End Semester Examination : 60 Marks
Credit : 3		Teacher's Assessment: 10
Aim:		
1.	The students of photography need some platform to express their creative ideas. This course will help the students to plan some creative motion pictures as well as give them some opportunity to apply their technical knowledge gained through all the theoretical and practical subjects on 'Motion photography'.	
Objectives - The student will be able to		
1.	Understand theanatomy of motion picture camera.	
2.	Understand thebasic lab techniques of processing picture negative (B/W).	
3.	Understand thebasic lab techniques of processing picture negative (colour).	
4.	Understand the techniques of motion picture printing.	
Pre-Requisite -		
1.	Basic idea about Photographic field.	
2.	Interest in motion picture photography.	

Contents: Total Periods: 60(15Weeks) +08(2Weeks) =68(17Weeks)

	Content (Name of Topic)	Periods
Group-A		
Module 1	**Anatomy of motion picture camera-** Shutter and shutter angle (camera and projector). (i) Viewfinder: Reflex and off-set (parallax) view finder, beam splitter. (ii) Intermittent motion, pull down and registration mechanism, camera motors. (iii) Threading. (iv) Magazine (dual, co-axial, displacement) feeding and take-up spool, loading and unloading. (v) Gates and ground glasses. (vi) Matte Box, camera supports and other accessories. (vii) Lenses, (prime and zoom), turret, lens mounts. (viii) Angle of view, wide and telephoto lenses and their relationship with movements. Normal lens. (ix) Magnification and its importance (x) Angle and its Importance	10

Module 2	**Basic lab technique: Processing of picture negative** (i) Black and White: Details: Film structure, spectral sensitivity of B/W film. (Panchromatic, Orthochromatic, Blue Sensitive, Infrared) (ii) Processing equipment (iii) Negative and positive process steps (iv) Mechanical and chemical specification for B/W negative, positive and sound negative processing, time and other factors. (v) Push and pull development. (vi) Preservation of negatives.	10
Group-B		
Module 3	**Colour negative** i. Film structure, process steps. ii. Processing equipment iii. Mechanical and chemical specification of each steps, iv. Time and other factors v. Preservation of negative	5
Module 4	**Motion Picture Printing** (i) Continuous-contact and step contact printer, i. step optical printer and continuous-optical printer. (ii) Wet-gate printing and dry gate printing. (iii)Black and white printing, colour printing. (iv)Additive and subtractive printing. (v) Sound track printing. (vi) Blow-up.	10
Group -C		
Module 5	**Positive film processing (Colour)** i. Grading or timing of picture negative ii. Film structure, process steps. ii. Processing equipments. iii. Mechanical and chemical specifications of each steps iv. Optical sound tract processing. v. Married print.	10
Total		45

EXAMINATION SCHEME

Internal Examination : Marks - 20 Marks on Attendance : 10
Final Examination : Marks - 60 Teacher's Assessment : 10

Group	Module	Objective Questions			Total Marks
		To be Set	To be	Marks per	

			Answered	Question	
A	1,2	10	Any Twenty	1	20×1=20
B	3,4	10			
C	5	5			

Group	Module	Subjective Questions			Total Marks
		To be Set	To be Answered	Marks per Question	
A	1,2	3	Any Five Taking At Least One from Each Group	8	5 ×8 =40
B	3,4	3			
C	5	2			

Note 1: Teacher's assessment will be based on performance on given assignments & quizzes.
Note 2: Assignments may be given on all the topics covered on the syllabus.

	Text Books	
Name of Authors	**Title of the Book**	
G. Hirchfield	**Image control**	
Ohanian and Phillips	Digital film making	
F.L.Hirshey	Optics and focus for camera assistants	
Samuelson	Hands-on manual for cinematographer	
Peter Word	Picture composition	
Samuelson	Motion picture camera techniques	
SMPTE	Control techniques in film processing	
Russel Cambell	Photographic theory of motion picture cameraman	
A.S.C.	American cinematographer's manual: 7th Edn.	
Ed. by Peter Ettedgue.	Cinematography screen craft	

S y l l a b u s F o r
Major Project (Short Film Production)

Name of the Course : PHOTOGRAPHY Name of the Subject: Professional practice IV (Short Film Production)		
Course Code :		Semester: Sixth
Duration: 15 weeks		**Maximum Marks: 100**
Teaching Scheme :		**Examination Scheme :**
Theory: Nil contact hours/week.		Internal Examination : Nil
Tutorial : Nil contact hour/week		Class Attendance : Nil
Practical : 3 Periods/Week		End Semester Examination : 100 Marks
Credit : 1.5		Teacher's Assessment: Nil
Aim:		
1.	The course is carried out to give the students an industrial exposure.	
2.	The diploma holders in this discipline are expected to have professional skills so that they can produce the job individually.	
Objectives - The student will be able to		
1.	Understand the necessity of a concept or story.	
2.	Understand the techniques of script writing.	
3.	Understand the necessity of controlling production cost.	
4.	Understand the necessity of planning a production.	
Pre-Requisite -		
1.	Thorough theoretical and practical knowledge for successful production of a short film.	

	Content (Name of Topic)	**Periods**
	1. Illusion of movements. 2. Pre-cinema toys and machines. 3. Film Form-Concept & Principle. 4. Review and final correction. Assessment will be done on the basis of : 1.Camera : operation , composition , movement , use of lens etc. 2. Construction of scene . 3.Transition-Continuity of Time and Space 4.Cinema in Digital Era	
Total		45

Note 1: Teacher's assessment will be based on performance on given assignments & quizzes.
Note 2: Assignments may be given on all the topics covered on the syllabus.

S y l l a b u s F o r
Light & Sound in Motion Picture Photography (TH)

Name of the Course : PHOTOGRAPHY Name of the Subject: **Light & Sound in Motion Picture Photography**	
Course Code :	Semester: Sixth
Duration: 15 weeks	**Maximum Marks: 100**
Teaching Scheme :	**Examination Scheme :**
Theory: 3 contact Hours/week.	Internal Examination : 20 Marks
Tutorial : NO contact Hour/week	Class Attendance : 10 Marks
Practical : NIL	End Semester Examination : 60 Marks
Credit : 3	Teacher's Assessment: 10 Marks

Aim:	
1.	Motion picture photography is based on light and sound, so that students should know the basic principle of light & sound.
2.	The students will also understand the knowledge of special shooting techniques based on light & sound..
Objectives - The student will be able to	
1.	Understand the basic principle of light & sound.
2.	Understand the quality and types of light.
3.	Understand the use of reflectors, diffusers, mirrors, skimmers in outdoor photography.
4.	Understand the basic principles of acoustics.
5.	Understand the basic principles of magnetic sound recording.
6.	Understand the technical parameters of dialogue recording.
Pre-Requisite -	
1.	Keen interest in motion picture Photography.

	Content (Name of Topic)	Periods
Group A		
Module 1	Recap : Basic principle of light. (i) Electromagnetic spectrum, visible spectrum. (ii) Behaviour of light falling on an object – absorption, reflection refraction, transmission, diffraction, dispersion, scattering of light, refractive index. (iii) Inverse square law. (iv) Basic principles of colur , CIE diagram , trichromatic theory of vision. 2. (i)Quality of light : Specular, diffused and bounced. (ii) Types of light : Natural day light, Incandescent, (tungsten- halogen, [Tenner (10K), Senior (5K), Junior (2K), Baby (1K), Inkie Multi 10, Multi 20 etc], photoflood), fluorescent, (Kino Flo), Metal Halide enclosed AC arc (HMI) etc. 3. Basic understanding of ratio lighting (key + fill : fill alone) use of back light, kicker and back ground light. How to lit up an indoor situation. Use of light source filters. 4. Use of reflectors, mirrors, skimmers in an outdoor situation 5. Chroma Key Lighting technique	15

Module 2	5. Use of different diffusers (Butter paper, Tissue paper, Gate-way, Acrylic sheets etc.) : Fore ground, mid-ground, back ground Separation to create depth. Golden rule. 6. Introduction to 'source' lighting as the key-concept of 'Realist 'School of cinematography. 7. Composition : Fore ground, mid-ground, back ground separation to create depth. Golden rule. 8. Properties of convex lens as the originating factor of perspective. Control of perspective using different prime lenses. 9. High-key and low-key lighting, manipulation of tone and contrast indoor-outdoor matching. 10. Light as a tool of expression and dramatization.	10
Group B		
	Sound	
Module 3	11. Acoustics : (Sound : reception , reproduction and its listening condition) 12. Sound reproduction techniques: (Basics of sound reproduction) 13. Synchronization: (Matching and mixing of audio with visual.)	8
Module 4	14. Commentary: (Techniques of recording commentary and it's requirements.) 15. Dialogue: (Techniques of recording dialogue.) 16. Music and effects: (Techniques of recording music/effects and their creative use) 17. Re-recording: (Techniques of mixing diff. sound tracks by sound mixer) 18. Digital sound: (Introduction to digital sound and the future)	12
Total		45

EXAMINATION SCHEME

Internal Examination :	Marks- 20			Marks on Attendance : 10	
Final Examination :	Marks - 60			Teacher's Assessment : 10	
Group	Module	Objective Questions			Total Marks
		To be Set	To be Answered	Marks per Question	
A	1,2	15	Any Ten	1	20×1=20
B	3,4	10			

Group	Module	Subjective Questions			Total Marks
		To be Set	To be Answered	Marks per Question	
A	1,2	6	Any Five Taking At Least One from Each Group	8	5 x8 =40
B	3,4	4			

Note 1: Teacher's assessment will be based on performance on given assignments & quizzes. Note 2: Assignments may be given on all the topics covered on the syllabus.

	Text Books	
Name of Authors	Title of the Book	
Des Lyver .Focal Press	Video lighting	
Fill and Thornley	Lighting technology	
: Murphy	Complete lighting guide	
Carlson.	Professional lighting hand book	
John Hart.	Lighting for action	
John Watkinson	Art of digital audio	
Alec Nisbett.	The sound studio	
Alec Nisbett	The use of microphones	
Des Lyver	Basics of sound	
John Watkinson	Art of digital audio	
T.Howard	Audio cyclopedia	
Mackenzie	Acoustics	
Glyn Alkin	Sound techniques for video and TV	

FLIMING AND EDITING TECHNIQUE LAB-II

Name of the Course : PHOTOGRAPHY **Name of the Subject: FLIMING AND EDITING TECHNIQUE LAB-II**	
Course Code :	Semester: Sixth
Duration: 17 weeks	**Maximum Marks: 100**
Teaching Scheme :	**Examination Scheme :**
Theory: Nil	Teacher's Assessment and Lab Note Book: 30
Tutorial : Nil	Class Attendance : 10 Marks
Practical : 3 contact Hour/Week	Class Performance : 20 Marks
Credit : 1.5	Viva Voce: 20 Marks
	Assignment on the day of Viva-Voce : 20

Aim:	
1.	The student should know the basic concepts of editing.
Objectives - The student will be able to	
1.	Understand the different editing techniques and style.
Pre-Requisite -	
1.	Basic knowledge of editing

2.	Interest in cinematography.

Contents: Total Periods: 60(15Weeks) +08(2Weeks) =68(17Weeks)

Content (Name of Topic)		**Periods**
Module 1	**1. Demonstrations of different edit equipment and its facilities.** **2.To set-up and operate edit equipment.** **3.Edit on assemble mode;(silent -rush and with sound)** **4.Edit on insert mode.** **5. Laying and mixing of sound tracks.** **6.Edit a dialogue exercise;(rough-cut and final cut)** **7.To insert titles.** 8.**Uploading system on social media**	
Total		45

Note 1: Teacher's assessment will be based on performance on given assignments & quizzes. Note 2: Assignments may be given on all the topics covered on the syllabus.

Name of the topic: Seminar

Course Code:	Semester: Sixth
Duration: 17 weeks (out of 17 weeks, 2 weeks are to be allotted for class tests)	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 1 hrs./ week	Evaluation through End Semester Seminar Presentation
Tutorial: NIL	
Practical: NIL	
Credit: 1	

Course outcome:

1. Students will be able to prepare a professional presentation using software.
2. Students will be able to present their project work through effective communication skills.
3. Students will be able to demonstrate the working model for the work presented during the seminar presentation.
4. Students will be able to work as a team in creating the seminar presentation.

Methodology:

Students will have to prepare a presentation based on the major project they have worked on during the final year of study in front of a panel of faculty, experts and peers at the end of the semester. During the presentation they will have to present the aim of their work, materials, prior work in the field, methods used, findings or final design and scope of their work in the future.

Seminars must be arranged for the students on that topic before an internal committee constituted by the concerned department of the institute. The evaluation of the students for seminar will be based on the following criteria:

Sl No	Criteria for evaluation of Internship Seminar
1	Quality of content presented
2	Proper planning for presentation
3	Effectiveness of presentation
4	Depth of knowledge and skills
5	Viva voce

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Printing Technology [DP]

Part-III (6th Semester)

2023

	Printing Technology						Evaluation Scheme of Theoritical Paper				Evaluation Scheme of Practical/Sessional				Total Marks
							Internal Scheme			End Semester Examination	Internal Assessment		End Semester Assessment		
Course Code	Semester V	L	T	P	Contact Hours	Credit	Class Test	Quizzes / Assignments / Student Activity	Class Attendance		Continuous Evaluation	Class Attendance	Viva-Voce	Assignment on the day of Viva-voce	
DP501	Printer's Costing & Estimating	2	0	0	2	2	20	10	10	60					100
DP502	Graphics Design	3	0	0	3	3	20	10	10	60					100
DP503	Print Converting & Packaging Techniques	3	0	0	3	3	20	10	10	60					100
DP504	Programme Elective II: Digital Publishing or Color Management	3	0	0	3	3	20	10	10	60					100
DP505	Programme Elective III: Press standardization or Advanced Packaging Techniques	3	0	0	3	3	20	10	10	60					100
DP506	Graphics Design practical	0	0	3	3	1.5					50	10	20	20	100
DP507	Print Converting & Packaging Techniques Workshop	0	0	3	3	1.5					50	10	20	20	100
DP508	Major Project	0	0	4	4	2									100
DP509	Internship II (after Sem IV)	0	0	0	0	1									100
					24	20									900

	Printing Technology						Evaluation Scheme of Theoritical Paper				Evaluation Scheme of Practical/Sessional				Total Marks
							Internal Scheme			End Semester Examination	Internal Assessment		End Semester Assessment		
Course Code	Semester VI	L	T	P	Contact Hours	Credit	Class Test	Quizzes / Assignments / Student Activity	Class Attendance		Continuous Evaluation	Class Attendance	Viva-Voce	Assignment on the day of Viva-voce	
DP601	Printing Machine Maintenance	3	0	0	3	3	20	10	10	60					100
DP602	Enterpreneurship and Start-ups	2	1	0	3	3	20	10	10	60					100
DP603	Programme Elective IV: Print Production Management (Workflow) or Quality management in Printing	3	0	0	3	3	20	10	10	60					100
DP604	Open Elective I: Engg Econ & Project Mng.	3		0	3	3	20	10	10	60					100
DP605	Open Elective II: Industrial Management or Environmental Engineering & Science	3		0	3	3	20	10	10	60					100
DP606	Printing Machine Maintenance Workshop	0	0	2	2	1					50	10	20	20	100
DP607	Major Project	0	0	6	6	3									100
DP608	Seminar	0		2	2	1									100
					25	20									800

Name of the course: Printing Machine Maintenance

Course Code:	**Semester: Sixth**
Duration: 17 weeks (out of 17 weeks, 2 weeks are to be allotted for class tests)	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./ week	Class Test (Two class tests will be conducted): 20
Tutorial: NIL	Quizzes/ Assignments/ Student Activity: 10
Practical: NIL	Class Attendance: 10
Credit: 3	End semester examination: 60

Aim:

Machine failure can cause press halt and lead to production delay. In a broader aspect, the longer a printing machine is out of action, the more money a press will lose through not being able to take on new jobs. Even replacing a printing machine with a brand new one can be really expensive and not an ideal solution for any company. Henceforth, preventing breakdown of any printing machine is of utmost importance for conducting a consistent, high quality printing. By practicing a maintenance schedule, a press operator can utilize the high usage of a machine as well as he/she can identify the spots problems of a particular machine before that occurs.

Course Outcomes:

1. To identify the correct piece of printing equipment considering the end product requirement.
2. To explain the maintenance processes of various systems of a printing machine.
3. To comprehend the factors to be considered for replacement and reconditioning.
4. To explain the process of scheduled Lubrication in a printing machine.

Prerequisite:

Basic engineering for Printing, Offset Printing Technology, Relief & Recess Printing etc.

Contents:

UNIT	CONTENT DETAILS	HOURS/ UNIT	MARKS
Unit 1: Maintenance Management	● Objectives of maintenance, Need for planned maintenance, Planned maintenance types and functions, Unplanned maintenance, Emergency maintenance, Contract maintenance ● Maintenance shop Machinery – Equipment & Tools, Illumination ● Spare parts management ● Safety precautions and Housekeeping, Do's & Don'ts in a press, Workplace behaviour, Role of a Press supervisor	6	8
Unit 2: Mechanical drive elements & Power Transmission	● Cam & Follower – Introduction, Cam Types, Follower types, Cam Design, Advantages & disadvantages ● Bearing – Bearing selection, Types, Advantages & disadvantages, Bearing failure & Maintenance ● Spring – Common types, Application ● Chain Drives – Terminology, Types, Advantages & disadvantages, Maintenance ● Belt & Pulley Drives – Belt types, Belt slippage, Pulley types, Advantages and disadvantages of belt drives ● Gear Drives – Terminology, Gear selection, Gear used for printing equipment, Gear failure and maintenance	12	16
Unit 3: Lubrication	● Introduction, Lubrication Principles ● Types of lubrication and their uses ● Characteristics of lubricants, Conventional Tests for Lubricant ● Lubrication maintenance failure ● Lubrication schedule/ Program, Charts and paint marks	6	8
Unit 4: Maintenance of mechanisms	● Electrical System Maintenance – Introduction of AC & DC Motor, Maintenance checklist for motors, Common problems with electricity, Troubleshooting motor problems ● Pneumatic System Maintenance – Introduction, Compressor types, Compressor accessories, Applications in Printing field, checklist for pneumatic maintenance ● Hydraulic System Maintenance – Introduction, Types of pumps, Applications in Printing field, checklist for hydraulic system maintenance	12	16

Unit 5: Distinct features of Sheetfed Offset Printing Machine	● Cylinder Parallelism ● Pile lifting and lowering mechanism ● Sheet sequences, press register ● Timing of machine ● Electroplating of metal roller, re-rubberizing ● Impression On / Off mechanism	9	12

References:

1. Herschel L. Apfelberg – Maintaining Printing Equipment
2. Jeffrey, Dick - Principles of machine operation and maintenance
3. Robert M. Gresham, George E. Totten - Lubrication and Maintenance of Industrial Machinery Best Practices and Reliability
4. Riccardo Manzini, Alberto Regattieri, Hoang Pham, Emilio Ferrari - Maintenance for industrial systems
5. Ricky Smith and R. Keith Mobley - Industrial Machinery Repair
6. Keith Mobley, Lindley Higgins, Darrin Wikoff - Maintenance Engineering Handbook
7. Cylinder setting mechanism for an offset printing machine – United States Patent – Patent Number - 4,691,631

Name of the course: Programme Elective IV – Print Production Management (Workflow)

Course Code:	**Semester: Sixth**
Duration: 17 weeks (out of 17 weeks, 2 weeks are to be allotted for class tests)	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./ week	Class Test (Two class tests will be conducted): 20
Tutorial: NIL	Quizzes/ Assignments/ Student Activity: 10
Practical: NIL	Class Attendance: 10
Credit: 3	End semester examination: 60

Aim: The print industry is increasingly adopting a standardized and automated approach towards print production workflow. This course deals with developing the concepts of what a print workflow is, its components, implementation and benefits of adopting it. Implementing an automated and efficient workflow ensures error-free data exchange, real-time inspection of production status and a closed loop feedback system that helps in matching print quality expectations. It is an area of constant development and as a print technologist, this provides a powerful tool to his disposal that enables them to increase print productivity.

Course Outcomes:

1. Explain the importance of print production workflow and its benefits
2. Prepare PDF/X files in compliance with specifications for blind exchange of print data
3. Determine a specific workflow for print production for a given set of print apparatus
4. Construct a job plan based on job requirements and equipment specifications
5. Mitigate problems caused by erroneous files in prepress workflows before RIPing

Prerequisite:

Digital Prepress, Digital Imaging for Printing

Contents:

UNIT	CONTENT DETAILS	HOURS/ UNIT	MARKS
Unit 1	● Introduction to Print Production Workflow ● Application of Print Production Workflow ● Benefits of a standardized workflow ● Terminology used in workflow ● Workflow automation ● Production Models: activity diagram, flowcharts ● Workflows for prepress to press ● Workflow types	2	5
Unit 2	● Print Production with PDFs ● Handling PDF ● PDF workflows ● Specifications in PDF workflows ● Transparency handling in PDF ● Font management in PDF ● PDF/X workflows ● Creating PDF/X files	10	15
Unit 3	● Processes in workflow ● PDF Normalizer: Distiller, CPSI, APPE ● Job Ticket creation ● Pre-Flighting ● Trapping ● Knockout ● Overprint ● Transparency ● Imposition ● RIPing ● Imaging	10	10
Unit 4:	● Production Models: Process Resource Models ● Process Management Task ● Job Entry ● Creating Folders on Servers ● Job/ Process Engineering ● Schedule Process ● Retrieve elements ● Process error trapping & notification ● Correction handling ● Intervention Notification/Handling ● Customer communication handling ● CIP3/4 ● Transfer upstream of color requirements ● Transfer upstream of printer requirements ● Color management support	10	15
Unit 5:	● Connected systems and their importance ● Automating workflows ● Print 4.0 ● Integrating systems ● Elements of system integration and their functions ● File formats for communication: PJTF, PPF	3	5

Unit 6:	● JDF Basics ● Structure of JDF documents ● Resources ● Resource links ● Distribution of JDF	10	10

References:

1. Thomas Hoffmann-Walbeck, Workflow Automation Basic Concepts of Workflow Automation in the Graphic Industry, Springer Cham, 2022

2. Thomas Hoffmann-Walbeck and Sebastian Riegel, JDF Workflow, Printing Industries Press in conjunction with CIP4 Organization, 2011

3. H. Kipphan, Handbook of Print Media, , ISBN: 3-540-67326-1 Springer-Verlag Berlin Heidelberg,2001.

4. Richard M. Adams II & Frank J. Romano, Computer-to-Plate-Automating the Printing Industry,GATF Press, 2nd edition.

Name of the course: Programme Elective IV – Quality Management in Printing

Course Code:	**Semester: Sixth**
Duration: 17 weeks (out of 17 weeks, 2 weeks are to be allotted for class tests)	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./ week	Class Test (Two class tests will be conducted): 20
Tutorial: NIL	Quizzes/ Assignments/ Student Activity: 10
Practical: NIL	Class Attendance: 10
Credit: 3	End semester examination: 60

Aim:

To acquaintance with management methods that are used to enhance quality and efficiency in printing industry

Course Outcomes:

1. To understand the need for quality, TQM models, contribution of quality thinkers etc.
2. To apply the various QC tools and techniques of TQM in Printing Industry
3. To appreciate the team work and deal with changes in the organization
4. To apply ISO Certification for QMS and EMS in Printing Industry

Prerequisite:

Basic engineering for Printing, Ink & Paper technology, Offset Printing Technology, Relief & Recess Printing etc.

Contents:

UNIT	CONTENT DETAILS	HOURS/ UNIT	MARKS
Unit 1: TQM	● Introduction of TQM, Definition of Quality and related terms, Basic elements of TQM, Measuring quality, Role of Managers in TQM, Role of Customers in TQM, Organizational activities for quality	6	8
Unit 2: TQM Models	● Foundations of the modern Quality movement – Contribution of Quality thinkers ● Kaizen, Deming Application Prize, Malcolm Baldrige Criteria for Performance Excellence, European Foundation for Quality Management ● Introduction to Six sigma, Principles, Methodologies, Six sigma Implementation roles, Criticism	10	12
Unit 3: Data Collection & Analysis	● Management by facts, Key points in data collection, Necessary precautions in the measurement process, Data collection principle, Determining measurement procedures, Statistical sampling	3	4
Unit 4: Statistical Process Control	● Framework for Problem solving – PDCA cycle ● Introduction to Statistical Process Control, Purpose, Detailed discussions on the QC tools – Ishikawa diagram, Check sheet, Histogram, Pareto Chart, Scatter Diagram, Stratification, Control charts ● Attributes vs. Variables, Different types of control charts for monitoring variables and monitoring attributes	12	16
Unit 5: Team Approach	● Introduction, Benefits of quality improvement teams, Developing a quality team effort, Issues to avoid, Identify and prioritize quality projects, Action Team development, training & Report	4	7
Unit 6: Interpretations of Change	● What is change? Basic assumptions, Perceived threats, Facilitating change, Modifications on continual process improvement	3	4

Unit 7: **ISO for QMS & EMS**	• Introduction to ISO 9000, ISO 9000 objective, Authority for certification / Registration, ISO 9001 & Industry specific applications, Benefits of ISO 9000, Comparative scope of 9000 and TQM • Introduction to ISO 14000 Series Standards, Concepts of ISO 14001, Requirements of ISO 14001, Benefits of EMS.	7	9

References:

1. Herschel L. Apfelberg&Micheal J. Apfelberg - Implementing Quality Management in The Graphic Arts

2. David L. Goetsch, Stanley Davis - Quality Management for Organizational Excellence

3. Theodore T. Allen – Introduction to Engineering Statistics and Six Sigma

4. Suganthi L and Anand Samuel - Total Quality Management

5. B. Janakiraman and R. K. Gopal - Total Quality Management: Text and Cases

6. Dale H. Besterfield – Total Quality Management

Name of the course: Printing Machine Maintenance Workshop

Course Code:	**Semester: Sixth**	
Duration: 17 weeks (out of 17 weeks, 2 weeks are to be allotted for class tests)	Total Marks: 100	
Teaching Scheme	**Examination Scheme**	
Theory & Tutorial: NIL	**Internal Assessment: 60**	**End Semester Assessment: 40**
Practical: 2 hrs./week	Continuous Evaluation: 50	Assignment on the day of Viva-voce & Practical report submission: 20
Credit: 1	Class Attendance: 10	Viva voce: 20

Aim:

To impart practical knowledge in the Workshop/Lab related to the course of study.

Course Outcomes:

1. To select various tools and equipment for performing a maintenance programme.
2. To adopt safety practices during the course of maintenance.
3. To perform the lubrication process in a printing machine.
4. To perform troubleshooting in various systems of a printing machine.

Contents:

1. Handling and application of spares, tools and equipment in Machine Workshop
2. Safety measures in printing Industry
3. Rolling elements and drive system and mechanical hub in printing machine
4. Lubrication by grease and oil, lubricating kits, identification of lubricating knobs, selection of lubricating grade, application area and frequency, Automatic Lubrication system
5. Checking the levelling /alignment of different units of a printing machine
6. Checking cylinder tolerance and parallelism
7. Troubleshooting in maintenance – removing damaged screws/pins/bolts and nuts
8. Working principle various compressors used in printing industry - Oil changing and air filter cleaning
9. Setting of Pile lifting and delivery pile lowering mechanism
10. Impression on/off mechanism
11. Checking the timing of machine
12. Performing the solid print test for identifying mechanical problems in the machine

Name of the course: Major Project

Course Code:	**Semester: Sixth**	
Duration: 17 weeks (out of 17 weeks, 2 weeks are to be allotted for class tests)	Total Marks: 100	
Teaching Scheme	**Examination Scheme**	
Theory & Tutorial: NIL	**Internal Assessment: 60**	**End Semester Assessment: 40**
Practical: 6 hrs./week	Continuous Evaluation: 50	Assignment on the day of Viva-voce & Practical report submission: 20
Credit: 3	Class Attendance: 10	Viva voce: 20

A Project topic must be selected by the students in consultation with their guides. The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and fabrication of a device for a specific application, a research project with a focus on an application needed by the industry/society, a management project or a design project. The progress of the project is evaluated based on multiple reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester.

Course Outcomes:

1. Students will be able to apply their knowledge and skill to develop solutions to real-world printing problems.
2. Students will be able to determine the timeline and plan accordingly for successful completion of a project.
3. Apply knowledge earned in printing technology to solve real-life problems of the industry.
4. Evaluate the feasibility of a project that is to be undertaken.
5. Prepare a technical report to summarize and present the results of a project in a meaningful manner.

Evaluation criteria:

The report submitted at the end of the course will be evaluated on the basis of following criteria (as applicable):

Sl No	**Criteria for evaluation of Report**
1	Originality
2	Adequacy and purposeful write-up
3	Organization, format, drawings, sketches, style, language
4	Practical applications and relationships with basic theory
5	Concepts taught in the course outcome
6	Practical applications, relationships with basic theory and concepts taught in the course
7	Attendance record, daily diary, quality of the Report
8	Ability to solve real-life industry-oriented problems

Name of the course: Seminar

Course Code:	**Semester: Sixth**
Duration: 17 weeks (out of 17 weeks, 2 weeks are to be allotted for class tests)	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 1 hrs./ week	Evaluation through End Semester Seminar Presentation
Tutorial: NIL	
Practical: NIL	
Credit: 1	

Course outcome:

1. Students will be able to prepare a professional presentation using software.
2. Students will be able to present their project work through effective communication skills.

Methodology:
Students will have to prepare a presentation based on the major project they have worked on during the final year of study in front of a panel of faculty, experts and peers at the end of the semester. During the presentation they will have to present the aim of their work, materials, prior work in the field, methods used, findings or final design and scope of their work in the future.

Seminars must be arranged for the students on that topic before an internal committee constituted by the concerned department of the institute. The evaluation of the students for seminar will be based on the following criteria:

Sl No	**Criteria for evaluation of Internship Seminar**
1	Quality of content presented
2	Proper planning for presentation
3	Effectiveness of presentation
4	Depth of knowledge and skills
5	Viva voce

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Survey Engineering [SE]

Part-III (6th Semester)

2023

6THSEMESTER													
SL NO	CODE	COURSETITLE	CREDIT	CLASS/WK			EXAMINATIONSCHEME						
							INTERNAL			ESE	PIA	PEA	TOTAL
				L	T	P	INT	AS/QZ	ATD				
1	SEPC302	Transmission Line Survey	3	3	-	-	20	10	10	60	-	-	100
2	HU302	Entrepreneurship and Start-up	3	2	1	-	20	10	10	60	-	-	100
3	SEPE302	Program Elective-IV	3	3	-	-	20	10	10	60	-	-	100
4	SEOE302	Open Elective –I	3	3	-	-	20	10	10	60	-	-	100
5	SEOE304	Open Elective -II	3	3	-	-	20	10	10	60	-	-	100
6	SESE302	Seminar	1	-	-	2	-	-	-	-	60	40	100
7	PR302	Major Project	3	-	-	6	-	-	-		60	40	100
8	SEPC304	Survey Training Camp	2	-	-	4	-	-	-		60	40	100
TOTAL			21	14	1	12	-	-	-	-	-	-	800

SEPE 302 :Any one of the three subjects1.Building Planning and Drawing,2.Construction Safety,3.Township Planning.
SEOE302: 1.Engineering Economics and Project Management
SEOE304: Anyone of the three subjects 1.Disaster Management, 2.Industrial Management, 3.Environmental Science and Engineering.

Student contact hours per week:27 Hrs.Theories and Practical Periodof 60 Minutes each.
L – Lecture,T–Tutorial, P –Practical, INT- Internal Assessment AS/QZ– Assignment /Quiz ATD-Attendance ESE – End Semester Exam, PIA-Practical Internal Assessment PEA-Practical External Assessment.

Name of the Course: Diploma in Survey Engineering	
Course Title: **Transmission Line Survey**	CourseCode:SEPC302
Number of Credits:3	Semester: Sixth
Teaching Scheme	**Examination/Scheme**
Duration:15weeks	MaximumMarks:100
Theory:3hours/ week	Continuous internal Assessment (INT):20Marks
Tutorial:Nil	Assignment/ Presentation/ Quiz (AS/QZ): 10 Marks
Practical:Nil	Attendance (ATD): 10 Marks
Total Contact Hours: 45hrs.	End Semester Examination (ESE):60 Marks

Pre-requisites : Students should have the knowledge of basic Surveying, and basic computer applications

Course Category : PC

Course Objective

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

- Understand the process of Preliminary and Detailed Survey required in Transmission Line
- Know the uses the Modern Survey Instruments like Total Station, GPS, DGPS in Transmission Line Survey
- Know the uses of Survey of India Topo Map, Satellite Images, UTM Coordinates, PLSCADD Software in Transmission Line Survey

Unit	**Course Content**	**Hours/Unit**	**Marks**
Unit1	**Introduction to Transmission Line Towers** 1.1 General concept on Overhead & Underground Power Transmission, Transmission Line Planning 1.2 Basic Concept of High Voltage Transmission Line, Concept of a Tower, Types and Shapes of Transmission Line Towers, Configuration &, Geometry of Tower, Height of a Tower, Tower parts and various type of Insulators 1.3 The different voltages for Power Transmission, Ground Clearance for various voltages	7	8
Unit2	**Preliminary Survey of Transmission Lines** 2.1 Concept of Topo Sheet (1:50000, 1:250000) & its Definitions, Survey of India Topo Map Numbering, UTM Zones, UTM Co-ordinates	16	20

	2.2 Parts of work & Accuracy order of Survey, Skills required for Overhead Power Transmission Line Surveyor 2.3 Beeline and Route Alignment, Reconnaissance survey, Walk Over Survey, Preliminary Survey field work, Way leave & Right of Way 2.4 General Points for Route Selection, Concept of various Crossing – River, Forest, Railway, Power Transmission Line, Communication Line, NH/SH Road Crossing, Provisions of route selection near Aerodromes, Radar Stations, Rifle Ranges and Helipads 2.5 Various instruments used in Survey (Theodolite, Auto Level, Total Station, GPS, DGPS, Smart Station etc.) &, their accuracies 2.6 Requirement of Transmission Line Routing, Usage of modern technologies (Satellite Images, Survey of India Topo Map, Aerial Photogrammetry, LiDAR) for Identification of Alternative routes, Route Alignment, Marking & Report Making and recommendation for final route.		
Unit 3	**Detailed Survey of Transmission Lines** 3.1 General concept of Detailed Survey, Collection of Detailed Survey Data, Profiling, Wind Span, Weight Span, Ruling Span 3.2 Preparation of Tower Spotting Data with necessary details 3.3 Locating the Takeoff Tower near Sub Stations 3.4 Manual Tower Spotting using Sag Templates, Sag Profiles. 3.5 Application of PLSCADD for optimum Tower Spotting, Minimum Clearance from Ground- Building etc. 3.6 Preparation of Tower Schedule, Land Schedule & ROW, Trial Pits, Soil Resistivity Data 3.7 Preparation of Detailed Survey Report, Check Survey, Check Survey Report	12	17
Unit 4	**General Knowledge of Foundation Works- Excavation & Stub-Setting and Safety in TL Survey** 4.1 Types of Loads on Foundation, Classification of Soils, Types of Foundation & Selection of Foundation, Preparation of Foundation site, type of foundation to be adopted, Pit Marking, Excavation & Orientation of Towers, Uses of Stubs for Foundation 4.2 General Safety Precautions, Safety measures during Field Survey Work, Route Clearance, Excavation and Foundation Works, System Stability & Environmental issues in Power Transmission.	10	15
Total		45	60

Suggested learning resources:

- Electrical Power Transmission Lines- by, T. Ch. Hanuman Rao, Dr. S. Majid Ali,

  Copies of the book can be obtained on request from- T. Ch. H. Rao, 9-222/2, Plot 257, Employees colony, Secunderabad 500 087

- Overhead Power Lines: Planning, Design, Construction by F. Kiessling, J. F. Nolasco, P. Nefzger, and U. Kaintzyk,Springer-Verlag Berlin Heidelberg publication.

- Transmission Line Manual, CBI&P panels of experts on Transmission lines, central board of irrigation and power, New Delhi

- Electric Power Generation, Transmission and Distribution- Leonard L. Grigsby

- Transmission and Distribution- electrical Engineering- Dr. C. R. Bayliss&, B. J. Hardy Newnes…Elsevier, Linacre House, Jordan Hill, Burlington, MA 01803, USA

Course outcomes: After completing this course, the student will be able to–

1. Acquire introductory idea on transmission line towers, its nomenclature, geometry and configuration.
2. Learn the procedure to be followed during Preliminary and Detailed Survey of Transmission Lines.
3. Know the basic idea of foundation works required in Transmission Line Survey.
4. Enhance the knowledge of Safety to be followed in Transmission Line Surveying
5. Learn the uses of Survey of India Topo Map, Satellite Images, UTM Coordinates, PLSCADD Software in Transmission Line Survey.

Name of the Course: Diploma in Survey Engineering	
Course Title: **Building Planning and Drawing**	Course Code: SEPE302/1
Number of Credits: 3	Semester: Sixth
Teaching Scheme	**Examination/Scheme**
Duration: 15 weeks	Maximum Marks: 100
Theory: 3hours/ week	Continuous internal Assessment: 20 Marks
Tutorial: Nil	Attendance: 10 Marks
Practical: Nil	Assignment/ Presentation/ Quiz: 10 Marks
Total Contact Hours: 45hrs	End Semester Examination: 60 marks

Pre-requisites : Students should have the knowledge of Civil engineering and design concept of basic engineering components

Course Category : PE

Course Objective

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

- Understand the concept of the symbols, signs and conventions from the given drawing.
- Prepare line plans of residential using principles of planning.
- Prepare submission and working drawing for the given requirement of civil engineering structure.
- Understand the building by-laws related to residential building.

Unit	**Course Content**	**Hour/Unit**	**Marks**
Unit 1	**Conventions and Symbols:** Conventions as per IS 962, symbols for different materials such as earthwork, brickwork, stonework, concrete, woodwork and glass. Graphical symbols for doors and windows, Abbreviations, Types of lines-visible lines, centre-line, hidden line, section line, dimension line, extension line, pointers, arrow head or dots. Appropriate size of lettering and numerals for titles, sub-titles, notes and dimensions. Sizes of various standard papers/sheets.	8	10
Unit 2	**Principles of Planning of Building:** Principles of planning for Residential and Public building- Aspect, Prospect, Orientation, Grouping, Privacy, Elegance, Flexibility, Circulation, Furniture requirements, Sanitation, Economy. Plot area, built up area, super built up area, plinth area, carpet area, floor area and FAR (Floor Area Ratio). **Building By-laws:**	14	17

	Important by-laws related residential building, Minimum standard dimension, building permissions		
Unit3	**Type of Building:** Type of Building based on occupancy based on NBC(part-IV):2005**,** Residential building, Educational building, Institutional building, Assembly building, Business Building, mercantile Building, Industrial building, storage building, Hazardous building ,Classification of Residential building as per NBC(part-IV):2005; Lodging, dwelling house, Dormitories, Apartment house, Hotels. **Planning of Residential building:** Planning of standard living room, Dining room, Bed room, Bath and water closet, Kitchen, Stair of residential building	10	10
Unit 4	**Basic components of Building Elements:** The basic concepts of building elements, Simple sectional view of different building components, Foundation, Purpose of foundation, Type of foundation, Selection of foundation, Masonry Wall, Classification of masonry wall, Brick masonry, Size and Shape of brick, Different types of bond, Stretcher, Header, English and Flemish bond, Door, part of Door, Window, Part of Windows, Planning and design of staircase- Rise and Tread for residential building, Flooring, Different type of flooring used in building. Load bearing structure, frame Structure, comparison of load bearing and frame structure.	9	15
Unit 5	**Site selection of residential building :** Topography of site, shape of site, nature of sub-soil, position of groundwater table, Facilities, availability of men and material, thing to be avoided near site.	4	8
Total		**45**	**60**

Suggested learning resources:

- Bhavikatti.S.S. and Chitwadagi, M.V., Building Planning and Drawing, I.K. International Publishing House Pvt. Ltd.
- Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, Mcgraw Hill Publishing company Ltd. New Delhi.
- Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd New Asian Publishers, New Delhi.
- M. G. Shah and C. M. Kale, Principles of Perspective Drawing, Mcgraw Hill Publishing company Ltd. New Delhi.
- Swamy, Kumara; Rao, N, Kameshwara, A ., Building Planning and Drawing, CharotarPublication, Anand.
- Bhavikatti, S. S., Building Construction, Vikas Publication House Pvt. Ltd., New Delhi.

- Mantri, Sandip, A to Z Building Construction, Satya Prakashan, New Delhi.
- IS 962 and NBC(part-IV):2005

Course outcomes: After completing this course, the student will be able to –

1. Interpret the symbols, signs and conventions from the given drawing.
2. Prepare line plans of residential buildings using principles of planning.
3. Prepare submission and working drawing for the given requirement of civil engineering structure.

Name of the Course: Diploma in Survey Engineering	
Course Title: **Construction Safety**	Course Code:SEPE302/2
Number of Credits:3	Semester: Sixth
Teaching Scheme	**Examination/Scheme**
Duration:15weeks	MaximumMarks:100
Theory:3hours/ week	Continuous internal Assessment (INT):20Marks
Tutorial:Nil	Assignment/ Presentation/ Quiz (AS/QZ): 10 Marks
Practical:Nil	Attendance (ATD): 10 Marks
Total Contact Hours: 45hrs.	End Semester Examination (ESE):60marks

Pre-requisites : Students should have the knowledge of construction work.

Course Category : PE

Course Objective

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

- Understand the importance of various safety guidelines of construction works.
- Understand various hazards occur in construction works.
- Find out the remedies to prevent various hazards which occur in construction works.

Unit	**Course Content**	**Hour/Unit**	**Marks**
Unit1	**Introduction:** History and Development of Safety Movement, Importance of Safety, Safety Policy: Safety Organization and its responsibilities. Physical, Physiological and Psychological factors of safety. Safety Education and Training.	5	10
Unit2	**Workplace hazards and its prevention methods:** **Fire Hazards:** Chemistry of Fire, Classification of Fire. Common Causes of Industrial Fire. Statutory Provisions regarding Fire Safety, Factors Contributing Towards Fire. Determination of Fire Load. Fire Resistance of Building Materials. Design of Industrial Plant for Fire Safety. Prevention of Fire: Portable Extinguishers- Water Type Extinguisher, Carbon dioxide	15	15

	Type Extinguisher, Foam Type Extinguisher, Dry Chemical Type Extinguisher. Sprinkle Systems, CO_2 Flooding System Foam Flooding System. Industrial Fire Detection and Alarms. Special Precautionary Measures in Handling/Processing Flammable Liquids, Gases, Vapours, Mists and Dusts. Emergency Action Plan. **Construction Hazards** Safe Operating Procedure (SOP) and Code of Practice (COP) for Various Civil Works, Works at Heights and Various Safe Conditions Including Fall Protection and Preventive Measures. Personal Protective Aids for Working at Construction Site. Permit to Work System. **Mining Hazards** Mine Rules and Regulations (CMR 2017 and MMR 1961), Specific Statutory Provisions from DGMS Circulars, Mine Act, Bye Laws for Safe Mining. Permit to Work System. **Hazards in survey works** Various types of hazards in survey works, Safety precaution in survey works. Precaution adopted in survey related works associated with Transmission towers, railways, power plants, transformer installations. safety requirements while working at height, prevention of falls at floor level. Precautions from falling of materials.		
Unit3	**Hygiene Concept, definition and importance of hygiene in construction industry:** Difference between domestic hygiene and industrial hygiene. Physical hazards – heat stress and its control, ventilation, noise, vibration, illumination, thermal radiation, X rays, ultra violet radiation, ionizing and non-ionizing radiations, sensitization to different air, water and waste water, soil contaminant related to construction industries, permissible exposure limits, effects of exposure, preventive and control measures.	8	10
Unit4	**Industrial safety legislations** Legislative Measures in Industrial Safety: Factories Act, 1948, Workmen's Compensation Act, 1943, Employees State Insurance Act, 1948. Water (Prevention and Control) Pollution Act, 1974,. Child Labour and Women Employee Act. ILO Convention and Recommendations in the Furtherance of Safety, Health and Welfare.	12	15

	Occupational Safety, Health and Environment Management: Bureau of Indian Standards on Safety and Health 14489 - 1998 and 15001 – 2000 OSHA(Occupational Safety and Health Administration).		
Unit5	**Safety management** Safety Management- Principles &Practices with Case Studies, Role of Management in Industrial Safety. Safety Organization: Role of Safety Committee and its Formation, Safety Awareness Programme: Motivation, Education and Training, Appraisal of Industrial Safety and Measurement of Safety Performance.	5	10
Total		45	60

Suggested learning resources:

- ISO 14001
- ISO 45001:2018/OHSAS 18001
- ILO Legislation
- Jha, N. Kumar, Patel, Dilip A, Singh Amarjit, Cosntruction Safety Management, Pearson India Education Seervices Pvt. Ltd, Noida, UP.
- Haldar, S.K., Occupational Health & Hygiene in Industry, CBS Publishers
- Das, Akhil Kumar, Principles of Industrial Safety Management by, PHI

Course outcomes: After completing this course, student will be able to:

- Understand the basic philosophy of safety engineering
- Interpret the existing safety engineering guidelines and recommendations
- Identify various safety requirements in construction and associated sectors.
- Understand hygiene and safety associated with construction industries
- Analyze the problems related to safety hazard and contaminant discharge from construction industries and to suggest remedial measures.

Name of the Course: Diploma in Survey Engineering	
Course Title: **Township Planning**	CourseCode:SEPE302/3
Number of Credits:3	Semester: Sixth
Teaching Scheme	**Examination/Scheme**
Duration:15weeks	MaximumMarks:100
Theory:3hours/ week	Continuous internal Assessment (INT):20Marks
Tutorial:Nil	Assignment/ Presentation/ Quiz (AS/QZ): 10 Marks
Practical:Nil	Attendance (ATD): 10 Marks
Total Contact Hours: 45hrs.	End Semester Examination (ESE):60marks

Pre-requisites : Students should have the knowledge of basic Surveying, drawing and sketching

Course Category : PE

Course Objective

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

- Understand the importance and the basic guidelines of town planning.
- Learn the basic concept of zoning and various aspects of town planning.
- Learn the application of Survey Engineering and Building Bye-Laws for preparation of the development plans in Town Planning.
- Understand the requirements of urban roads and traffic management in town planning.

Unit	**Course Content**	**Hour/Unit**	**Marks**
Unit1	**1.0 Introduction** 1.1 Objects, Principles and Necessity of Town Planning 1.2 Origin and Growth of Towns, Distribution of land uses, Forms of planning, Important features of the site of a town	6	10
Unit2	**2.0 Town Planning Surveys** 2.1 Necessity and types of Survey in Town Planning 2.2 Collection of Data and Methods of data collection, Drawings and Report of Town planning Surveys	10	15
Unit3	**3.0 Zoning** 3.1 Objects, Principle, Advantage and Importance of Zoning.	8	10

	3.2 Requirements and classification of: Housing, Public Buildings, Industries, Parks and Playgrounds		
Unit4	**4.0 Building Bye-Laws and Development Plan** 4.1 Objects and Applicability of Building Bye-Laws 4.2 Principles underlying Building Bye-Laws, Set-Back, Light Plane, Floor Space Index, Minimum Plot Sizes, Margin and Maximum Built-Up Area 4.3 Objects and necessity of Development Plan 4.4 Required data, drawings and report for Development Plan	12	15
Unit5	**5.0 Urban Roads and Traffic Management** 5.1 Objects, Requirements and Classification of Urban Roads, Types of street systems 5.2 Objects of Traffic Management, Traffic Surveys, Road junctions and intersections, Parking, Traffic Signals, Road Signs, Road Markings, Street lighting in a town.	9	10
Total		45	60

Suggested learning resources:

- Town Planning byS C Rangwala,Charotar Publishing House
- Fundamentals of Town Planning byG. K. Hiraskar,DhanpatRai Publishing
- Urban Planning in India by Amiya Kumar Das,RawatPublications
- Urban Planning Theory and Practice by Rao M. P., CBS Publishers
- Introduction to Urban Development and PlanningbyB. K. Pattanaik, SAGE Publications

Course outcomes: After completing this course, the student will be able to–

1. Understand the importance and significance of various features of town planning.
2. Use the basic guidelines of town planning in zoning.
3. Apply the basic knowledge of Surveying in Town Planning.
4. Use the knowledge of Building Bye-Laws for preparation of the development plans in Town Planning.
5. Learn the basic requirements and classification of urban roads and its significance in town planning.
6. Learn the various aspects of traffic management and its application in town planning.

Name of the Course: Diploma in Survey Engineering	
Course Title: **Seminar**	Course Code: SESE 302
Number of Credits:1	Semester: Sixth
Teaching Scheme	**Examination/Scheme**
Duration:15 weeks	MaximumMarks:100
Theory:Nil	Practical Internal Assessment (PIA):60Marks
Tutorial:Nil	
Practical:2 hrs per week	
Total Contact Hours: 30	Practical External Assessment (PEA):40marks

Pre-requisites : Students should have good presentation skill.

Course Category : Seminar

Course Objectives

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

- Acquire information from different sources.
- Prepare presentation for given topic or project.
- Present seminar using different audio visual method
- Interact with audience to share thoughts.
- Defend their project by answering queries from audience.

Instructions:
Seminar should be presented by group or individual. This will be decided by the respective faculty member.

Content	Seminar is intended to provide opportunity to the student to present a project related work or any subject related topic given by respective faculties in front of a technical gathering with the help of different oral, aural and visual communication aids. In the seminar students are expected to defend the project or topic while answering questions arising out of their presentation.

Course Outcomes:
Upon completion of this course student should be able to Present given topic in a seminar using different audio visual method.

Name of the Course: Diploma in Survey Engineering	
Course Title: **Major Project**	CourseCode:PR302
NumberofCredits:3	Semester: Sixth
Teaching Scheme	**Examination/Scheme**
Duration:15weeks	MaximumMarks:100
Theory:Nil	Practical Internal Assessment (PIA):60Marks
Tutorial:Nil	
Practical:6Classes/week	
Total Contact Hours: 90hrs.	Practical External Assessment (PEA):40marks

Pre-requisites : Students should have the knowledge of basic surveying with drawing and sketching.

Course Category : Project

Course Objectives

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

- Read a topographical map and understand its uses in planning of a township.
- Understand the procedures of land development and planning required in a small township.
- Prepare report including drawing using the surveyed data collected in the field.
- Enhance knowledge to represent the surveyed data.

Sl.No.	**Assignments/Practical**
Land Development & Planning of a Small Township on a topographical map	
1	Field and Laboratory works of the project 1.1 Arrangement of a topographical map of an area not less than 1 sq. km. (preferably prepared by indirect contouring method at Annual Survey Training Camp) 1.2 Collection of Socio-economic, rainfall, High Flood Level data of the area. 1.3 Zoning, Preparation of Master Plan with division of Sectors, Streets on the topographic map for the proposed township. 1.4 Preparation of Street map and any one of the water supply map, surface drains map and power supply map 1.5 Land development work, Quantity and rough cost estimate of earth work required in

	different zones
2	Preparation of the Project Report The project report should include the following information: 2.1 Introduction 2.2 Necessity and back ground of the township 2.3 Representation of Socio-Economic survey, rainfall, High Flood Level data (Pie Chart and Bar Chart of the data may be prepared by using Ms-Excel) 2.4 Land development work along with the following: i) Allocation of land for use of different purpose, ii) Quantity and rough cost Estimate for earth work-cutting, filling, leveling, surface dressing in different zones 2.5 Overall benefit of the project 2.6 Conclusion and recommendation 2.7 The following maps are to be submitted along with the report: i) Topographical map used in the project (Prepared at annual survey training camp), ii) Master plan of the township (Plan shown only: division of sectors, location of streets), iii) Proposed Street map and any one of the: water supply map, surface drains map and power supply map.

Suggested learning resources

- Surveying and Levelling (Vol.1 &, 2)by S. K. Duggal,TATAMcGRAW-HILL
- Surveying(Vol.1&,2)by Dr.K.R.Arora, STANDARDBOOK HOUSE
- Surveying and Levelling byN.N. Basak,TATAMcGRAW-HILL
- Surveying and Levelling(Vol. 1 &,2)byDr. B.C. Punmia,Laxmi Publication

Course outcomes:

After completing this course, the student will be able to–

- Read a topographical map and use it in the planning of a township.
- Learn the procedures of necessary survey work required for the project.
- Compute necessary survey data from map and from field observation.
- Prepare a lay out of a new township on a topographical map.
- Prepare the lay outs of streets and various other required components of a township on a topographical map.
- Grow the knowledge on the preparation and presentation of a project report.

Name of the Course: Diploma in Survey Engineering	
Course Title: **Survey Training Camp**	Course Code: SEPC 304
NumberofCredits:2	Semester: Sixth
Teaching Scheme	**Examination/Scheme**
Duration:15 weeks	MaximumMarks:100
Theory:Nil	Practical Internal Assessment (PIA):60Marks
Tutorial:Nil	
Practical:4 hrs per week	
Total Contact Hours: 60 hrs	Practical External Assessment (PEA):40marks

Pre-requisites : Students should have the knowledge of basic surveying with drawing and sketching.

Course Category : PC

Course Objectives

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

- Measure necessary observation with the survey instruments
- Compute and record necessary survey data from field observation for drawing.
- Prepare drawing using survey data.

INSTRUCTIONS:	
Sl.No.	
1.	Group size for survey practical work may be formed by subject teacher
2.	Each student from a group should handle the instrument independently to understand the function of different components and use of the instrument.
3.	Drawing and plotting should be considered as part of practical.
4.	Term work shall consist of record of all practical and projects in field book and drawing of Project work on full/half imperial size drawing sheets.

Sl.No.	**Assignments/Practical**	**Remarks**
1	Direct Contouring Method using Plane Table ,Auto Level and Theodolite / Total Station	

2	Preparation of Topo-Map (of an area not less than 1 sq. km) applying the concept of Indirect contouring by square method using Auto level, Theodolite or Total Station	Classes may be conducted at the beginning of the semester at any suitable location.
3	Indirect contouring of a hilly area by Total Station /Tacheometer.	
4	Minor triangulation with single chain of triangle	
5	Trilateration with Braced Quadrilaterals.	
6	Road Project Survey (of a distance not less than 1 km) using Total Station or Theodolite.	
7	Map preparation of Institute Premises using GPS/ DGPS.	

Suggested learning resources:

- Surveying Vol. I, II and III by Dr. K. R. Arora. Standard Book House, Delhi.

Course outcomes: After completing this course, student will be able to –

- Prepare direct and indirect contour maps.
- Prepare topographical map of an area.
- Establish horizontal control points using triangulation and trilateration.
- Learn the use of Total Station and Theodolite in a road survey.
- Learn the procedure and use of GPS in map preparation.

West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Modern Office Practice & Management [MOPM]

Part-III (6th Semester)

2023

CURRICULAR STRUCTURE FOR PART–III (3rd YEAR) OF THE
FULL-TIME DIPLOMA COURSE IN MODERN OFFICE PRACTICE & MANAGEMENT

MODERN OFFICE PRACTICE & MANAGEMENT : Semester VI

Sl No.	Category of courses	Code	Course Title	L	T	P	Contact Hours	Credit	Marks
1	Programme Core	MOPMPC601	Total Quality Management	3	1	0	4	4	100
2	Programme Eleective	MOPMPE602	1.Office Administration II 2. Record Management Principles -II	3	1	0	4	4	100
3	Humanities & Social Science	HS302	Entrepreneurship and Start-ups	2	1	0	3	3	100
4	Open Elective	MOPMOE603	Engineering Economics & Project Management	3	0	0	3	3	100
5	Open Elective	MOPMOE604	Economic Policies in India	3	0	0	3	3	100
6	Major Project	MOPMPR 302	Major Project - II	0	0	4	4	2	100
7	Seminar	MOPMSE302	Seminar	0	0	0	0	1	100
Total Contact hours, Credits and Marks							21	20	700

Name of the Subject : Total Quality Management		
Course Code: MOPMPC601	Semester: Sixth	
Duration:: Seventeen weeks	Marks:100	
Theory: 3hrs./week	Mid Semester Exam.:20 Marks	
Tutorial: Nil/ week	Attendance & Teacher's Assessment: 10+10 Marks	
Practical: Nil hrs./week	End Semester Exam.:60 Marks	
Credit:4		

Objective:
On satisfactory completion of the course, the students should be in a position to:
1. Present a comprehensive view of concepts, principles and practice of Total Quality Management
2.Understand seven Tools of Quality
3. Understand the Quality Management System : ISO 9000
4. Know about the contributions of Quality Gurus

Course Outcomes:
On successful completion of the course students will be able to:
CO1: To get familiarized with the basic concept and framework of Total Quality management
CO2: To Understand the contribution of Quality Gurus in TQM Journey
CO3: To grasp the nature and importance of various components that constitute TQM
CO4: To describe and discuss the role of techniques used in TQM

Detail Course Content

Unit:1 Introduction	1.1 Background and evolution of TQM 1.2 Quality and its definition, concepts and features 1.3 Concept of customer satisfaction 1.4 Eight Building blocks of TQM 1.5 Cost of quality	Periods: 9
Unit:2 Quality Thinkers & Thoughts	2.1 Deming's Principles & PDCA Cycle 2.2 Quality control technique by Schewart 2.3 Juran's Trilogy 2.4 Ishikawa's QC 2.5 5S model 2.6 Six Sigma : concept of Six Sigma, 5 Key Principles of Six Sigma. 2.7 Quality Awards : What is quality Award? Concept of most popular quality awards or performance excellence models.	Periods: 12
Unit : 3 Quality Management Tools	3.1 Seven Quality Control Tools & their use - Cause-and-effect diagrams (Fishbone or Ishikawa diagram), Scatter diagrams, Histograms, Control charts, Pareto charts, Check sheets, Stratification 3.2 Bench Marking : Definition, concept, process & benefits.	Periods: 12
Unit : 4 Quality Management System	5.1 ISO 9000 series and related standards 5.2 Quality Management Principles 5.3 Quality Management System 5.4 Management Responsibility 5.5 Steps of ISO 9000:2000 implementation	Periods: 12

Contact Periods : 45 Internal Assessment : 6
Total Periods : 51

Reference Books:

1. Total Quality Management - By Besterfield Dale H.
2. Out of Crisis W. Edwards Deming
3. Total Quality Management – Principles and Practice – By S. k. Mandal
4. The seven habits of highly effective people – By Stephen Covey
5. Getting started and achieving results with TQM – by William Winchell

Programme Elective **Name of the Subject : OFFICE ADMINISTRATION-II**	
Course Code: MOPMPE602/1	Semester: Sixth
Duration:: Seventeen weeks	Marks:100
Theory: 3 hrs./week	Mid Semester Exam.: 20
Tutorial: 1 hr./week	Attendance & Teacher's Assessment: 10 +10
Practical: Nil hrs./week	End Semester Exam.: 60
Credit: 4	

Course Objective:

The objective of this course is to provide students with the knowledge, skills, attitudes and competencies to function in a modern office environment.

Course Outcomes: On successful completion students will be able to

CO1. Apply the knowledge of principles, policies, procedures and technological competencies involved in office administration;

CO2. Develop solving skills necessary for functioning in a modern office environment;

CO3. Improve capability to adapt to changes that impact the business environment;

CO4. Prepare office documents like tender order, office memo, purchase order, bin card, performance appraisal sheet and circular.

Detail Course Content		
Unit:1 Efficiency and productivity	1.1 Time Management 1.2 Quality Management 1.3 Office Budgeting and Cost Reduction	Periods: 5
Unit:2 Office Personnel Relations	2.1 Human Relation in Office 2.2 Management Employee Communication 2.3 Methods of Communication 2.4 Maintaining Office Discipline 2.5 Recruitment of Staff 2.6 Training of Staff 2.7 Promotion of Staff 2.8 Disciplinary Preceding against Employee, demotion and dismissals of Staff.	Periods: 10
Unit : 3 Office Supervision	3.1 Office Supervisor – Position, Function, Duties & Responsibility 3.2 Important aspects of Functioning of the Supervisor 3.3 Elements of Securing Effective Supervisor 3.4 Supervisor in Action 3.5 Evaluating Supervisory Performance 3.6 Supervisory Progress and Performance Preview 3.7 Women as Supervisors 3.8 Human Relations in Supervisor	Periods: 10

Unit : 4 Preparing Office Documents and managing office correspondence	4.1 Requisition 4.2 Tender Notice 4.3 Purchase Order 4.4 Office Memo 4.5 Application for jobs 4.6 Bin Card 4.7 Comparative Statement 4.8 Circular 4.9 Performance appraisal sheet 4.10 Preparation of questionnaire.	Periods: 20
Contact Periods : 45	Internal Assessment : 6	Total Periods : 51

Reference books:

1. Office Management/B.R. Duggal/Kitab Mahal Publications-Delhi
2. Manual of Office Management and Correspondence/B.N. Tandon
3. Office Organization and Management/S.P. Arora
4. Office Organization and Management/M.E. Thokaram Rao

Programme Elective **Name of the Subject : RECORD MANAGEMENT PRINCIPLES-II**	
Course Code: MOPMPE602/2	Semester: Sixth
Duration:: Seventeen weeks	Marks:100
Theory: 3 hrs./week	Mid Semester Exam.: 20
Tutorial: 1 hr./week	Attendance & Teacher's Assessment: 10 +10
Practical: Nil hrs./week	End Semester Exam.: 60
Credit: 4	

Course Objective:
The objective of this course is to provide students with the knowledge, skills, attitudes and competencies to function in a modern office environment.
Course Outcomes: On successful completion students will be able to
CO1. Apply the knowledge of technological competencies involved in office administration;
CO2. Design Office Forms;
CO3. Apply the knowledge of Office Record & Information Management ;
CO4. Develop documentation skills.

Detail Course Content

Unit:1 Report	1.1 Classification of Report 1.2 Form & Length of Report 1.3 Principle of Preparation of Report 1.4 Qualities or Element of a good Report 1.5 Steps in Report Preparation 1.6 Need for a Managerial Reporting System	Periods: 15

Unit : 2 Designing forms & it's Management	2.1 Importance of Proper Forms Design 2.2 Principles of Form Design 2.3 Factors Affecting Designing of Forms 2.4 Object of Forms Control and Management 2.5 Designing EDP Forms 2.6 Factors in selection of Form sets 2.7 Identifying Copies of Manifold Forms 2.8 Simplification of Proper Work: Rational use of Forms	Periods: 15
Unit : 3 Office Record & Information Management	3.1 Filing: Modern Method 3.2 Indexing: Method 3.3 Microfilming 3.4 Report: Classification, qualities of a good report, preparation of formats, for report used in office 3.5 Forms: Factors affecting design of forms, design of some specific forms.	Periods: 15
Contact Periods : 45	Internal Assessment : 6	Total Periods : 51

Reference books:

1. Office Management/B.R. Duggal/Kitab Mahal Publications-Delhi
2. Manual of Office Management and Correspondence/B.N. Tandon
3. Office Organization and Management/S.P. Arora
4. Office Organization and Management/M.E. Thokaram Rao

Course Title	**Entrepreneurship and Start-ups**
Course Code	HS 302
Number of Credits	3
Pre Requisites	None
Total Contact Hours	3(L: 2; T: 1)/week = 45 hrs
Course Category	HS

Course Learning Objectives

1. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
2. To motivate and inspire students toward an entrepreneurial career.
3. To understand venture creation process and to develop generic entrepreneurial competences.
4. To introduce students to the basic steps required for planning, starting and running a business.
5. To familiarise students with the different exit strategies available to entrepreneurs.

Course Outcomes:

After completing the course students will able to:

CO 1	Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
CO 2	Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
CO 3	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
CO 4	Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

Detailed Course Content

Unit	Name of the Topic	Hours
1.	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS** • Concept, Competencies, Functions and Risks of entrepreneurship • Entrepreneurial Values& Attitudes and Skills • Mindset of an employee/manager and an entrepreneur • Types of Ownership for Small Businesses o Sole proprietorship o Partnerships o Joint Stock company- public limited and private limited companies • Difference between entrepreneur and Intrapreneur	10
2.	**PREPARATION FOR ENTREPRENEURIAL VENTURES** • Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. • Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard Feasibility Study Report • Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan • Project Report- Concept, its features and components • Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. <u>They **may not** be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.</u>	20

3.	**ESTABLISHING SMALL ENTERPRISES** • Legal Requirements and Compliances needed for establishing a New Unit- o NOC from Local body o Registration of business in DIC o Statutory license or clearance o Tax compliances	03
4.	**START-UP VENTURES** • Concept & Features • Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical • Problems and challenges faced by start-ups. • Start-up Ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. No questions are to be set from the case studies.	04
5.	**FINANCING START-UP VENTURES IN INDIA** • Communication of Ideas to potential investors – Investor Pitch • Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups • Govt Initiatives including incubation centre to boost start-up ventures • MSME Registration for Start-ups –its benefits	06
6.	**EXIT STRATEGIES FOR ENTREPRENEURS** • Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – **Basic Concept only**	02

Examination Scheme

❖ **End Semester Examination: 60 marks**

Suggested Question Paper Scheme for End Semester Examination

Group A: 20marks

Question Type	Number of questions to be set	Number of questions to be answered
MCQ, Fill in the blanks, True or False (Carrying 1 mark each)	25	20

Group B: 40marks

Question Type	umber of questions to be set	umber of questions to be answered
Subjective Type questions (Carrying 8 marks each)	10	5

- **Internal Assessment: 40 marks**
  - Class test : 20 marks
  - Assignment: 10 marks
  - Class attendance: 10 marks

Suggested Learning Resources

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of IndiaLearning Private Ltd
2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Caseson Entrepreneurship	Anjan Raichaudhuri	Prentice Hall of India Learning Private Ltd
6.	How to Start a Business in India	Simon Daniel	Buuks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development and Business Ethics	Abhik Kumar Mukherjee & Shaunak Roy	Oxford University Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

Engineering Economics & ProjectManagement

Course Code:	OE301
Course Title:	Engineering Economics & Project Management
No. of Credits:	3 (L: 3, T: 0, P: 0)
Prerequisites:	NIL
Course Category:	Open Elective (Compulsory for all branches)

Course Objectives:

- To acquire knowledge of basic economics to facilitate the process of economic decision making.
- To acquire knowledge on basic financial management aspects.
- To develop the idea of project plan, from defining and confirming the project goalsand objectives, identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

Group-A

Unit-I (INTRODUCTION, THEORY OF DEMAND & SUPPLY) [9 hours]

Introduction to Engineering Economics, the relationship between Engineeringand Economics

Resources, scarcity of resources, and efficient utilization of resources.

Opportunity cost, rationality costs, and benefits

Theory of Demand: the law of demand, different types of demand, determinantsof demand, demand function, price elasticity of demand.

Theory of Supply: determinants of supply, supply function.

Market mechanism: Equilibrium, basic comparative static analysis (Numerical problems)

Unit-II (THEORY OF PRODUCTION & COSTS) [10 hours]

: Concept of production (goods & services), Different factors of production (fixed and variable factors), Short-run Production function (Graphical illustration), and Longrun production function (returns to scale).

: Theory of Cost: Short-run and long-run cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost etc.

: Economic concept of profit, profit maximization (numerical problems)

UNIT-III (DIFFERENT TYPES OF MARKET AND ROLE OF GOVERNMENT) [4 hours]

: Perfect Competition: Features of Perfectly Competitive Market.

: Imperfect Competition: Monopoly, Monopolistic Competition, and Oligopoly.

: Role of government in Socialist, Capitalist and Mixed Economy structure with example.

Group-B

Unit-I (CONCEPT OF PROJECT) [4 hours]

1.1: Definition and classification of projects)1.2: Importance

of Project Management.

1.3: Project life Cycle [Conceptualization→Planning→Execution→Termination]

Unit-II (FEASIBILITY ANALYSIS OF A PROJECT) [10 hours]

: Economic and Market analysis.

: Financial analysis: Basic techniques in capital budgeting – Payback periodmethod, Net Present Value method, Internal Rate of Return method.

: Environmental Impact study – adverse impact of the project on the environment.

: Project risk and uncertainty: Technical, economical, socio-political, and environmental risks.

: Evaluation of the financial health of a project – Understanding the basic conceptof Fixed & Working Capital, Debt & Equity, Shares, Debentures etc., and different financial ratios like Liquidity Ratios, Activity Ratios, Debt-equity ratio & Profitability Ratio (Basic concept only).

N.B: Knowledge of financial statements is not required; for the estimation of ratiosthe values of the relevant variables will be provided.

Unit-III (PROJECT ADMINISTRATION) [8 hours]

: Gantt Chart – a system of bar charts for scheduling and reporting the progressof a project (basic concept).

: Concept of Project Evaluation and Review Technique (PERT) and Critical Pathmethod (CPM): basic concept and application with real-life examples.

Examination Scheme:

A. Semester Examination pattern of 60 marks:

1. Objective type Question (MCQ, Fill in the blanks, and Very Short question-1 markeach): At least five questions from each unit. [total marks:20]

2. Subjective questions: Eight questions to be answered taking at least three fromeach group. (Two questions should be given from each unit). [total marks: 40]

B. Assignment (10 Marks)

Guideline for Assignment (10 Marks)

Students should be instructed to prepare a report on a project (preferably theMajor Project they prepare in 6 th Semester), using a popular project management software in IT/Computer Laboratory, under the guidance of theLecturer in Computer Science & Technology and Lecturer in Humanities.

C. Class Test: Two examinations 20 marks each. Take best of two.

D. Attendance: 10 Marks

Suggested reference books:

1. Principles of Economics – Case and Fair, Pearson Education Publication

2. Principles of Economics – Mankiw, Cengage Learning

3. Project planning, analysis, selection, implementation and review – Prasannachandra – Tata McGraw Hill.

4. Project Management – Gopala krishnan – Mcmillan India Ltd

Open Elective Name of the Subject : ECONOMIC POLICIES IN INDIA	
Course Code: MOPMOE 604	Semester: Sixth
Duration:: Seventeen weeks	Marks:100
Theory: 3 hrs./week	Mid Semester Exam.: 20
Tutorial: Nil hr./week	Attendance & Teacher's Assessment: 10 +10
Practical: Nil hrs./week	End Semester Exam.: 60
Credit: 3	

Course Learning Objectives:
The objective of this course is to familiarize the students of different streams with the basic concepts, structure, proble ms and issues concerning Indian economy.

Course Outcomes:
CO1: Understand Indian economics policy, planning strategies
CO2:It will enable to students to comprehend theoretical and empirical development across countries and region for policy purposes
CO3: Development Economics as a discipline encompasses different approaches to the problems of unemployment, poverty, income generation, industrialization from different perspectives
CO4: Able to identify the problems and capable to decide the application for future development
CO5: Analyze economic issues and find solutions to complex economic problems and take correct economic judgment

Detail Course Content		
Unit:1 Basic features and problems of Indian Economy	▪ Economic History of India ▪ Nature of Indian Economy, ▪ Planned Economy, Mixed Economy (changes since 1991) ▪ Demographic features and Human Development Index ▪ Problems of Poverty ▪ Unemployment, ▪ Inflation, ▪ Income inequality ▪ Black money in India.	Periods:10
Unit:2 Agriculture	▪ Issues in Agriculture sector in India ▪ Components of Green Revolutions ▪ Impact of Green Revolutions ▪ Food Management(Minimum Support Price, Procurement Price, Issue Price, Farm Subsidies) ▪ PDS & Food Subsidy ▪ Agricultural Credits and it's impact on Farmers	Periods:10
Unit : 3 Industrial Policies	▪ A brief review of Industrial Policies up to 1980 ▪ New Industrial Policy 1991 ▪ Disinvestment, Types of Disinvestment, Current Disinvestment Policy ▪ FDI Policy Measures ▪ Make in India.	Periods:10

Unit : 4 Recent trends in Fiscal and Monetary Policies in India	▪ What is Monetary Policy? What is Fiscal Policy? Difference between Monetary & Fiscal Policy. ▪ Recent trends in Fiscal and Monetary Policies in India	Periods:5
Unit : 5 External sector in India	▪ Description ▪ Forex Reserves ▪ External Debt ▪ Fixed Currency Regime ▪ Floating Currency Regime ▪ Foreign Exchange Market ▪ Trade Balance, BOP ▪ India's External Performance	Periods:5
Unit : 6 Service Sector	▪ Importance of Service Sector ▪ Manufacturing Vs. Service ▪ Trade in Service ▪ Different types of services - Consultancy Services - Space Services - R&D Services	Periods:5
Contact Periods : 45	Internal Assessment : 6	Total Periods : 51

Reference Books:

1. Dutt Rudder and K.P.M Sunderam (2017). Indian Economy. S Chand & Co. Ltd. New Delhi.
2. Mishra S.K & V.K Puri (2017). Indian Economy and –Its Development Experience. Himalaya Publishing House.
3. Singh, Ramesh, (2016): Indian Economy, Tata-McGraw Hill Publications, New Delhi.
4. Dhingra, I.C., (2017): March of the Indian Economy, Heed Publications Pvt. Ltd.
5. Karam Singh Gill, (1978): Evolution of the Indian Economy, NCERT, New Delhi
6. Kaushik Basu (2007): The Oxford Companion to Economics of India, Oxford University Press.

Name of the Subject : MAJOR PROJECT Part II	
Course Code: MOPMPR302	Semester: Fifth
Duration:: Eleven weeks	Marks: 100
Teaching Scheme:	Examination Scheme:
Theory: Nil hrs./week	Internal Practical Exam : 60 Marks
Tutorial: Nil hrs./week	External Practical Exam : 40 Marks
Practical: 4 hrs./week	
Credit:2	

Course Objective: Project Work is intended to provide opportunity to students to develop understanding of the interrelationship between different courses learnt in the entire diploma programme and to apply the knowledge gained in a way that enables them to develop & demonstrate higher order skills.

After completing this course, the students will be able
1. to understand the Modern Office System
2. to achieve the potentiality to work in a team effectively
3. to understand the gap between academic knowledge and actual real life problem solving knowledge.
4. to prepare the project repot in a skill full way.

Course Outcome:
After completing this course, the students will
CO1: understand the modern office systems
CO2: develop the ability to work in a team.
CO3: learn new skills and supplement knowledge
CO4: analyze the data to prepare the project repot in a skill full way.

Detail Course Content

To proceed with the project work it is very important to select a right topic. Project can be undertaken on any subject addressing Modern Office Management. Research and development projects on suggested subject areas should be encouraged.
Suggested Topics:
1. Financial Accounting
2. Office Correspondence.
3. Office Inventory Control
4. Office Purchase Procedure
5. Quality Control
6. Recruitment policy of
7. Conflict Management & grievance handling.
8. Public Relations
9. Performance Appraisal System
10. Fringe benefits
11. Any other topic from curriculum chosen by the student or suggested by the teacher

As per AICTE guidelines the Major Project is spread out in both Fifth & Sixth Semesters as Major Project Part I & Major Project Part II . The students of 5th semester should attain 40 to 50% of "Major Project" work. Remaining part will be completed by the students in sixth semester.

Guidelines:

i. To proceed with the project work it is very important to select a right topic. Project can be undertaken on any subject addressing Organizational issues. Research and development projects on problems of practical and theoretical interest should be encouraged.
ii. Project work must be carried out by the group of at least two students and maximum three and must be original.
iii. Students can certainly take ideas from anywhere, but be sure that they should evolve them in the unique way to suit their project requirements.
iv. The project work can be undertaken in a research institute or organization/company/any business establishment.
v. Student must consult internal guide along with external guide (if any) in selection of topic.
vi. Internal Guide will take decision regarding selection of projects.
vii. Student has to submit weekly progress report to the internal guide. This progress report can be used for awarding term work marks.

Major Project-I Report Format:
At the end of semester the project report should be submitted by the students. The project report should preferably contain at least following details:-

1. Critical Appraisal.
2. Suggestion.
3. Conclusion.

Distribution of marks for term work shall be as follows:

Weekly Attendance on Project Day
Project work contribute
Project Report (Spiral Bound)