CURRICULUM OF 6TH SEMESTER FOR 03 YEAR DIPLOMA COURSES IN POLYTECHNICS OF UT OF JAMMU AND KASHMIR

GENERAL GUIDELINES, PATTERN FOR SUBMISSION AND EVALUATION MECHANISM FOR MAJOR PROJECT

(FOR ALL BRANCHES WHEREVER APPLICABLE)

OBJECTIVE

Major Project Work in the 3-year diploma course aims to enhance students' innovative skills by applying the knowledge and skills acquired during their coursework to solve specific problems or undertake projects. As students possess diverse aptitudes and strengths, project assignments should align with their capabilities. This document outlines the guidelines for major project assignments, general pattern for submission and evaluation mechanism.

MECHANISM

The Major Projects can be executed by the students in the following mechanisms:

1. **Internal Institute Projects**
   - Projects developed and executed solely within the institute's academic environment wherein students can work on problems or challenges identified within the institute's curriculum or research priorities.
2. **Collaborative Projects**
   - Collaborative projects with other educational institutions like polytechnics, engineering colleges or universities.
3. **Industry Collaborations**
   - Projects in partnership with industry stakeholders or corporate entities wherein students can gain real-world experience by tackling industry-relevant problems and accessing industry resources.
4. **Research-oriented Projects**
   - Projects emphasizing experimental research, data analysis, or theoretical exploration which will encourages students to contribute to the advancement of knowledge within their field of study.
5. **Community Engagement Projects:**
   - Projects addressing community needs or contributing to societal welfare wherein students can collaborate with local organizations or communities to create meaningful impact.

CONDUCTION

The Project is to be conducted in the following phased manner:

1. Selection of Project Problem and Submission of Synopsis

1.1. *Submission Deadline:* End of 2nd Week of the Session

1.2. Guidelines

1.2.1. Students are encouraged to select projects that align with their interests, academic goals, and the latest industry trends.

1.2.2. Consideration should be given to the feasibility and scope of the project within the given timeframe and available resources.

1.2.3. Projects should aim to address real-world problems or demonstrate innovative solutions.

1.2.4. The number of students that should be in a single group should in the range of 02 to 04 and only in exceptional circumstances may be less or more and reasons for the same may be recorded then.

1.3. *Submission Pattern:* 02 to 04 Pages with the following mandatory details/sections.

I. Project Title
II. Group Members and Guide Name
III. Objectives of the project
IV. Project Scope/Impact/Relevance
V. Project Deliverables
VI. Execution Plan and its timeline
VII. Technologies to be used
VIII. Financial Requirements (if any)
IX. Any other Sections if required.

2. Submission of Progress Report-I and Work Done Review:

2.1. *Submission Deadline*: End of 6th Week of the Session

2.2. Guidelines

2.2.1. Progress reports should reflect the work completed up to the designated timeframe.

2.2.2. Include details of any challenges faced and solutions implemented.

2.2.3. Provide evidence of research conducted, experiments performed, or code written, depending on the nature of the project.

2.2.4. Highlight any deviations from the initial plan and strategies for course correction, if necessary.

2.3. *Submission Pattern:* 05 to 06 Pages on the following pattern

I. Project Title.
II. Group Members and Guide Name.

III. Objectives Achieved: Describe the objectives set for this phase and the extent to which they have been accomplished.
IV. Work Completed: Provide details of the work completed during this phase, including research conducted, experiments performed, or code developed.
V. Challenges Faced: Identify any challenges encountered during this phase and the strategies employed to overcome them.
VI. Revisions to Execution Plan (if required): Outline any revisions made to the initial execution plan based on evolving project requirements or feedback received.
VII. Timeline Update: Update the project timeline to reflect progress made and adjustments to future milestones.
VIII. Further Work: Outline the next steps planned for the project, including tasks to be completed before the next submission deadline.

3. Submission of Progress Report-II and Work Done Review:

3.1. *Submission Deadline:* End of 10th Week of the Session

3.2. Guidelines

3.2.1. Progress Report-II should demonstrate significant advancements since the previous report.
3.2.2. Include updated timelines, revised objectives (if any), and a clear indication of project milestones achieved.
3.2.3. Provide insights into any refinements made to the project plan based on feedback or evolving requirements.

3.3. *Submission Pattern*: 07-10 Pages on the following pattern

I. Project Title.
II. Group Members and Guide Name.
III. Objectives Achieved: Recap all the objectives set for this phase and evaluate the extent to which they have been achieved.
IV. Significant Milestones Reached: Highlight any significant milestones reached during this phase and their implications for the project's progress.
V. Refinements and Enhancements: Describe any refinements or enhancements made to the project based on feedback received or lessons learned.
VI. Remaining Tasks: Identify any remaining tasks or objectives to be completed before the final submission.
VII. Timeline Update: Update the project timeline to reflect progress made and revised deadlines for remaining tasks.

VIII. Further Work: Outline the next steps planned for the project, including tasks to be completed before the next submission deadline.

4. Preliminary Draft & Final Copy of the Final Project Report

4.1. *Submission Deadline*: Preliminary Copy of the Final Project Report by the end of 12th to 13th Week of the Session

4.2. Guidelines

4.2.1. The preliminary copy should be a comprehensive draft of the final project report, incorporating all sections and components.

4.2.2. Report may contain at least a minimum of 15 pages including title pages, references and appendices etc

4.2.3. Paper Size: A4, Margin 25mm left,17.5mm right and 17.5mm top/bottom

4.2.4. Font Style: Times New Roman.

4.2.5. Font Size:

4.2.5.1. Section Heading: 17pt, bold and leading caps

4.2.5.2. Second Level Section Heading: 14 points, bold and sentence case

4.2.5.3. Third Level Section Heading: 12 points, bold and sentence case

4.2.5.4. Running Text: 12pt normal case,

4.2.5.5. Captions: 11pt

4.2.6. Line Spacing: 1.5

4.2.7. *Sections in the report:* The Final Project report should contain the following sections

I. Cover Page: (Containing Project Title, Names of the Students in the group, Branch Name, Institute Name, Institute Logo and Submission Year)

II. Title Page

III. Certificate signed by the Guide(s) and Head of the Department

IV. Declaration signed by the Candidate

V. Acknowledgements

VI. Abstract

VII. Table of Contents

VIII. List of Figures

IX. List of Tables

X. Abbreviations/ Notations/ Nomenclature (if any)

XI. Text of the Report in form of Chapters as

Chapter 1
Chapter 2
…..
…..

XII. References

4.2.8. The preliminary draft report is to be submitted in order to get feedback from the guide and other members of the department to identify areas for improvement or refinement before the final submission.

4.2.9. After receiving the approval of the preliminary draft of the Final Report and certificate, the report should be printed (from the section of chapters onwards, printing should be on both sides of the paper) and submitted in the form a hard-bound report.

4.2.10. The concerned department or guide should ensure that the project reports are added to the institute or department libraries for future record and reference, and that the projects' themselves are included in the department's archives/labs after the culmination of final examination of the students. A proper record for the same must be maintained in each department/institute.

5. Group Presentation of the Project:

5.1. Guidelines

5.1.1. Group presentations should effectively communicate the project's objectives, methodology, key findings, and conclusions.

5.1.2. Use visual aids such as slides or demonstrations to enhance understanding and engagement.

5.1.3. Allocate sufficient time for questions and feedback from the audience.

5.1.4. The audience in the presentations may comprise of all the other students of the department/institute. However, it is suggested that the participation of 2nd Year Students of the same branch be made compulsory besides all faculty members of the department should also be part of the presentations.

5.1.5. Presenters should demonstrate confidence, professionalism, and a thorough grasp of the subject matter.

EVALAUTION MECHANISM FOR MAJOR PROJECT

Evaluation (Weightage)	Sno	Evaluation criteria/Timeline	Max. marks
INTERNAL EVALUATION (60) (To be given by Concerned Guide in consultation/approval of the HOD Concerned)	1	Selection of Project Problem and Submission of Synopsis (At the end of 02nd week)	10
	2	Submission of Progress Report-I (At the end of 06th week)	15
	3	Submission of Progress Report-II (At the end of 10th Week)	15
	4	Submission of Preliminary Copy of the Final Project Report for review (At the end of 12th to 13th Week)	05
	5	Group Presentation of the Project	05
	6	Internal Project Demonstration	10
EXTERNAL EVALUATION (40) (To be given by External Examiner who is to be appointed by JKBOTE)	1	External Project Demonstration	15
	2	Project Report	10
	3	Project Usability and relevance	05
	4	Project Viva	10
Total			**100**

For Internal Evaluation , a proper record needs to be maintained by the concerned Semester In charge depicting marks obtained by the candidates in each phase of the evaluation.
The total marks obtained by the candidate out of 100 is to be accordingly converted to relevant grade point as per prevailing norms.

CURRICULUM

FOR

SIXTH SEMESTER

OF

THREE-YEAR DIPLOMA COURSE

IN

ARCHITECTURAL

ASSISTANTSHIP

STUDY SCHEME SIXTH SEMESTER

Code	Subjects	Periods Per Week			Total Hours L+T+P	Credits			Total Credits L+T+P
		L	**T**	**P**		L	T	P	
AAMP601	Architectural Design-V (Major Project)	0	0	12	12	0	0	6	6
ES602	Structure-III (Design of Steel Structure)	4	0	0	4	4	0	0	4
AAPC603	Quantity Surveying & Valuation	4	0	0	4	4	0	0	4
HS604	Generic Skill and Entrepreneurship	3	0	0	3	3	0	0	3
AAPC605	Professional Training	4-6 WEEKS TRAINING IN AN ARCHITECT OFFICE (COA REGISTERED) at the end of 3rd/4th Semester				0	0	2	2
Elective – II									
OE606	EARTHQUAKE RESISTANT BUILDING DESIGN	3	0	0	3	3	0	0	3
OE607	CONSTRUCTION MANAGEMENT								
OE608	LOW COST BUILDING								
OE609	REPAIR & MAINTENANCE OF BUILDINGS								
OE610	GREEN BUILDINGS								
Total		**14**			**26**	**14**		**8**	**22**

HS	BS	ES	PC	PE	OE	MP	SL/PR	AU	Total
03	**0**	**04**	**06**	**0**	**03**	**06**	**0**	**0**	**22**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ARCHITECTURAL ASSISTANTSHIP	
Course Code : **AAMP501**	Course Title: **Architectural Design-V (Major Project)**
Semester : **6th**	Credits: **7 (L: 0 T:0 P:7)**
Hours per week: **14 (L: 0 T:0 P:14)**	

COURSE OBJECTIVES

The objective of the subject is to make student synthesize and use knowledge of various disciplines gained during entire study in an architectural project of his choice.

COURSE CONTENT

Design any one of these: Small Housing complex, Hotel, College/Institutional Building, Hospital, School, 3 storey residential Building, etc.
Complete working drawings with details to be produced:

- Site plan with landscape, parking, services
- Detailed floor plans showing furniture layout
- Elevations
- Sections from staircase
- Views
- Model
- case study report.

PORTFOLIO (Major Project)

One project chosen by individual student/team to be developed in the following stages:

Stage-1 Site Analysis, Case Studies, Data Analysis, Library study, tentative space requirement in the form of rough report. Concept, Pre-Final design proposal and Block Mode on drawing sheets. Stage-01 to be evaluated during mid semester.

Stage-2 Detailed working drawings showing the following services: Air-conditioning, Landscape, Structure, Interior detailing, Water supply & Sanitation or any other detail (Drawing sheets). Project Report on A4 size paper. Final design proposal along with model/views. Stage-02 to be evaluated in the end semester.

COURSE OUTCOMES

After successful completion of this course, students shall be able to :

- Improve upon their creative and technical skills.
- Understand user and project requirements.
- Develop a good understanding of building services and its integration into the design.

RECOMMENDED BOOKS

1. 'Principles of three Dimensional Design' by Wucius Wong.
2. "Time Saver Standards for Architectural Design Data" by John Hanock.
3. "Architectural Graphic Standards" by Ramsay and Sleeper.
4. "Space, Time and Architecture" by Gideon.
5. Architecture: Form, Space and Order by Francis D. K. Ching, John Wiley & Sons, 2007.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ARCHITECTURAL ASSISTANTSHIP.	
Course Code : **ES602**	Course Title: **Structure-III (Design of Steel Structure)**
Semester : **6th**	Credits: **4 (L: 4 T:0 P:0)**
Hours per week: **4 (L:4 T:0 P:0)**	

COURSE OBJECTIVE

Students of Architectural Apprenticeship Diploma are expected to understand the behavior of structures under load. They should understand the theory and design of simple structures and should be able to sketch structural details.

COURSE CONTENT

1. **Structural Steel and Sections**
   - **1.1** Properties of structural steel as per IS Code .
   - **1.2** Designation of structural steel sections as per IS handbook and IS:800:2007

2. **Riveted Connections and Welded connections**
   - **2.1 Riveted Connections**
     - **2.1.1** Types of rivets, permissible stresses in rivets.
     - **2.1.2** Types of riveted joints, specifications for riveted joints as per IS 800.
     - **2.1.3** Failure of a riveted joint.
     - **2.1.4** Assumptions in the theory of riveted joints.
     - **2.1.5** Strength and efficiency of a riveted joint.
     - **2.1.6** Design of riveted joints for axially loaded members (No Staggered riveting).
   - **2.2 Welded connections:**
     - **2.2.1** Types of welds and welded joints,
     - **2.2.2** Advantages and disadvantages of welded joints
     - **2.2.3** Design of fillet and butt weld.

3. **Tension Members and Compression Members**
   - **3.1** Analysis and design of single section tension members and their riveted and welded connections with gusset plate as per IS:800
   - **3.2** Analysis and design of single angle sections compression members (struts) and their riveted and welded connections with gusset plate as per BIS:800.

4. **Roof Trusses**
   - **4.1** Form of trusses, pitch of roof truss, spacing of trusses, spacing of purlins.
   - **4.2** Drawing of Connection between purlin and roof covering.
   - **4.3** Drawing of Connection between purlin and principal rafter(No Numerical)

5. **Columns**
   - **5.1** Concept of buckling of columns,
   - **5.2** effective length and slenderness ratio,
   - **5.3** permissible stresses in compression as per IS:800 for different end conditions.
   - **5.4** Types of column bases (Descriptive only)
   - **5.5** Analysis and Design of axially loaded single section steel column.
   - **5.6** Drawings of slab base and gusseted base for single section steel columns.

6. Beams

6.1 Analysis and design of single section simply supported laterally restrained steel beams.

6.2 Drawing of Sealed and Framed Beam to Beam Connections

6.3 Drawing of Sealed and Framed beam to Column Connections

Important Note: Use of IS: 800 and Steel Tables are permitted in examination

COURSE OUTCOME

After completion of the course the student be able to:

- Understand the basics of steel structure.
- Understand the various topics and design related to the riveted connections and welded connections.
- Analyse and design the tension members and compression members.
- Understand the theory of roof trusses.
- Understand the various concepts of columns.
- Analyse and design the steel beams

RECOMMENDED BOOKS

1. Duggal SK, "Design of Steel Structures" by Standard Publishers, Delhi
2. Birinder Singh, "Steel Structures Design and Drawing", Kaption Publishing House, Ludhiana
3. S Ramamurthan, "Design of Steel Structures".
4. Singh, Harbhajan, "Structural Drawings", Abhishek Publishers, Chandigarh
5. Structural Drawing by Rajeev Bhatia, Publisher Eagles.
6. Code: 800-2007

UNIT WISE TIME AND MARKS DISTRIBUTION

TOPIC NO.	TIME ALLOTED(HRS)	MARKS ALLOTED (%)
1	02	05
2	10	15
3	18	30
4	06	10
5	14	20
6	14	20
Total	**64**	**100**

PROGRAM : THREE YEARS DIPLOMA PROGRAM IN ARCHITECTURAL ASSISTANTSHIP	
Course Code:**AAPC603**	Course Title: **QUANTITY SURVEYING & VALUATION**
Semester: **6TH**	Credits: **4 (L:4 T:0 P:0)**
Hours per week: **4 (L:4 T:0 P:0)**	

COURSE OBJECTIVES:

The objective of the subject is to provide the students knowledge about the calculations of different items of works of buildings, their estimated costs and to give value of different types of buildings. Besides this, to give knowledge about tender, contract documents, specifications of building also.

COURSE CONTENT

1. Introduction

1.1 Introduction to quantity surveying and its importance.

1.2 Duties of quantity surveyor

2. Types of estimates

2.1 Preliminary estimates includes:

- Plinth area estimate
- Cubic rate estimate
- Unit base estimate

2.2 Detailed estimate

2.3 Stages of preparation of estimation and calculation of quantities and abstract

3. Measurements

3.1 Units of measurements for various items of works as per BIS : 1200

3.2 Rules for measurements

3.3 Methods of measurements to find out quantities:

- Long wall and short wall method
- Centre line method

4. Preparation of detailed estimates

4.1 Two/three room single storyed residential building with flat roof.

4.2 Septic tank

4.3 Under ground water tank

5. Abstract of materials

5.1 Quantities of materials for:

- Brick works in cement mortar
- Cement mortar
- Plastering works
- R.C.C. works
- Terrazzo flooring

6. Analysis of rates

6.1 Rates of material and labour for:

- Earthwork in excavation
- Cement Concrete foundation
- R.C.C. works
- Brick works in cement mortar
- Terrazo flooring
- Cement mortar
- Painting.

7. Valuation

7.1 Definition and purpose of valuation

7.2 Definition of – market value, depreciation, salvage and scrap value, sinking funds and year of purchase.

7.3 Methods of valuation:

- Cost based method
- Rental Return method

8. Contractorship

8.1 Definition and meaning of contract

8.2 Qualities of a good contractor and their qualifications

8.3 Conditions of contract, penalty, liquidated damages

8.4 Types of contracts,

8.5 Advantages and disadvantages of contracts

8.6 Introduction of tender, tender forms and documents, tender notice, submission of tender and deposit of earnest money, security deposit, retention money, maintenance period, Measurement Book, Preparation of bill, First and final bill, Running account bill, Advance payment, Secured advance payment, Refund of security money.

9. Specifications

9.1 General specifications of a Single storey buildings

9.2 General specification 1st, 2nd, 3rd and 4th class buildings

COURSE OUTCOMES

1. After successful completion of this course, students shall be able to:
2. Calculate items of works of buildings
3. Work out analysis of materials.
4. Work out analysis of rates of labour and material
5. Know about contract and tenders.
6. Understand Specifications of building materials & works.

RECOMMENDED BOOKS

- Estimating and costing in civil engg. – Theory and practice by B.N. Dutta
- Estimating and costing by Rangwala, B.S; Anand, Charotar book stall
- Estimating , costing and specification in civil engg; Chakraborti, M;Calcutta
- A text book on estimating and costing (civil) with drawings ; Kohli, D and Kohli, RC; Ambala; Ramesh Publications

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit	Time (Hours)	Marks (%age)
1	02	05
2	06	10
3	06	10
4	18	20
5	06	10
6	08	15
7	06	10
8	06	10
9	06	10
Total	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ARCHITECTURAL ASSISTANTSHIP.	
Course Code : **HS604**	Course Title: **Generic Skill and Entrepreneurship**
Semester : **6th**	Credits: **3 (L: 3 T: 0 P: 0)**
Hours per week: **3 (L: 3 T: 0 P: 0)**	

COURSE OBJECTIVE

The course provides a comprehensive understanding of the concept of an entrepreneur and intricacies involved in managing entrepreneurial projects. The prime aim is to imbibe the necessary entrepreneurial competencies among students and motivate them to choose entrepreneurship as a feasible and desirable career option.

COURSE CONTENT:

1. Introduction to Entrepreneurship

1.1 Meaning and concept of entrepreneurship.
1.2 History of entrepreneurship development,
1.3 Entrepreneurs, Managers and Inrapreneurs
1.4 Barriers to entrepreneurship
1.5 Role of Entrepreneurship in economic development.
1.6 Types of Entrepreneurship.

2. Entrepreneurial process and Entrepreneurship Development

2.1 Entrepreneurial competencies.
2.2 Traits and characteristics, motives, attitude, achievement orientation, self-assessment required to be an entrepreneur.
2.3 Entrepreneurial decision process, Skill gap analysis,

3. Entrepreneurship as career

3.1 Identification and selection of business opportunities.
3.2 Market assessment, technology search, production capacity.
3.3 Assessment of infrastructure requirements and other resources.
3.4 Business plan and its importance

4. Institutional infrastructure to promote entrepreneurship

4.1 Overview, roles, promotional schemes.
4.2 Financial, regulatory and other support system institutions.

5. Emerging trends in Entrepreneurship

5.1 Technopreneurship
5.2 Netpreneurs , Agripreneurs
5.3 Women Entrepreneurship
5.4 Franchising

COURSE OUTCOME:

After completion of the course the student will be able to

- Understand the meaning and concept of entrepreneurship, its historical development, and its role in economic development.
- Differentiate between entrepreneurs, managers, and entrepreneurs and identify the barriers to entrepreneurship.
- Identify the traits, characteristics, and attitudes required to be a successful entrepreneur and perform a self-assessment to evaluate one's potential in entrepreneurship.
- Analyze business opportunities, conduct market assessments, and assess resource requirements for entrepreneurial ventures.
- Recognize and explore emerging trends in entrepreneurship, such as technopreneurship, netpreneurs, agripreneurs, women entrepreneurship, and franchising.

RECOMMENDED BOOKS:

1. Desai Vasant, Fundamentals of entrepreneurship and small business management, Himalya publishing house.
2. Gupta C.B. Srinivasan N.P. Entrepreneurship development in India, Text and cases , Sultan Chand and Sons, New Delhi.
3. Charantimath, P.M. Entrepreneurship development and small business management, Pearson Education.
4. Generic skills and entrepreneurship development by Ishan Publishers, Ambala.
5. A handbook of entrepreneurship edited by B.S. Rathore and Dr. J.S. Saini.

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No	Time (hrs)	Marks (%age)
1.	12	25
2.	10	20
3	12	25
4	07	15
5	07	15
	48	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ARCHITECTURAL ASSISTANTSHIP.	
Course Code : **AAPC605**	Course Title: **Professional Training**
Semester : **6th**	Credits: **2 (L: 0 T: 0 P: 2)**
Hours per week: **0 (L: 0 T: 0 P:0)**4-6 WEEKS TRAINING IN AN ARCHITECT OFFICE (COA REGISTERED) including vacation period at the end of 3rd/4th Semester	

COURSE OBJECTIVES

This course aims to develop the students as professional architects to face the challenges in the professional practices. They should have thorough knowledge of various Architect's Act, Code of conduct in effect, and personnel management.

COURSE CONTENT

4-5 WEEKS TRAINING IN AN ARCHITECT OFFICE (COA REGISTERED) including vacation period after 5th semester.

It will be carried out in 2 parts:

PART-1

Working in an Architect office and producing minimum of two projects prints on which the student has himself/herself worked. This would be evaluated through a viva-voce at the mid of the 6th semester.

PART-2

During the training period, the students must identify the CASE STUDY for his/her team major project and procure its necessary data. This would be evaluated through a viva-voce at the end of 6th semester.

Note: Students will submit the copy of working certificate (duly attested by an Architect), two projects prints and case study reports in department after the completion of 4-5 weeks Internship/ Professional Training.

COURSE OUTCOMES:

After successful completion of this training, students shall be able:

- Students prepared for their professional life.
- Incorporated the basic knowledge for professional practices.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ARCHITECTURAL ASSISTANTSHIP.	
Course Code : **OE606**	Course Title: **EARTHQUAKE RESISTANT BUILDING CONSTRUCTION (Elective-II)**
Semester : **6th**	Credits: **3 (L: 3 T: 0 P: 0)**
Hours per week: **3 (L: 3 T: 0 P: 0)**	

COURSE OBJECTIVE

The objective of the subject is to let the students understand the terminology used in Earthquake and its effects on structural and non-structural elements.

COURSE CONTENT

1. **Elements of Engineering Seismology**
   - 1.1 General features of tectonic of seismic regions.
   - 1.2 Causes of earthquakes, Seismic waves,
   - 1.3 earthquake size (magnitude and intensity), Epicenter and Seismograph,
   - 1.4 Classification of earthquakes,
   - 1.5 Seismic zoning map of India,

2. **Seismic Behavior of Traditionally-Built Constructions of India**
   - 2.1 Performance of building during earthquakes
   - 2.2 Mode of failure (Out-of-plane failure, in-plane failure, Diaphragm failure, Connection failure, Non-structural components failure)

3. **Construction Method and Provision**
   - **3.1** Special construction method,
   - **3.2** Tips and precautions to be observed while planning, designing and construction of earthquake resistant building.
   - **3.2** Provision of reinforcement detailing in masonry and RC constructions
   - **3.3** Seismic Provision of Strengthening and Retrofitting Measures for Traditionally-Built Constructions, Brick and RCC Structures

UNIT 4-Introductionvarious IS codes

- **4.1** Introduction to IS: 4326, IS: 13828, IS: 1893 (Part 1), 154326 and IS: 13920 (latest edition)

COURSE OUTCOME

After completion of the course the student be able to:

- Understand the concept of earthquake and its effect on buildings
- Understand the Seismic zoning map of India
- Understand the planning, designing and construction of earthquake resistant building.
- Understand the Mode of failure of a structure.
- Understand the various IS codes.

RECOMMENDED BOOKS

1. Elements of Earthquake Engineering by Jai Krishana and AR Chandersekaran; Sarita Parkashan, Meerut.
2. Manual Published by Earthquake Engineering department, IIT Roorkee / IIT Kanpur

3. IS 13920, IS: 13827, IS: 13828, IS 1893, IS 4326 (latest edition)
4. Singh, Harbhajan " Earthquake Resistant Building Construction" Abhishek Publishers, Chandigarh

UNIT WISE TIME AND MARKS DISTRIBUTION

TOPIC NO.	TIME ALLOTED(HRS)	MARKS ALLOTED (%)
1	12	25
2	14	30
3	14	30
4	08	15
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ARCHITECTURAL ASSISTANTSHIP.	
Course Code : **OE607**	Course Title: **CONSTRUCTION MANAGEMENT (Elective-II)**
Semester : **6th**	Credits: **3 (L: 3 T: 0 P: 0)**
Hours per week: **3 (L: 3 T: 0 P: 0)**	

COURSE OBJECTIVE

The objective of the subject is to let the students understand the onsite problems related to building construction and causes of delay in construction, as well as to inculcate the skills as a team manager.

COURSE CONTENT

1. **Introduction**
   - **1.1** Significance of construction management
   - **1.2** Main objectives of construction management
   - **1.3** Functions of construction management, planning, organizing, staffing, directing, controlling and coordinating, meaning of each of these with respect to construction job.
   - **1.4** Classification of construction into light, heavy and industrial construction
   - **1.5** Stages in construction from conception to completion
   - **1.6** The construction team: owner, engineer, architect and contractors, their functions.
   - **1.7** Role of an architect in construction management.

2. **Construction Planning**
   - **2.1** Importance of construction planning
   - **2.2** Stages of construction planning
     - Pre-tender stage
     - Contract stage
   - **2.3** Bar charts and Limitations of bar charts
   - **2.4** Introduction to network techniques; PERT and CPM,
   - **2.5** Differences between PERT and CPM terminology
3. **Organization**
   - **3.1** Types of organizations
   - **3.2** Introduction to Site Organization
   - **3.3** Principle of storing and stacking materials at site
   - **3.4** Location of equipment
   - **3.5** Preparation of actual job layout for a building
   - **3.6** Organizing labour at site
4. **Control of Progress:**
   - **4.1** Methods of recording progress
   - **4.2** Analysis of progress
   - **4.3** Cost time optimization for simple jobs - Direct and indirect cost, variation with time, cost optimization.
5. **Inspection and Quality Control**
   - **5.1** Need for inspection and quality control
   - **5.2** Principles of inspection
   - **5.3** Stages of inspection and quality control for
     - Earth work

- Masonry
- RCC
- Sanitary and water supply services

6. Accidents and Safety in Construction

6.1 Accidents – causes and remedies

6.2 Safety measures for

- Excavation work
- Drilling and blasting
- Scaffolding, ladders, form work
- Demolitions

COURSE OUTCOME

After completion of the course the student be able to:

- Learn the techniques of project management.
- Understand the role of an architect in construction management.
- Understand the Stages of inspection and quality control
- Understand the safety measure to be followed in construction.

RECOMMENDED BOOKS

1. Peurifoy, RL, "Construction Planning, Equipment and Methods", McGraw Hill.
2. Singh, Harbhajan‟ Construction Project Management” Abhishek Publishers.
3. Verma, Mahesh; "Construction Equipment and its Planning and Application
4. Dharwadker, PP; "Management in Construction Industry", , Oxford and IBH Publishing Company, New Delhi
5. Gahlot PS; Dhir, BM; "Construction Planning and Management", Wiley Eastern Limited, New Delhi

UNIT WISE TIME AND MARKS DISTRIBUTION

TOPIC NO.	TIME ALLOTED(HRS)	MARKS ALLOTED (%)
1	10	20
2	10	20
3	07	15
4	07	15
5	07	15
6	07	15
Total	**48**	**100**

PROGRAM : THREE YEARS DIPLOMA PROGRAM IN ARCHITECTURAL ASSISTANTSHIP	
Course Code: **OE608**	Course Title: **LOW COST BUILDING (Elective-II)**
Semester: **6th**	Credits: **3 (L: 3 T: 0 P: 0)**
Hours per week: **3 (L: 3 T: 0 P: 0)**	

COURSE OBJECTIVES

The objective of the subject to develop the understanding of low cost construction and use of both conventional and non- conventional resources for low cost building construction.

COURSE CONTENT

1. **Introduction to Low Cost Building**
   - **1.1** Introduction of need for low cost construction, both in the rural and the urban sectors.
   - **1.2** Principles and parameters of low cost buildings.
   - **1.3** Works of Balkrishana V Doshi, Laurie Baker, Raj Rewal and Charles Correa.

2. **Vernacular Architecture**
   - **2.1** Introduction to various building techniques adopted in different climatic zones of the country, which result in varied vernacular expressions.
   - **2.2** Use of cost effective technologies including the use of local materials, up gradation of traditional technologies, prefabrication etc.

3. **New techniques**
   - **3.1** Introduction to affordable housing.
   - **3.2** Introduction to PMAY- Housing for all.
   - **3.3** Comparative analysis of building materials.

COURSE OUTCOMES

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

- Understand the concept of low cost buildings, its material and techniques in construction.
- Learn an approach to work with different local materials and techniques.
- Integrate Vernacular Architecture with modern techniques.

RECOMMENDED BOOKS

1. "Low Cost Housing in Developing Countries", Guru CharanMathur; For Centre for Science & Technology of the Non-Aligned and Other Developing Countries, Oxford & IBH Publishing Company, 1993
2. "Building Systems for Low Income Housing", Ashok Kumar Jain; Management Publishing House, 1992

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit	**Time (Hours)**	**Marks (% age)**
1	18	40
2	15	30
3	15	30
Total	**48**	**100**

PROGRAM : THREE YEARS DIPLOMA PROGRAM IN ARCHITECTURAL ASSISTANTSHIP	
Course Code: **OE609**	Course Title: **REPAIR & MAINTENANCE OF BUILDINGS (Elective-II)**
Semester: **6th**	Credits: **3 (L: 3 T: 0 P: 0)**
Hours per week: **3 (L: 3 T: 0 P: 0)**	

COURSE OBJECTIVES

The objective of the subject is to provide knowledge about historical building types and their conservation and a thorough knowledge of Building Maintenance can substantially contribute towards adequacy of design and suitability of materials.

COURSE CONTENT

1. **Need for Maintenance**
   - **1.1** Importance and significance of repair and maintenance of buildings
   - **1.2** Meaning of maintenance
   - **1.3** Objectives of maintenance
   - **1.4** Factors influencing the repair and maintenance

2. **Agencies Causing Deterioration**
   - **2.1** Definition of deterioration/decay
   - **2.2** Factors causing deterioration, their classification
     - **2.1.1** Human factors causing deterioration
     - **2.1.2** Chemical factors causing deterioration
     - **2.1.3** Environmental conditions causing deterioration
     - **2.1.4** Miscellaneous factors
   - **2.3** Effects of various agencies of deterioration on various building materials i.e. bricks, timber, concrete, paints, metals, plastics, stones

3. **Investigation and Diagnosis of Defects**
   - **3.1** Systematic approach/procedure of investigation
   - **3.2** Sequence of detailed steps for diagnosis of building defects/problems
   - **3.3** List non-destructive and others tests on structural elements
   - **3.4** Define defects in buildings
   - **3.5** Classification of defects
   - **3.6** Main causes of building defects in various building elements
     - Foundations, basements and DPC
     - Walls
     - Column and Beams
     - Roof and Terraces
     - Defects caused by dampness

4. **Materials for Repair, maintenance and protection**
   - 4.1 Compatibility aspects of repair materials
   - 4.2 State application of following materials in repairs:
     - Anti corrosion coatings
     - Adhesives/bonding aids
     - Repair mortars
     - Joints sealants
     - Waterproofing systems for roofs
     - Protective coatings

5. **Remedial Measures for Building Defects**
   - 5.1 Preventive maintenance considerations
   - 5.2 Surface preparation techniques for repair
   - 5.3 Crack repair methods
     - Epoxy injection
     - Grooving and sealing
     - Adding reinforcement and grouting

- Flexible sealing by sealant

5.4 Repair of surface defects of concrete
- Bug holes
- Form tie holes
- Honey comb and larger voids

5.5 Repair of corrosion in RCC elements
- Steps in repairing
- Prevention of corrosion in reinforcement

5.6 Repair of DPC against Rising Dampness

5.7 Repair of walls

5.8 Waterproofing of wet areas and roofs
- Water proofing of wet areas
- Water proofing of flat RCC roofs

5.9 Repair of joints in buildings
- Types of sealing joints with different types of sealants
- Techniques for repair of joints

COURSE OUTCOMES

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

- Understand the importance of building maintenance.
- Understand the Factors causing deterioration
- Understand about the Materials for Repair, maintenance and protection.
- Diagnose the causes of building defects and apply the ailment methods.

RECOMMENDED BOOKS

1. Repair and Renovation of Modern Buildings by Ian Chandler
2. A Manual of Maintenance Engineering by B. S.Nayak
3. Maintenance and Repairs of Buildings by P.K.Guha
4. Gahlot P.S. and Sanjay Sharma, "Building Defects and Maintenance Management", CBS Publishers, New Delhi
5. Ransom, WH "Building Failures - Diagnosis and Avoidance", Publishing E and F.N. Span
6. Hutchinson, BD; et al, "Maintenance and Repair of Buildings", Published by Newness – Butterworth

UNIT WISE TIME DISTRIBUTION

UNIT NO	TIME (HOURS)	MARKS ALLOTED(%)
01	06	15
02	10	20
03	10	20
04	06	15
05	16	30
Total	**48**	**100**

PROGRAM : THREE YEARS DIPLOMA PROGRAM IN ARCHITECTURAL ASSISTANTSHIP	
Course Code: **0E610**	Course Title: **GREEN BUILDING (Elective-II)**
Semester:**6th**	Credits:**3 (L: 3 T: 0 P: 0)**
Hours per week: **3 (L:3 T:0 P:0)**	

COURSE OBJECTIVES

The objective of the subject is to develop an understanding about the role of energy in built environment and ways to achieve energy efficiency in design process.

COURSE CONTENT

1. Introduction

1.1 Green buildings: global and local perspective.

1.2 Renewable energy, Energy Star Rating of buildings

1.3 Introduction to GRIHA, TERI, IGBC, ECBC, GEM and LEED

2. Building Code

2.1 Energy Conservation Building Code (ECBC).

2.2 Energy Performance Index.

2.3 Building Envelope, Fenestration, Daylighting, Building Envelope Sealing and roof.

3. GRIHA

3.1 Introduction to Building rating systems in India. Basic study on GRIHA (Green Rating for Integrated Habitat Assessment).

3.2 Criteria for GRIHA rating- Resource conservation and efficient utilization of resources. Building planning and construction.

4. Case Studies (Online)

4.1 Case study: Green buildings in INDIA- Rajiv Gandhi International Airport, Hyderabad, Suzlon One Earth, Pune, and CII-Sohrabji Godrej Green Business Centre, Hyderabad.

COURSE OUTCOMES

After successful completion of this course, students shall be able to;

- Understand the concept and need of energy efficiency.
- Understand ECBC, GRIHA.
- Learn the different case studies on energy efficient buildings in India.

RECOMMENDED BOOKS

1. Renewable Energy Sources and Their Environmental Impact by Shahid A. Abbasi, Naseema Abbasi; PHI Learning Pvt. Ltd., 2004
2. Indian Energy Conservation Act 2001, GoI
3. Energy Conservation Building Code Manual, GoI
4. GRIHA Manuals, The Energy and Resources Institute (TERI), 2011
5. Energy-efficient Buildings in India, The Energy and Resources Institute (TERI), 2001

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit	**Time (Hours)**	**Marks (% age)**
1	12	25
2	12	25
3	12	25
4	12	25
Total	**48**	**100**

CURRICULUM
FOR
SIXTH SEMESTER
OF
THREE-YEAR DIPLOMA COURSE
IN
AUTOMOBILE ENGINEERING

STUDY SCHEME FOR 6TH SEMESTER AUTOMOBILE ENGINEERING									
Course code	**Subjects**	**Time in hours**				**Credits**			
		L	**T**	**P**	**Total**	**L**	**T**	**P**	**Total**
AEPC601	Hybrid Electric Vehicles	3	1	0	4	3	1	0	4
AEPC602	Hybrid Electric Vehicles Lab	0	0	2	2	0	0	1	1
AEPC603	Vehicle Maintenance	0	0	4	4	0	0	2	2
AEPC604	Vehicle Body Engineering	3	0	0	3	3	0	0	3
AEPC605	Vehicle Body Engineering Lab	0	0	2	2	0	0	1	1
*	Core Elective-III	3	0	0	3	3	0	0	3
**	Open Elective-II	3	0	0	3	3	0	0	3
AEPC606	Major Project	0	0	10	10	0	0	5	5
Total		**12**	**1**	**18**	**31**	**12**	**1**	**9**	**22**

***Core Elective-III**		
S. No.	**Course Code**	**Course Name**
1	AEPE09	Automobile Systems Design
2	AEPE10	Garage Management
3	AEPE11	Special Purpose Vehicles
4	AEPE12	Metrology
****Open Elective-II**		
S. No.	**Course Code**	**Course Name**
1	AEOE06	Disaster Management
2	AEOE07	Computer Numerical Control
3	AEOE08	Values and Ethics in Profession
4	AEOE09	Artificial Intelligence
5	AEOE10	E-Governance

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING	
Course Code: **AEPC601**	Course Title: **Hybrid Electric Vehicles**
Semester: **6th**	Credits: **04**
Periods Per Week: **04 (L: 03, T: 01, P: 00)**	

COURSE OBJECTIVE:

The course aims to provide students with comprehensive knowledge of new generation electric vehicles, fundamental principles of electronic automatic transmissions, operational intricacies and control mechanisms of contemporary vehicles, as well as an understanding of different hybrid vehicle types. It also seeks to familiarize students with essential concepts and components of hybrid vehicles, while introducing them to various aspects of hybrid drive trains.

COURSE CONTENT:

1. Introduction to hybrid electric vehicle

1.1. Basic concept of HEV, history of HEV, Benefits of HEV, Comparison of gasoline engine and electric motor

1.2. Basic units of hybrid-electric vehicles: engine, battery pack, electric motor, system controller (basic concept only)

1.3. Hybrid control systems (concept only): battery management, engine management, transmission management

1.4. Power train functions of hybrid vehicles: regenerative braking, idle stop, power assist, Engine-off drive-electric vehicle mode

2. Layout of Hybrid-Electric Vehicles

2.1. Levels of hybridization: Micro, Mild, Full, Range Extended, Plug-in, and Performance hybrids (propulsion device, energy source, system voltage and power train functions only)

2.2. Architecture (types) of HEV: series hybrid, parallel hybrid, series-parallel hybrid, power-split hybrid (topology, power flow and powertrain functions only)

2.3. HEV driving modes: start-up charge; Electric Driving; engine and, motor drive; engine drive and battery charging; engine and motor drive and battery charging; full acceleration; energy recuperation

2.4. Hybrid accessories: HV power steering, HV air-conditioning, HV brakes, Hybrid artificial sounds for pedestrian safety

3. Advanced Engine technologies (concepts only)

3.1. Cylinder deactivation; Active Alternators; variable intake systems; variable geometry turbochargers; electric supercharges; variable valve actuation technology; X-by-wire technologies; 48-Volt Electrical Systems; active cooling

3.2. Camshaft less engines; adiabatic engines; variable compression ratio engines; Miller and Atkinson cycle engines; Homogeneous Charge Compression Ratio engines; gasoline direct engines; Lean Burn Engine; Stratified Charge Engine; Surface Ignition Engine, multi-fuel engines

4. Advanced driver assistance systems (ADAS)

4.1. Alerts and warning: ignition interlock devices; Blind spot monitor; driver drowsiness detection; driver monitoring system; electric vehicle warning sounds; forward collision warning; intelligent speed adaption; intersection assistant; lane departure

warning system; parking sensors; tyre pressure monitoring system; wrong way driving warning

4.2. Driving task assistance: Adaptive cruise control; automatic parking collision avoidance system; emergency driver assistance; hill descent control; hill start assists; lane centering; lane changing assistance; rain sensors

4.3. Visual and environmental monitoring: automotive head-up display; automotive navigation system; automotive night vision; back-up camera; glare free high beam; omni view technology; traffic sign recognition

5. Autonomous cars

5.1. Autonomous cars: objectives of Autonomous cars, SAE levels, challenges;

5.2. Summary of shared mobility; connected cars, big data & analytics

COURSE OUTCOME

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

- Select new generation electric vehicles based on application.
- Use elements of electronic automatic transmissions.
- Operate and control modern vehicles effectively.
- Illustrate different types of Fuel cells, its operation, and performance.
- Quantify fuel cell processing using codes and standards.
- Comprehend basic concept of Hybrid traction.
- Illustrate various Architectures related to Hybrid Drive train.
- Illustrate need and environmental importance of Hybrid technology.

RECOMMENDED BOOKS

1. Electric and Hybrid Vehicle (AICTE Recommended) by AK Babu, Khanna Publishing
2. Hybrid And Electric Vehicles by Dr. R. Saravanan, Dr. S. SooriyaPrabha, XIP
3. Electric and Hybrid Vehicles by Dr. C. BalakrishnaMoorthy, Dr. U. Muthuraman, Inder Singh Bisht, Akinik Publications, New Delhi
4. Electric Vehicle Technology by Sunil R Pawar, Nation Press Publications
5. Electric and Hybrid Vehicles by Tom Denton, IMI
6. Electric and Hybrid Vehicles: design fundamentals, by IqbalHussian, CRC Press
7. Autonomous Vehicles, Volume 1 and 2: Using Machine Intel ligence, RomilRawat, Syed Imran Patel & Co, Wiley
8. Engineering Autonomous Vehicles and Robots, Liu Shaoshan, wiley

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME (HOURS)	MARKS (%AGE)
1	09	18
2	10	20
3	08	18
4	15	30
5	06	14
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING	
Course Code: **AEPC602**	Course Title: **Hybrid Electric Vehicles Lab**
Semester: **6th**	Credits: **01**
Periods Per Week: **02 (L: 02, T: 00, P: 00)**	

COURSE OBJECTIVE:

The practical course aims to provide students with a comprehensive understanding of hybrid electric vehicle (HEV) power trains and associated systems. Through hands-on activities such as disassembling and examining components, inspecting electrical connections, checking fluid levels, and practicing maintenance tasks like air filter replacement, students will gain practical skills in HEV technology, enabling them to contribute effectively to the field of sustainable transportation. Additionally, the course seeks to familiarize students with regenerative braking and air-conditioning systems, enhancing their knowledge of advanced vehicle technologies.

LIST OF PRACTICALS:

1. Study of various powertrain configurations of HEVs
2. Disassemble and examine the various components of a hybrid electric vehicle powertrain, such as the electric motor, internal combustion engine, transmission, and power electronics.
3. Inspect the electrical components and connections for any signs of wear, damage, or loose connections.
4. Practice and procedure of checking the fluid levels, including engine oil, brake fluid, transmission fluid (if applicable), and power steering fluid
5. Practice of inspecting and replacing air filter of a HEV
6. Study and sketching of Hybrid electric vehicle Air-Conditioning system
7. Dismantling and assembly of traction motor from a hybrid vehicle
8. Study of regenerative braking system of a HEV

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING	
Course Code:**AEPC603**	Course Title: **Vehicle Maintenance**
Semester: 6Th	Credits: **02**
Periods Per Week: **04 (L:00, T: 00, P:04)**	

COURSE OBJECTIVE:

The comprehensive course on Automobile Workshop Equipment and Maintenance aims to provide students with a thorough understanding of general safety precautions and procedures in an automotive workshop. Through detailed exploration of essential tools and equipment, participants will learn their functions and proper usage while prioritizing safety. The course focuses on engine, transmission, brake, suspension, and body system maintenance, enabling students to diagnose, troubleshoot, and service various components effectively. By the end of the course, participants will be equipped with the knowledge and skills necessary for proficiently managing automotive repair and maintenance tasks.

COURSE COMTENT:

1. Automobile Workshop Equipment

1.1. General safety precautions and procedures.

1.2. Functions of General shop equipment, gauges and tools with safety precautions while using:

1.2.1. Cylinder bore gauge, inside and outside micrometer, dial indicator gauge, Straight edge and Feeler gauge, Torque wrench, Depth gauge

1.2.2. Wheel balancer, Wheel aligner, Crankshaft aligner and straightener, Engine analyzer, Arbor press, Tyre changer, FIP calibration machine, Head light aligner

1.2.3. Valve grinder, Cylinder boring, Honing machine.

2. Workshop Layouts

2.1. Layout with equipment required for dealers of two-wheeler, four wheelers- cars and commercial vehicles and for road- side garage.

2.2. Layout of modern workshop for specialized job work like crankshaft repair, engine cylinder re-boring, F.I.P testing and repair, brake drum boring. Wheel balancing and alignment, Dent and paint shop etc.

3. Engine Maintenance

3.1. Engine Diagnosis- Engine Smoke, oil level and condition, coolant level and condition, oil pressure testing, compression test, vacuum test, Cylinder Leakage test.

3.2. Engine Servicing

3.2..1. Checking and Servicing of engine components: cylinder head, cylinder block, cylinder liners, piston, piston ring, crank-shaft, Connecting rod, valves.

3.2..2. Tuning of engine.

3.3. Troubles, Causes and remedies in fuel, cooling, lubrication system and MPFI Engine, charging and starting system.

4. Servicing of Engine Systems

4.1. Fuel feed system service, carburetor - dismantling, cleaning and tuning. Injector cleaning and testing, FIP phasing and calibration, CRDI injector servicing, MPFI - injector testing and cleaning.

4.2. Lubrication system service – change oil filter, check oil pump, and diagnose causes for excessive oil consumption, external oil leakage, and low oil pressure in an engine.
4.3. Cooling system servicing - refilling of radiator, Pressure testing, thermostat checking, Leakage testing, Fan belt tension checking and adjusting.

5. Transmission System Maintenance

5.1. Maintenance of Clutch and Gearbox
5.1.1. Checking clutch plate for thickness, run out, rivet depth, slackness of torsion spring. Pressure plate surface and thickness, axial spring height.
5.1.2. Clutch adjustment – types and procedure.
5.1.3. Clutch troubleshooting – causes and remedies
5.1.4. Checking gearbox for run out of main shaft and lay shaft, oil seals, bearings, gears and synchromesh unit.
5.1.5. Gearbox troubleshooting- causes and remedies.
5.2. Maintenance of Final drive, Propeller shaft and rear axle.
5.2.1. Checking and adjusting differential for ring gear run-out, backlash in ring gear, tooth contact between ring gear and pinion, bearing preload – necessity and procedure.
5.2.2. Troubles, Causes and remedies of propeller shaft, differential and rear axle.

6. Maintenance of Brakes

6.1. Inspection of master cylinder, wheel cylinder, brake drum, brake linings, brake disc and brake pads.
6.2. Adjustment of hydraulic brakes – shoe clearance, brake pedal free travel, pedal to floor clearance, parking brake adjustment.
6.3. Procedure of bleeding of hydraulic brakes. methods of brake bleeding.
6.4. Troubles, Causes and remedies of Hydraulic and Air brake system.

7. Servicing of suspension and Steering system

7.1. Troubleshooting of suspension and Steering system
7.1..1. Troubles, causes and remedies of suspension system,
7.1..2. Troubles, causes and remedies of steering System.
7.2. Maintenance of wheels and tyres
7.2..1. Care of wheels and tyres
7.2..2. Procedure of tyre retreading and vulcanizing.
7.2..3. Procedure of wheel alignment by wheel alignment gauges and procedure of wheel balancing.

8. Body Maintenance

8.1. Frame repairs (for cracks, loose rivets, and skewness in frames) and alignments.
8.2. Body repairs- Procedure to remove dent, denting tools and equipment.
8.3. Adjustment of doors and locks.
8.4. Repainting procedure, patch work. Painting defects.

RECOMMENDED BOOKS

1. Automotive Mechanics by Crouse &Anglin, Tata McGraw Hill Publication
2. Vehicle Maintenance and Garage Practice by Jigar A. Doshi (Author), Dhruv U. Panchal (Author), Jayesh P. Maniar (Author), Prentice-Hall of India Pvt. Ltd
3. A Practical Approach to Motor Vehicle Engineering and Maintenance by Allan Bonnick, Derek Newbold
4. Automobile Mechanical and Electrical Systems, Tom Denton, BH Publishing
5. Automobile Engineering by K. K. Jain, R. B. Asthana, Tata McGraw-Hill Publishing Company Limited, New Delhi

6. Automotive Systems Principles and Practice by G.K. Awari V.S. Kumbhar R.B. Tirpude, Taylor and Francis

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING	
Course Code: **AEPC604**	Course Title: **Vehicle Body Engineering**
Semester: **6th**	Credits: **03**
Periods Per Week: **03 (L: 03, T: 00, P: 00)**	

COURSE OBJECTIVE:

This course aims to provide a comprehensive understanding of vehicle body design, encompassing fundamental principles, diverse structural designs, and their specific requisites. It delves into the realm of vehicle aerodynamics, explores a range of body structures, investigates pertinent materials, and fosters an appreciation for the intricate interplay between form, function, and efficiency in automotive design. By the course's conclusion, students will possess a well-rounded knowledge of vehicle body engineering and design considerations, equipping them for innovative contributions to the automotive industry.

COURSE CONTENT:

1. Vehicle structure

1.1. Concept and function of automobile body; Milestones in automobile body history; global bus and truck manufacturers; global car and two-wheeler manufacturers; Indian automobile industry

1.2. Types of car body styles: hatchback, notchback, fastback, sedan, station wagon, pick-up truck, van, coupe, crossover, convertible, limousine, MPV, SUV, racing and sports car (with examples in local market)

2. Basic vehicle dimensions

2.1.1. Cab, fascia, headroom, legroom, shoulder room, boot space

2.1.2. Wheel base, wheel track, overhang, ground clearance, angle of approach, departure angle, ramp break-over angle, turning radius, wading depth

2.1.3. overall height, width and length, bed length and width, cowl height, deck height

2.2. Specifying an automobile; concept of facelift, platform

2.3. Interior and exterior trim, car upholstery

3. Car Body construction

3.1. Car body construction

3.1.1. Frame over body construction, integral body construction, space frame construction, monocoque construction; advantages and disadvantages of car body construction methods

3.2. Car body anatomy:

3.2.1. Car body panel nomenclature; Structural components of front, rear and centre body sections; concept of crash zones

3.2.2. Description and function of car body parts: Window and body pillars, windscreen and rear window rails, cant rails, roof structure, upper quarter panel window, floor seat and boot pans, central tunnel and sills, scuttle, front longitudinal, front and rear valence, toe and heel board;

4. Body materials

4.1. Requirements of car body materials

4.2. Types of materials used in automobile body

4.2.1. Steels, aluminium, magnesium, glass, rubber, plastics, timber, BIW

4.2.2. Advanced body materials: GRP, Carbon fiber, fiber glass, Shape-Memory Polymers (SMP's)

4.3. Automotive paints
- 4.3.1. Composition of automotive paints- body, vehicle, pigment, thinner, dryer
- 4.3.2. Protective and anticorrosive coatings
- 4.3.3. Paint process- preparation, primer, base coat, clear coat
- 4.3.4. Repainting process; Teflon coating; vehicle paint code

5. Automotive glazing

5.1. The material properties of glass; Automotive windshield and window glass
5.2. Front wiper systems; Rear wiper systems
5.3. Windshield and rear-window washer systems; Headlamp cleaning systems
5.4. Manual window glass operating mechanism; manual seat setting mechanism

6. Heavy vehicle bodies

6.1. Bus body details
- 6.1.1. Types of busses- minibus, single and double decker bus, articulated bus, two leve\l and split-level bus
- 6.1.2. Bus frame construction, double skin construction

6.2. Commercial vehicle bodies
- 6.2.1. Classification of commercial vehicles by GVW
- 6.2.2. Constructional features of tanker body, tipper body, fixed side, drop side, flat platform, lorries (rigid truck body and tractor-trailers)

7. Body Control Modules (BCMs)

7.1. Functions and benefits of BCM; General representation of a body control module, BCM manufacturers
7.2. Function, components and working of:
- 7.2.1. External lighting; Interior lighting; Windshield wipers; Windshield washer system; Central locking system; Climate control system; electric seat adjustment; Power windows
- 7.2.2. RF reception; Immobilizer; Remote Keyless Entry (RKE); Passive Start and Entry Systems (PASE); Tire Pressure Monitoring System; Energy management systems; Alarms

COURSE OUTCOME:

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

- Illustrate different types of Vehicle structures
- Comprehend various loads acting on vehicle body.
- Illustrate different vehicle body styles.
- Classify different materials related to vehicle body.
- Discuss Aerodynamic concept related to vehicle body
- Illustrate importance of thin-walled structures in vehicle body elements.
- Discuss the layout of heavy-duty commercial vehicles
- Understand modern body electric systems and safety features

RECOMMENDED BOOKS:

1. Vehicle Body Engineering by A K Babu, Khanna Publishing
2. Automotive systems, principles and practices by GK Awari and VS Kumbhar, CRC Press
3. Automobile Engineering by K. K. Jain, R. B. Asthana, Tata Mc-Graw Hill Publications
4. Auto Body Repair Technology by James E Duffy, NATEF

5. The Repair of Vehicle Bodies by Andrew Livesey& CO, Taylor and Francis
6. Advanced Vehicle Technology by Heinz Heisler, Butterworth Heinemann
7. Automotive Handbook from Bosch, 11th Edition, SAE publication
8. H-Point (the Fundamentals of Car Design and Packaging) by Stuart Macey
9. A textbook of Automobile Engineering by RK Rajput, Laxmi Publication
10. Automobile Engineering by PS Gill, Katson Books

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME (HOURS)	MARKS (%AGE)
1	05	12
2	06	14
3	08	16
4	08	16
5	05	10
6	08	16
7	08	16
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING	
Course Code: **AEPC605**	Course Title: **Vehicle Body Engineering Lab**
Semester: **6th**	Credits: **01**
Periods Per Week: **02 (L: 00, T: 00, P: 02)**	

COURSE OBJECTIVE:

This practical course focuses on imparting essential skills for understanding, maintaining, and repairing vehicle bodies. Participants will learn to decode specifications, measure dimensions, identify parts, study body styles, and sketch constructions. They'll gain insights into dent repair, corrosion prevention, paint application, windshield replacement, and trim installation. By engaging with real-world scenarios and tools, students will develop problem-solving abilities and a solid foundation in automotive bodywork, enhancing their proficiency in diagnosing and addressing body-related issues.

LIST OF PRACTICALS:

1. Decoding specifications of brand-new vehicle
2. Practice of measuring various body dimensions
3. Typical Car - body construction with sketches. Study of various car body styles with sketches
4. Identification of exterior car body parts
5. Find the VIN on several vehicles. Write down the location of the VIN for several cars. Look up the VIN data in a service manual
6. To demonstrate constructional and operational features of mechanical and power window mechanism.
7. To study the construction of typical truck body and draw sketches.
8. Inspect several badly damaged vehicles. Make a list of the mechanical parts that have been damaged in the collision.
9. Identifying various causes of corrosion and their prevention
10. Identification and practice of using various denting hand tools: Denting hammers, dollies, dent pullers, spoons & picks
11. Practice of Paintless Dent Repair (PDR)
12. Steps to dent repair
13. Preparing a car body for painting practice of spray-painting processes.
14. Practice of mixing a paint for cars
15. Practice of replacing a broken windshield
16. Installing body trim and moldings
17. Using a service manual, summarize the procedures for removing a hood and fender from three different makes of cars and trucks. Write a report on how these procedures vary
18. Inspect plastic body parts. Try to find an identification code on the back of each part. Make a report on the type of plastic used for different parts.
19. Visit an outside body shop. Talk with other technicians about the tools they use. Discuss with the class anything you learned about new tools or techniques.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING	
Course Code: **AEPE09**	Course Title: **Automobile Systems Design (Elective-III)**
Semester: **6th**	Credits: **03**
Periods Per Week: **03 (L:03, T: 00, P:00)**	

COURSE OBJECTIVE:

This course aims to familiarize students with the fundamental knowledge in the field of automotive design and acquaint them with required analytical abilities to provide solutions to design problems.

COURSE CONTENT:

Part A: Design of Engine Components

1. Cylinder and cylinder head

1.1. Data of engine specifications and calculations of cylinder dimensions for given power.
1.2. Design of cylinder head thickness

2. Piston

2.1. Forces acting on piston
2.2. Design of piston crown by bending strength and thermal considerations.
2.3. Design of piston rings and skirt length
2.4. Design of piston pin for bearing, bending and shear considerations

3. Connecting Rod

3.1. Loads acting on connecting rod
3.2. Design of connecting rod cross -section (I-section).
3.3. Design of connecting rod small end
3.4. Design of big end, cap and bolts.

Part B: Design of Chassis Components

4. Design of clutch

4.1. Considerations in designing a friction clutch
4.2. Design of Single plate and Multi plate, using uniform pressure and wear condition.

5. Gearbox

5.1. Teeth calculation of gears for sliding mesh/constant mesh gear box
5.2. Concept of minimum number of teeth on spur pinion

6. Leaf Spring

6.1. Concept of nipping and grading
6.2. Design of semi elliptical leaf spring

7. Design of axles

7.1. Design of propeller shaft,
7.2. Loads acting on fronts and rear axles
7.3. Design of front axle (dead axle only)
7.4. Design of Rear axle (fully floating only)

COURSE OUTCOME:

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

- Illustrate various design aspects and design procedures.
- Design shafts and Gearbox
- Evaluate the various forces, stresses and strains acting on the different engine components.
- Design various Engine components.
- Design clutch/ with drive lines.

RECOMMENDED BOOKS

1. Design of Machine Elements by V B Bhandari, Tata McGraw-Hill Publishing Company Limited New Delhi
2. Machine design by SG Kulkarni, Tata McGraw-Hill Publishing Company Limited New Delhi
3. Fundamentals of machine design by Ajeet Singh, Cambridge
4. Machine Design by U. C. Jindal, Pearson
5. A Textbook of Machine Design by R.S. Khurmi and J.K. Gupta, S Chand Publications
6. Machine Design by Sharma and Agrawal; Katson Publishing House, Ludhiana.
7. Machine Design by A.P.Verma; SK Kataria and Sons, Delhi

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME (HOURS)	MARKS (%AGE)
1.	08	16
2.	09	20
3.	09	18
4.	04	08
5.	05	10
6.	06	13
7.	07	15
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING	
Course Code: **AEPE10**	Course Title: **Garage Management (Core Elective-III)**
Semester: **6th**	Credits: **03**
Periods Per Week: **03 (L: 03, T: 00, P: 00)**	

COURSE OBJECTIVE:

This comprehensive course delves into the core aspects of the automotive industry, equipping learners with a solid foundation in motor vehicle operations, service procedures, safety protocols, and maintenance practices. Participants will gain a deep understanding of motor vehicle companies, their structures, and operations, along with honing technical English writing skills crucial for effective communication. The course also emphasizes safety measures, service information utilization, and advanced maintenance techniques, enabling students to excel in vehicle maintenance and inspection, while staying abreast of evolving trends in the field.

COURSE CONTENT:

1. **The motor industry**
   - 1.1. Introduction; Types of motor vehicle companies; Company structure; Role of a franchised dealer; Reception and booking systems; Parts department; Estimating costs and times; Job cards and systems; Invoicing; Warranties; Computerized workshop system
   - 1.2. Technical English
     - 1.2.1. Formal Letter Writing Skills: Letter of complaint, Job application letter
     - 1.2.2. Industry Related Writing Skills: Writing emails, completing a job card, Work carried out on a job card, Completing a parts invoice
     - 1.2.3. Writing Skills: Car descriptions, Vehicle modification, Persuasive writing
2. **Garages and Service Stations**
   - 2.1. Types of Garages; Location and Layout of Garages and Service Stations; Layout of a Workshop;
   - 2.2. Equipment for Garages and Service Stations; Motor Vehicle Workshop Tools; Important Services and Equipment; Standard Service for Cars and Light Vans; Service Procedure
3. **Shop safety**
   - 3.1. Personal protective equipment: safety glasses, clothing; shoes; gloves; bump cap; ear protection; respiratory protection
   - 3.2. Safety tips for technicians
   - 3.3. Fire extinguisher: classes and types of fire extinguishers; fire blanket
   - 3.4. First aid and eye wash station
   - 3.5. Cleaning methods and processes: power washing; abrasive cleaning; thermal ovens; chemical and microbe cleaning
   - 3.6. Jump starting and battery safety
4. **Shop work and service information**
   - 4.1. Information sources: VIN; service specification; service manuals and shop manuals; service bulletins; flat rate manuals; labour guide manuals; lubrication

manuals; electronic service information; hardcopy vs electronic service information; specialty repair manuals

4.2. Automotive service procedure; steps in an automotive repair job;

4.3. Automotive satellite television network; aftermarket supplies guide and catalogues

5. Vehicle Maintenance and inspection

5.1. importance of Maintenance; Maintenance Documentation

5.2. Types of Maintenance: Preventive Maintenance; Scheduled Preventive Maintenance; Condition-Based Preventive Maintenance; Predictive Maintenance; Proactive Maintenance; Breakdown Maintenance

5.3. Procedure and Methodologies Adopted: Daily Maintenance; Weekly Maintenance; 3,000–7,500-mile Maintenance; 12,000–15,000-mile Maintenance; 30,000–60,000-mile Maintenance

5.4. Advanced Techniques and Tools Used: Modern Tools Used; On-Board Diagnostics; Handheld; PC/Laptop with Scan Tool; Mobile Device (Phone or Tablet) Application

5.5. Recent Trends in Routine Maintenance

5.6. Importance of inspection; Prework; post work; pre-delivery inspection (PDI); used vehicle inspection; special inspection (e.g., after an accident).

COURSE OUTCOME:

On completion of this course student will be able to:

- Identify and enlist garage tools, equipment and prepare garage layout for setting new garage and service station.
- Identify different garages found in common practice.
- Understand the various activities take place in a modern garage and service station
- Understand schedule maintenance of automobiles.
- Understand management of garage store, procurement of stores, sales and distribution motor vehicles.
- Know the main features of motor vehicle act applicable for day-to-day life.

RECOMMENDED BOOKS:

1. Automotive Mechanics by William H Crouse, Tata McGraw Hill
2. Automobile Engineering by GBS Narang, Khanna Publications
3. Vehicle Maintenance and Garage Practice by Jigar A. Doshi (Author), Dhruv U. Panchal (Author), Jayesh P. Maniar (Author), Prentice-Hall of India Pvt. Ltd
4. A Practical Approach to Motor Vehicle Engineering and Maintenance by Allan Bonnick, Derek Newbold
5. Automotive Systems Principles and Practice by G.K. Awari V.S. Kumbhar R.B. Tirpude, Taylor and Francis
6. Automotive Technology by NK Giri, Khanna Publications
7. Vehicle maintenance and garage practice by JA Doshi, PHI
8. All about Automobiles by MK Sapru, Vijay Publishers
9. Automobile Engineering Vol III by Anil Chikara, SatyaPrakashan

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME (HOURS)	MARKS (%AGE)
1.	08	16
2.	09	20
3.	09	18
4.	04	08
5.	05	10
6.	06	13
7.	07	15
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING	
Course Code: **AEPE11**	Course Title: **Special Purpose Vehicles (Core Elective-III)**
Semester: **6th**	Credits: **03**
Periods Per Week: **03 (L: 03, T: 00, P: 00)**	

COURSE OBJECTIVE:

The course aims to provide a comprehensive understanding of Special Purpose Vehicles (SPVs) and Heavy Earth Moving Machinery (HEMM), focusing on their design, construction, and applications. Students will grasp the fundamental principles of SPV design, including noise, vibration, and thermal considerations, as well as ergonomic and safety aspects. The course will cover various types of SPVs and HEMM, their working features, and specialized equipment, such as bulletproof materials. Upon completion, participants will be equipped to design, analyse, and operate these vehicles with emphasis on efficiency, safety, and innovation.

COURSE CONTENT:

1. **Special Purpose vehicle Basics**
   - 1.1. Introduction, Requirements of SPV, Applications of SPV
   - 1.2. Classification of Special Purpose Vehicles, wheel type & track type, applications, Vehicles for differently challenged persons
2. **Principles and Design Consideration**
   - 2.1 Noise, Vibrations
   - 2.2 Thermo-Mechanical properties
   - 2.3 Fatigue, Fracture, Failure, corrosion analysis and its Prevention.
   - 2.4 Design considerations of different systems of SPV'S (**Concept only**) Mechanical linkages, Electrical, Hydraulic, Pneumatics, Lubrication, Transmission, Braking, final Drive and steering systems.
3. **Ergonomics and Aesthetics of SPV**
   - 3.1. Human factors in special purpose vehicle design with reference to
     - 3.1.1. Comfort, convenience and safety
     - 3.1.2. Effects of noise, vibration and thermal stresses.
   - 3.2. Safety, Stability and Economics of SPV's
4. **Special Purpose vehicle**
   - 4.1. Construction and working features of: Ambulance, fire engine, towing and rescue vehicles, tippers, Dumpers, fork lift.
   - 4.2. Construction and special equipment of Bullet proof materials
5. **Heavy Earth moving Machinery**
   - 5.1. Powertrain layout and working features of: Scrapers and shovels, excavators, bulldozers, and road rollers.
   - 5.2. Constructional features, applications, powertrain layout and working features of: Backhoe Loaders, snow blowers, HDD.
   - 5.3. Properties, use and production of Bullet proof materials.

COURSE OUTCOME:

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

- Understand the construction and operation of heavy equipment viz. tractors, dumpers, graders, compactors, dozers, loaders, excavators, cranes, scrapers, lift trucks, Dredgers, tanker Carriers.

- Explain the different components of a hydraulic system utilized in a hydraulically operated heavy vehicle.
- Understand the importance of maintenance and safety measures of heavy equipment.

RECOMMENDED BOOKS

1. Theory of Ground Vehicles by J.Y Wong, John Wiley and Sons.
2. Trucks Cranes by A. Astakhov, MIR, Moscow.
3. Hand book of Earth Moving Machinery - Central Water & Power Commission (Govt. of India)
4. N. Rudenko, "Material Handling Equipment", M.R. Publishers.
5. David A. Day, Neal B. H. Benjamin, "Construction Equipment Guide", Wiley.
6. Donnell hunt and L. Garver - Farm machinery and mechanism, Lowe state university press.

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME (HOURS)	MARKS (%AGE)
1.	08	16
2.	10	20
3.	09	18
4.	04	08
5.	04	10
6.	06	13
7.	07	15
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING	
Course Code: **AEPE12**	Course Title: **Metrology (Core Elective-III)**
Semester: **6th**	Credits: **03**
Periods Per Week: **03 (L: 03, T: 00, P: 00)**	

COURSE OBJECTIVE:

The course aims to provide a comprehensive understanding of metrology, encompassing fundamental concepts like standardization, precision, accuracy, and calibration. Students will learn about a wide array of measurement instruments, from non-precision to precision linear and angular instruments, comparators, and optical tools. The course delves into surface finish measurement, screw thread and gear measurements, and introduces instrumentation techniques for mechanical quantities using transducers and electronic devices. By the end, participants will possess a solid foundation in measurement principles, tools, and techniques crucial for accurate and reliable engineering practices.

COURSE CONTENT:

1. Introduction

1.1. Definition of metrology
1.2. Standard of measurement
1.3. Types of Errors - Controllable and random errors
1.4. Precision, accuracy, sensitivity, hysteresis, response time, repeatability,
1.5. calibration, uncertainty of measurement, interchangeability.
1.6. Standardization and standardizing organizations

2. Linear and Angular Measurement

2.1. Construction features and use of instruments for non-precision linear measurement: steel rule, callipers, surface plate, angle plate, V-block.
2.2. Construction features and use of instruments for precision measurements: vernier callipers, vernier height and depth gauges, micrometres.
2.3. Slip gauges, Indian standards of slip gauges, sets of slip gauges, use of slip gauges.
2.4. Cylinder bore gauges, feeler and wire gauges. Checking flatness, roundness and squareness
2.5. Comparators–Characteristics, uses, working principles of different types of comparators: mechanical, electrical, electronics and pneumatic
2.6. Construction and use of instruments for angular measurements: bevel protector, sine bar, angle gauges, clinometer, angledekkor. Optical instruments for angular measurement, auto collimator.

3. Measurement of Surface Finish

3.1. Terminology of surface roughness.
3.2. Concept of primary texture and secondary texture.
3.3. Factors affecting surface finish.
3.4. CLA, RMS and RA value.
3.5. Principle and operation of stylus probe instruments. Tomlinson surface meter and Taylor surface talysurf.

4. Measurements of Screw threads and Gauges

4.1. Measurement of screw threads- Introduction, measurements of external and core diameters, checking of pitch and angle of threads with gauges.
4.2. Measurements of gears (spur) – Measurement of tooth thickness, pitch,
4.3. Profile projector, Coordinate Measuring Machine (CMM), Tool maker's microscope.

5. Instrumentation

5.1. Various types of instruments used for mechanical quantities such as displacement, velocity, acceleration, speed and torque. Use of transducers and electronic counters, stroboscope, vibrating reeds and tachometers.

5.2. Strain gauge – use of strain gauge and load cells

COURSE OUTCOME:

After the completing this course, the students will be able to:

- Gain an understanding of the fundamental principles and concepts of metrology, including measurement units, accuracy, precision, calibration, and traceability.
- Learn various measurement techniques and instruments used in metrology, such as calipers, micrometers, gauges, coordinate measuring machines, and optical instruments.
- Identify and analyze various sources of measurement errors

RECOMMENDED BOOKS

1. Metrology and Measurements by AK Bewoor&Kulkarni, Tata McGraw Hills
2. Engineering Metrology by RK Jain; Khanna Publishers, New Delhi.
3. A Text Book of Production Engineering by RC Sharma; S Chand and Company, New Delhi.
4. Engineering Metrology by RK Rajput; SK Kataria and Sons, Ludhiana.
5. A textbook of metrology by M Mahajan, DhanpatRai& Co
6. Mechanical Measurements and Control by DS Kumar

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME (HOURS)	MARKS (%AGE)
1.	08	16
2.	12	26
3.	10	20
4.	08	18
5.	10	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING	
Course Code: **AEOE06**	Course Title: **Disaster Management (Open Elective-II)**
Semester: **6th**	Credits: **03**
Periods Per Week: **03 (L: 03, T: 00, P: 00)**	

COURSE OBJECTIVE:

The course aims to provide a comprehensive understanding of disasters, encompassing their definitions, types, and underlying factors such as hazards, risks, and vulnerabilities. It delves into both natural and man-made disasters, examining their causes and impacts. Participants will explore mitigation and management strategies, including disaster management cycles, early warning systems, and building resilience in seismic zones. Practical aspects like training, awareness programs, and the application of GIS and remote sensing techniques will be covered. The course further examines significant disasters, fostering insights into their nature, impacts, and socio-economic and environmental repercussions, with a focus on real-world case studies, particularly within the context of Jammu and Kashmir.

COURSE CONTENT:

1. Definition and types of disaster

1.1. Hazards and Disasters, Risk and Vulnerability in Disasters
1.2. Natural disasters: earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes
1.3. Man-made disasters: Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.

2. Mitigation and Management techniques of Disaster

2.1. Basic principles of disasters management, Disaster Management cycle, Disaster management policy,
2.2. Early Warming Systems, building design and construction in highly seismic zones, retrofitting of buildings.
2.3. National and State Bodies for Disaster Management,

3. Training, awareness program and project on disaster management

3.1. Training and drills for disaster preparedness
3.2. Awareness generation program
3.3. Usages of GIS and Remote sensing techniques in disaster management

4. Study of Important disasters

4.1. Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate
4.2. Flood types and its management
4.3. drought types and its management
4.4. landside and its managements
4.5. Case studies of disasters in Jammu and Kashmir (e.g., Earthquakes, Landside).
4.6. Social Economics and Environmental impact of disasters.

COURSE OUTCOME:

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

- Define hazards and disasters, and differentiate between natural and man-made disasters.
- Understand the concepts of risk, vulnerability, and the disaster management cycle.
- Analyze disaster mitigation strategies, including early warning systems and building retrofitting.
- Recognize the roles of national and state disaster management bodies.
- Develop and implement training, drills, and awareness programs for disaster preparedness.
- Utilize GIS and remote sensing technologies in disaster management.
- Assess the social, economic, and environmental impacts of disasters through case studies.

RECOMMENDED BOOKS

1. Disaster Management and Preparedness by Dhawan, CBS Publishers
2. Disaster Management by HK Gupta, Universities Press
3. Fundamentals Of Disaster Management Scholars World Fundamentals of Disaster Management by Deshmukh, Atul B, Sandip P Nikam&Ulhas S Surve, SW
4. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.
5. Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.
6. Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India LTD.
7. Disaster Management Guidelines, GOI-UND Disaster Risk Program
8. Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME (HOURS)	MARKS (%AGE)
1.	12	24
2.	12	26
3.	10	20
4.	14	30
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING	
Course Code: **AEOE07**	Course Title: **Computer Numerical Control (Open Elective-III)**
Semester: **6th**	Credits: **03**
Periods Per Week: **03 (L: 03, T: 00, P: 00)**	

COURSE OBJECTIVE:

This course offers a comprehensive understanding of NC, CNC, and DNC systems, including their applications, benefits, and drawbacks. Participants will learn about machine control units, CNC machine construction, tooling, part programming, automation trends, and robot technology, with a focus on automobile industry applications. By course end, learners will be well-equipped with essential skills for modern manufacturing and automation.

COURSE CONTENT:

1. Introduction

1.1. Introduction to NC, CNC & DNC, their advantages, disadvantages and applications,
1.2. Machine Control Unit, input devices, selection of components to be machined on CNC machines,
1.3. Problems with conventional NC, New developments in NC, Axis identification,
1.4. PLC Control and its components. Its advantages and disadvantages.

2. Construction and Tooling of CNC

2.1. Design features, specification Chart of CNC machines, use of slideways, balls, rollers and coatings, motor and leadscrew, swarf removal, safety and guarding devices,
2.2. various cutting tools for CNC machines,
2.3. overview of tool holder, different pallet systems and automatic tool changer system, management of a tool room.

3. Part Programming

3.1. Part programming and basic concepts of part programming, NC words, part programming formats, simple programming for rational components, part programming using conned cycles, subroutines and do loops, tool off sets, cutter radius compensation and wear compensation.

4. System Devices

4.1. Actuators, Transducers and Sensors, Tachometer, LVDT, opto-interrupters, potentiometers for linear and angular position, encoder and decoder, axis drives, open loop system, close loop system.

5. Automation and NC system

5.1. Role of computer in automation, emerging trends in automation, automatic assembly, manufacture of magnetic tape, manufacture of printed circuit boards, manufacture of integrated Circuits,
5.2. Overview of 3D additive manufacturing, FMS, Group technology, CAD/CAM and CIM.

6. Robot Technology

6.1. Introduction to robot technology, reasons for using robots
6.2. Basic elements of robots
6.3. basic robot motion, robot applications
6.4. applications of robots in Automobile industry

COURSE OUTCOME:

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

- Perform various CNC machining operations, such as milling, turning, drilling, and grinding
- Interpret engineering drawings, blueprints, and specifications to understand the requirements for machining operations.
- Write and modify CNC programs to control machine movements, tooling, and machining operations.
- Explore the various applications of robotics in different industries, such as manufacturing, healthcare, logistics, agriculture, and entertainment.

RECOMMENDED BOOKS

1. CNC Machines – Programming and Applications by M Adithan and BS Pabla; New Age International (P) Ltd., Delhi.
2. Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata McGraw Hill, New Delhi.
3. CNC Machine by Bharaj; Satya Publications, New Delhi.
4. Production technology by R K Jain, Khanna Publishers
5. A Textbook of Manufacturing Technology by R. K. Rajput, Laxmi Publication

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME (HOURS)	MARKS (%AGE)
1.	06	12
2.	09	20
3.	08	18
4.	10	20
5.	08	16
6.	07	14
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING	
Course Code: **AEOE08**	Course Title: **Values and Ethics in Profession (Open Elective-II)**
Semester: **6th**	Credits: **03**
Periods Per Week: **03 (L: 03, T: 00, P: 00)**	

COURSE OBJECTIVE:

This course aims to provide a comprehensive understanding of the multifaceted impact of technological growth on society and the environment. It delves into topics such as resource depletion, renewable energy solutions, environmental degradation, and eco-friendly technologies. The course also explores the ethical dimensions of the engineering profession, addressing conflicts between business interests and ethical ideals, as well as the broader societal and human values inherent in modern technology-driven societies. By examining these complex issues, students will develop a holistic perspective on technology, ethics, and values, enabling them to navigate the challenges and responsibilities of their future roles as technologists and engineers.

COURSE CONTENT:

1. Effects of Technological Growth

1.1. Rapid Technological growth and depletion of resources, sustainable development
1.2. Energy Crisis: Renewable Energy Resources
1.3. Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics
1.4. Appropriate Technology Movement of Schumacher; later developments
1.5. Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis.
1.6. Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centred Technology.

2. Ethics of Profession

2.1. Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals.
2.2. Social and ethical responsibilities of Technologists.
2.3. Codes of professional ethics. Whistle blowing and beyond

3. Profession and Human Values

3.1. Values Crisis in contemporary society
3.2. Nature of values: Value Spectrum of a good life
3.3. Psychological values: Integrated personality; mental health
3.4. Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution.
3.5. Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity
3.6. Moral and ethical values: Nature of moral judgements; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

COURSE OUTCOME:

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

- Understand the implications of rapid technological growth on resource depletion, sustainable development, and energy crises.

- Analyze environmental issues such as degradation and pollution, and explore eco-friendly technologies and regulations.
- Explore the impact of technology on developing nations, including challenges in technology transfer and assessment.
- Examine the role of human operators in engineering projects, addressing issues related to automation and human-centered technology.
- Address ethical dilemmas in the engineering profession, including conflicts between business demands and professional ethics.
- Recognize the social and ethical responsibilities of technologists, and understand codes of professional ethics and whistleblowing.
- Reflect on contemporary value crises, and explore societal, psychological, aesthetic, moral, and ethical values, including those enshrined in the Indian Constitution.

RECOMMENDED BOOKS

1. Values and Ethics in Business and Profession by S Manna, PHI
2. Professional Ethics and Human Values by M Govindarajan and S Natarajan, PHI
3. Human Values & Professional Ethics by Ishwar Singh, DhanpatRai& Co
4. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME (HOURS)	MARKS (%AGE)
1.	20	45
2.	12	20
3.	16	35
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING	
Course Code: **AEOE09**	Course Title: **Artificial Intelligence (Open Elective-II)**
Semester: **6th**	Credits: **03**
Periods Per Week: **03 (L: 03, T: 00, P: 00)**	

COURSE OBJECTIVE:

The course on "Artificial Intelligence and Robotics" aims to provide students with a comprehensive understanding of the fundamental concepts, theories, and applications of AI and robotics. It covers topics ranging from the history and philosophy of AI to the practical implementation of intelligent systems and robots. Through this course, students will explore various AI techniques, agent-environment interactions, and the role of AI in computer vision and the automotive industry. The course aims to equip students with the knowledge and skills necessary to engage with cutting-edge technologies and contribute to advancements in the field.

COURSE CONTENT:

1. **Introduction to Artificial Intelligence (AI)**
   - 1.1. Basic concept of Artificial Intelligence, History of AI
   - 1.2. The Philosophy of AI, Goals of AI, Techniques of AI
   - 1.3. Applications of AI (Gaming, Natural Language Processing, expert systems, vision systems, speech recognition, handwriting recognition, Intelligent Robot)

2. **Intelligent Systems**
   - 2.1. Define Intelligence, and its types (Linguistic intelligence, Musical intelligence, Logical mathematical intelligence, Spatial intelligence, Bodily Kinesthetic intelligence, Intra-personal intelligence)
   - 2.2. What is Intelligence Composed of: (Reasoning, Learning, Problem Solving, Perception, Linguistic Intelligence)
   - 2.3. Difference between Human and Machine Intelligence

3. **Agents and Environments**
   - 3.1. What are Agent and Environment?
   - 3.2. Agents Terminology, Rationality, Ideal Rational Agent?
   - 3.3. The Structure of Intelligent Agents
   - 3.4. The Nature of Environments Properties of Environment

4. **Robotics**
   - 4.1. Concept of Robots and Robotics
   - 4.2. Difference in Robot System and Other AI Programs
   - 4.3. Robot Locomotion: legged locomotion, wheeled locomotion, combination of legged and wheeled locomotion, tracked locomotion
   - 4.4. Components of a Robot: power supply, activators, electric motors, pneumatic air muscles, muscle wires, piezo motors and ultrasonic motors, sensors

5. **Computer vision**
   - 5.1. Artificial Intelligence vs Computer Vision

5.2. Tasks of Computer Vision: OCR, face detection, object recognition, position estimation
5.3. Application Domains of Computer Vision
5.4. Applications of Robotics

6. AI in Automotive Industry

6.1. Applications Of AI in automotive industry
6.2. Benefits of implementing AI technology in Automotive industry
  6.2.1. Driver Behaviour Analytics
  6.2.2. Quality Control
  6.2.3. Rapid Document Digitalization
  6.2.4. Data Driven Personalized control
  6.2.5. Risk Identification and estimation
6.3. Future of AI in Automotive sector

COURSE OUTCOME:

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

- Understand the fundamental concepts, history, and philosophy of AI, including its goals and techniques.
- Explore various applications of AI, such as gaming, natural language processing, expert systems, and robotics.
- Define intelligence, its types, and components, and differentiate between human and machine intelligence.
- Analyze the concepts of agents and environments, including the structure of intelligent agents and the nature of environments.
- Comprehend the fundamentals of robotics, including robot locomotion and the components that make up robotic systems.
- Differentiate between AI and computer vision, and understand the tasks and applications of computer vision in various domains.
- Evaluate the role and future of AI in the automotive industry, including applications like driver behavior analytics, quality control, and risk identification.

RECOMMENDED BOOKS:

1. Introduction to AI by RajendraAkerkar, PHI publications
2. Artificial intelligence unleashed by Ryan Baumgartner, M&M Limitless
3. Artificial Intelligence, Practical Approach Rajiv Chopra, S Chand
4. Artificial Intelligence a Modern Approach by DR. Dwarakanath& Co.
5. Introduction to AI by Eugene Charnaik, Pearson publications
6. Artificial Intelligence, Building intelligent systems by ParagKulkarni, PHI publications.

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit	Time (Hours)	Marks (%age)
1.	06	12
2.	09	18
3.	05	10
4.	11	24
5.	08	16
6.	09	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING	
Course Code: **AEOE10**	Course Title: **E-Governance (Open Elective-II)**
Semester: **6th**	Credits: **03**
Periods Per Week: **03 (L: 03, T: 00, P: 00)**	

COURSE OBJECTIVE:

This comprehensive course aims to provide students with a deep understanding of e-governance, encompassing its necessity, challenges, and global trends. By delving into Indian approaches like the NeGP, participants will gain insights into strategy formulation, project development, and effective management. The course also focuses on capacity building, change management, and government process re-engineering, equipping learners to drive successful e-governance initiatives while emphasizing leadership roles and technological advancements in the field.

COURSE CONTENT:

1. Introduction to E-Governance:

Need of e-governance, Issues in e-governance application and the digital divide, Evolution, scope and concept of e-governance, components of governance, Present global trends of growth in e-Governance, Areas of e-governance, critical success and failure factors for e-governance, Role of social media in e-governance**.**

2. Indian approaches to governance

Introduction to NeGP (National e-Governance Plan), NeGP vision, The framework of e-governance, National e-Governance strategy, Major components of national e-governance plan, Mission model projects, Infrastructure and pillars of NeGP, Capacity building initiatives under NeGP

3. Development and management of projects under e-governance.

Introduction to e-government project development, Conceptualization phase, Architect phase, Define phase, Support phase, e-government Project Management Phase, Business model for e-government projects, Public private partnership for e-government Security for e-government projects.

4. Capacity building and changing management

Capacity building for e-governance, Governance structure for e-government project, Change management for e-governance projects, Role of leadership in e-governance projects.

5. Government process Re-engineering

Process reformers for e-governance projects, Tools and techniques for government process re-engineering, Legal reforms, Technology management and enterprise architecture for e-governance.

COURSE OUTCOME:

After studying this course, students will be able to:

- Understand the need for e-governance, the issues it faces, and the concept's evolution and scope, including critical success and failure factors.
- Analyze the National e-Governance Plan (NeGP) in India, its vision, strategy, major components, and infrastructure.

- Develop and manage e-government projects, including phases of project development and the role of public-private partnerships.
- Implement capacity-building initiatives and change management strategies for successful e-governance projects.
- Understand the importance of leadership in e-governance and its impact on project outcomes.
- Apply tools and techniques for government process re-engineering to improve efficiency and effectiveness in governance.
- Address legal reforms, technology management, and enterprise architecture considerations in the context of e-governance.

RECOMMENDED BOOKS

1. E-governance concepts and case studies by CSR Prabhu Prentice of India Pvt limited (2004)
2. E-Governance book by Dr. Uttam Kumar Singh, Dr. Akshaya Kumar Nayak & Dr. Read E
3. E-governance Techniques: Indian and Global Experiences by B Srinivas Raj, New Century Publications
4. E-Governance a New Age Tool for 21st Century Challenges by Rao and Mrs Krishna Prasada and D C Reddy, Raj Publications Century Challenges
5. A Handbook Of E-Governance in India by Dr M Sumathy
6. E-Governance and Rural Development by Venkatamallu Thadaboina
7. E-governance in developing countries by Backus Michiel, IICD Research Brief, No.1 (2001)

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME (HOURS)	MARKS (%AGE)
1.	10	20
2.	10	22
3.	10	20
4.	18	16
5.	10	22
Total	**48**	**100**

CURRICULUM

FOR

SIXTH SEMESTER

DIPLOMA

IN

CIVIL

ENGINEERING

STUDY AND EVALUATION SCHEME FOR 6TH SEMESTER CIVIL ENGG

Code	Subjects	Study Scheme Periods Per Week			Total Hours L+T+P	Credits			Total Credits L+T+P
		L	T	P		L	T	P	
CIVPC601	Design of Steel Structures & Drawing	4	0	0	4	4	0	0	4
HS602	Entrepreneurship & Start Ups	3	0	0	3	3	0	0	3
Open Elective - III		3	0	0	3	3	0	0	3
CIVOE603	Energy Conservation & Audit								
CIVOE604	Engineering Economics & Accountancy								
CIVOE605	Economic Policies in India								
CIVMP606	Major Project	0	0	14	14	0	0	7	7
CIVSI607	Seminar	0	0	4	4	0	0	2	2
Elective- IV		3	0	0	3	3	0	0	3
CIVPE608	Construction Contracts & Specifications								
CIVPE609	Construction Planning & Scheduling								
AU607	Essence of Indian Knowledge & Tradition	2	0	0	2	0	0	0	0
TOTAL		**15**	**0**	**18**	**33***	**13**	**0**	**9**	**22**

The extra classes to be managed by taking supplementary classes/during project hours.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN CIVIL ENGINEERING	
Course Code: CIV**PC601**	Course Title: **Design of Steel Structures & Drawing**
Semester: **6th**	Credits: **4**
Periods Per Week: **(L: 4, T: 0, P: 0)**	

COURSE OBJECTIVE:

This subject is an applied engineering subject Diploma holders in Civil Engineering will be required to supervise steel construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials. This subject thus deals with elementary design, principles as per BIS code of practice ARE: 800.

COURSE CONTENT

1. Structural Steel and Properties

Advantages and disadvantages of Steel structures, structural steel sections, loads and load combinations, Limit state design- Design considerations, Failure criteria for steel, codal specifications and section classifications as per **IS 800-2007**.

2. Bolted Connections

Introduction, advantages and disadvantages of bolted connections, Difference between unfinished bolts and High strength friction grip bolts (HSFG). Behaviors of bolted joints, failure of bolted joints, Simple problems on finding shear strength, bearing strength, tensile strength of bolts (bearing type only).Tensile strength of plate, Efficiency of the joint. Simple Lap Joint Design problems.

Note: Excluding problems on HSFG Bolts and Long joints conditions.

3. Welded Connections

Introduction, advantages of welding, types of joints, weld symbols, specifications, effective area of weld, design strength of fillet weld, Simple problems on welded joints (fillet weld only).

4. Tension and Compression Members

Analysis and design of single angle section tension members and their bolted and welded connections with gusset plate as per IS:800 -2007

Analysis and design of single angle sections compression members (struts) and their Bolted and welded connections with gusset plate as per BIS:800

5. Columns:

Concept of buckling of columns, effective length and slenderness ratio, permissible stresses in compression as per IS:800 for different end conditions. Analysis and Design of axially loaded single section steel column Types of column bases (Descriptive only) Beam and column, frame and seated connections (descriptive only, no design). Drawing of Column and Column Bases, Column and Beam Connections.

6. Roof Trusses

Form of trusses, pitch of roof truss, spacing of trusses, spacing of purlins, connection between purlin and roof covering. Connection between purlin and principal rafter (no design, only concept). Drawing of Fink Roof Trusses with all important details.

7. Beams

Only concept of Beams. Introduction to plate girder and functions of various elements of a plate girder. Drawing of Plate Girder with important details.

Important Note: Use of IS: 800 and Steel Tables are permitted in examination.

COURSE OUTCOME

After undergoing the subject, students will be able to:

- Explain structural properties of steel and its designation as per Indian Standards
- Select different types of bolted and welded joints
- Analyze and design single and double angle section struts and I section compression members
- Explain different types of trusses, their different components and usability
- Analyze and design of simply supported steel beams
- Select various types of plate girders
- Supervise fabrication and erection of steel structure like trusses, columns and girders

RECOMMENDED BOOKS:

1. Duggal SK, "Design of Steel Structures" by Standard Publishers, Delhi
2. Birinder Singh, "Steel Structures Design and Drawing", Kaption Publishing House, Ludhiana
3. Ram Chandra, "Design of Steel Structures", Standard Publishers,Delhi
4. S Ramamurthan, "Design of Steel Structures",
5. HarbhajanSingh ,"Design of Steel Structures", Abhishek Publishing, Chandigarh
6. IS Code : 800-2007
7. Layal JS "Civil Engineering Drawing", SatyaParkashan, New Delhi
8. Chandel RP " Civil Engineering Drawings"
9. Kumar; NS " Civil Engineering Drawing " IPH, New Delhi
10. Malik RS and Meo GA, "Civil Engineering Drawing" Asian Publishing House, New Delhi
11. Singh, Birinder "RCC Design and Drawing" Kaption Publishing House, New Delhi.
12. Singh, Harbhajan, "Structural Drawings", Abhishek Publishers, Chandigarh
13. B.V. Sikka, Civil Engineering Drawing

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	3	05
2	05	10
3	05	10
4	10	25
5	13	25
6	06	10
7	06	15
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN CIVIL ENGINEERING	
Course Code: **HS602**	Course Title: **Entrepreneurship and Start-ups**
Semester: **6th**	Credits: **3**
Periods Per Week:**3(L: 3, T: 0, P: 0)**	

COURSE OBJECTIVES:

The objectives include cultivating an entrepreneurial spirit and resourcefulness, understanding diverse applications of human resources for dignified livelihoods, grasping the essence and significance of entrepreneurship for personal and national growth, developing entrepreneurial qualities, competencies, and motivation, and mastering the skills required for creating and managing entrepreneurial ventures.

COURSE CONTENT:

1. INTRODUCTION TO ENTREPRENEURSHIP AND START–UPS

1.1. Definitions, Traits of an entrepreneur, Entrepreneurship, Motivation
1.2. Types of Business Structures,
1.3. Similarities / differences between entrepreneurs and managers.

2. BUSINESS IDEAS AND THEIR IMPLEMENTATION

2.1. Discovering ideas and visualizing the business
2.2. Activity map
2.3. Business Plan

3. IDEA TO START-UP

3.1. Market Analysis– Identifying the target market,
3.2. Competition evaluation and Strategy Development,
3.3. Marketing and accounting,

4. MANAGEMENT

4.1. Company's Organization Structure,
4.2. Recruitment and management of talent.
4.3. Financial organization and management

5. FINANCING AND PROTECTION OF IDEAS

5.1. Financing methods available for start-ups in India
5.2. Communication of Ideas to potential investors– Investor Pitch
5.3. Patenting and Licenses

COURSE OUTCOME:

After undergoing the subject, students will be able to:

- Understanding the dynamic role of entrepreneurship and small businesses
- Organizing and Managing a Small Business
- Financial Planning and Control

- Forms of Ownership for Small Business
- Strategic Marketing Planning
- New Product or Service Development
- Business Plan Creation

RECOMMENDED BOOKS:

1. The Startup Owner's Manual: The Step by Step Guide for Building a Great Company,Steve Blank and Bob Dorf, K & S Ranch ISBN–978-0984999392
2. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Eric Ries, Penguin UK ISBN–978-0670921607
3. Demand: Creating What People Love Before They Know They Want It, Adrian J. Slywotzky with Karl Weber, HeadlinebBook Publishing ISBN–978-0755388974
4. The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business, Clayton M. Chris Tensen, Harvard business ISBN

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	20
2	08	20
3	08	20
4	08	20
5	08	20
Total	**40**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN CIVIL ENGINEERING	
Course Code:CIV**OE603**	Course Title: **Energy conservation and Audit (Open Elective-III)**
Semester: **6th**	Credits: **3**
Periods per week: **3 (L: 3, T:0, P:0)**	

COURSE OBJECTIVE:

The subject aims at giving the basic knowledge of energy conservation and audit to the students in order to analyze and optimize the energy usage in various systems such as buildings and transportation for reduction in energy consumption and improving overall efficiency.

COURSE CONTENT

1. **Energy Conservation**
   - 1.1 Introduction to Energy Conservation:
     - 1.1.1 Basic concepts of energy conservation
     - 1.1.2 Importance of energy conservation and its impact on the environment and economy
     - 1.1.3 Energy conservation policies and regulations
   - 1.2 Energy Auditing:
     - 1.2.1 Introduction to energy auditing
     - 1.2.2 Energy audit process and methodologies
     - 1.2.3 Energy audit tools and techniques
     - 1.2.4 Types of energy audits (preliminary, walkthrough, comprehensive)
     - 1.2.5 Data collection and analysis for energy auditing
2. **Energy Systems and Efficiency:**
   - 2.1 Overview of energy systems (electrical, mechanical, thermal)
   - 2.2 Energy efficiency principles and calculations
   - 2.3 Energy performance assessment of various systems and equipment
   - 2.4 Identifying energy loss and waste in systems
   - 2.5 Energy-efficient technologies and practices
3. **Building Energy Conservation:**
   - 3.1 Energy conservation in residential, commercial, and industrial buildings
   - 3.2 Building envelope and insulation systems
   - 3.3 HVAC (Heating, Ventilation, and Air Conditioning) systems and energy efficiency

3.4 Lighting systems and energy-efficient lighting design
3.5 Renewable energy integration in building

4. Renewable Energy Sources

4.1 Overview of renewable energy sources (solar, wind, hydro, geothermal, biomass)
4.2 Integration of renewable energy systems
4.3 Feasibility analysis of renewable energy projects
4.4 Policies and incentives for renewable energy adoption

5. Energy Management and Planning:

5.1 Energy management strategies for organizations
5.2 Energy conservation planning and implementation
5.3 Monitoring and verification of energy savings
5.4 Energy performance contracting

COURSE OUTCOME

After undergoing the subject, students will be able to:

- Identification of energy conservation opportunities in various industrial processes.
- Gain knowledge on tools and techniques employed in energy auditing.
- Comprehend an Energy Audit report, including economic parameters

RECOMMENDED BOOKS:

1. "Energy Audit Handbook: A Guide for Energy Auditors" by A.K. Gupta and S.P. Kaushik
2. Energy Audit and Management: Principles and Practices" by Manish Goyal
3. Energy Management and Conservation Handbook" by Frank Kreith and D. Yogi Goswami
4. "Energy Audit of Building Systems: An Engineering Approach" by MoncefKrarti
5. "Energy Audit and Conservation" by S. RaoParulekar

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO	TIME ALLOTED (HRS)	MARKS ALLOTED (%)
1	16	33
2	08	17
3	10	20
4	06	17
5	04	13
TOTAL	**44**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN CIVIL ENGINEERING	
Course code: **CIVOE604**	Course Title: **Engineering Economics and Accountancy (Open Elective -III)**
Semester: **6th**	Credits:**3**
Period Per Week: **3(L:3, T:0, P:0)**	

COURSE OBJECTIVE:

EEA is a think beyond program which will make the student to examine the application of microeconomics theory as applied to the manager's responsibilities in an organization. To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making. This course should emphasize the quantitative and qualitative applications of economic principle to business analysis

COURSE CONTENT

1. UNIT I:

Business Environment and Managerial Economics Business Environment - Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Latest trends in Business Environment (Entrepreneurship). Managerial Economics - Definition, Nature and Scope of Managerial Economics— Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand, Types, Significance of Elasticity of Demand, Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.

2. UNIT II:

Theory of Production and Cost Analysis. Theory of Production - Production Function — ISO quants and ISO costs, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis - Cost concepts, Opportunity cost, fixed vs. Variable costs, explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)- Determination of Break-Even Point (simple problems) - Managerial Significance and limitations of BEA.

3. UNIT III:

Market structures and Pricing Policies. Introduction to Markets & Market structures - Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and

Monopoly. B: Pricing Policies & Methods - Cost plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, PLC based pricing methods. 103

4. UNIT IV:

Capital and Capital Budgeting. Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting - Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

5. UNIT V:

Financial Accounting and Ratios Financial Accounting -Introduction, Accounting principles, Accounting Cycle, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis Through Ratios - Computation, Analysis and Interpretation of Liquidity Ratios(Current Ratio and quick ratio), Activity Ratios(Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

COURSE OUTCOME

After undergoing the subject, students will be able to:

- Evaluate the economics theories, cost concepts & pricing policies.
- Understand accountancy systems and analyze financial statements.
- Understand the basic principle of managerial economics, accountancy and current business environment.
- Understand the quantities and qualitative application of economic principle to business analysis.

RECOMMENDED BOOKS:

1. Aryasri, "Managerial Economics and Financial Analysis", TMH, 2'd edition, 2005.
2. Varshney & Maheswari, "Managerial Economics", 5thEdition Sultan Chand, 2003
3. H. Craig Peterson & W. Cris Lewis, "Managerial Economics", PHI, 4th Edition
4. Domnick Salvatore, "Managerial Economics In a Global Economy", Thomson, 4° Edition.
5. Raghunatha Reddy &Narasimhachary, "Managerial Economics& Financial Analysis", 4th Edition Scitech.
6. S.N.Maheswari& S.K. Maheswari, "Financial Accounting", 6 th Edition Vikas. S. Dwivedi, "Managerial Economics", Vikas, 6th Edition.

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	7	20
2	6	20
3	6	20
4	6	20
5	7	20
Total	**32**	**100**

PROGRAM: THREE YEARS DIPLOMA IN CIVIL ENGINEERING	
Course Code: CIV**OE 605**	Course Title: **Economic Policies in India (Open Elective -III)**
Semester: **6th**	Credits:**3**
Periods Per Week: **3 (L: 3, T: 0, P: 0)**	

COURSE OBJECTIVE:

The objective of this course is to familiarize the students of different streams with the basic concepts, structure, problems and issues concerning Indian economy.

COURSE CONTENT:

1. UNIT-I

Basic features and problems of Indian Economy, Economic history of India, Nature of Indian Economy, Features and Indicators of Development, Poverty: Concept, Causes and Government policies, Unemployment in India: Concept, Causes and Government policies, Inflation: Nature and extent

2. UNIT-II

Sectoral composition of Indian Economy: Issues in Agriculture sector in India, land reforms, Productivity Trends and Crop Patterns, Green Revolution, Recent Issues in Indian Agriculture Growth, Trends and patterns in Agriculture: Rural Credit & Marketing, WTO & Agriculture

3. UNIT-III

Industrial development ,Industrial Sector in Pre-reform Period, Industrial Sector in Post-reform Period, Issues and Problems of Public Sector, small scale and cottage industries, industrial policy, Public sector in India, service sector in India

4. UNIT-IV

Economic policies: Economic planning in India, Implementation of Economic Policies, Parallel Economy, Role of Bureaucracy and Delivery Mechanism in Implementation of Economic Policies, Planning commission v/s NITI Aayog, Five Year Plans, monetary policy in India, Fiscal Policy in India, Centre State Finance Relations, Finance commission in India. LPG policy in India

5. UNIT-V

External sector in India- India's foreign trade value composition and direction, India Balance of payment since 1991, Role of Foreign Capital-FDI and

Multinational Corporations, Impact of Globalization on Indian Economy, WTO and India

COURSE OUTCOME:

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

- Understand Indian economic policies, planning strategies
- Analyze economic issues and find solutions to complex economic problems and take correct economic judgment.
- Describe the economic Planning in India.
- Explain the Objective, Strategies and Evaluation of economic Planning in India
- Able to identify the problems and capable to decide the application for future development.

RECOMMENDED BOOKS:

1. The Indian Economy; S.K. Ray; Prentic, Hall of India Private Limited New Delhi.
2. Indian Economy ;Gaurav Datt and Aswani Mahajan; S. Chand and Company LTD. Ram Nagar, New Delhi
3. Dutt Rudder and KPM Sunnderam (2017) Indian Economy S Chand & Co, Ltd. New Delhi.
4. Mishra S.K & VK Puri (2017) Indian Economy and its development experience, Himalaya Publishing House.
5. Singh, Ramesh (2016): Indian Econoy, Tata –McGraw Hill Publications, New Delhi
6. Karam Singh Gill (1978), Evolution of the Indian Economy, NCERT, New Delhi

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	7	15
2	7	20
3	7	20
4	8	30
5	7	15
Total	**36**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN CIVIL ENGINEERING	
Course Code: **CIVMP606**	Course Title: **Major Project**
Semester: **6th**	Credits: **7**
Periods Per Week:**14 (L: 0, T: 0, P: 14)**	

As far as possible students should be given live project problems with a view to:

i. Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.

ii. Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.

iii. Provide firsthand experience to develop confidence amongst the students to enable them to use and apply classroom based knowledge and skills to solve practical problems of the world of work.

iv. Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience. It is necessary that each organization is visited well in advance by respective teachers and activities to be performed by students are well defined. The chosen activities should be such which are of curricular interest to students and of professional value to industrial/field organizations. Each teacher is expected to supervise and guide 5 - 6 students.

Effort should be made to identify actual field problems to be given as project work to the students. Project selected should not be too complex which is beyond the comprehension level of the students. The placement of the students for such a practical cum project work should match with the competency profile and interest of students. Students may be assessed both by industry and polytechnic faculty.
Some of suggested projects are given below: These are only guidelines, teacher may take any project related to Civil Engineering depending upon the availability of projects. Preference should be given to practical oriented projects.

According to the need of the polytechnic, the following major projects are suggested:

1. Construction of a small concrete road consisting of following activities
   - Survey and preparation of site plan
   - Preparation of drawings i.e. L-Section and X-Section
   - Estimating earth work
   - Preparation of sub grade with stone ballast

- Laying of concrete
- Testing of slump, casting of cubes and testing
- Material estimating and costing with specifications
- Technical report writing

2. Water Supply system for a one or two villages
   - Surveying
   - Design of water requirements and water distribution system
   - Preparation of drawing of overhead tank
   - Material estimating and costing
   - Specifications
   - Technical report writing

3. Construction of seating benches in polytechnic campus

4. Welding of angle iron and Expanded metal jali to prepare fencing in polytechnic campus

5. Construction of toilets and baths for a shopping complex in a township

6. Construction of bridal path 4 kms long

7. Construction of shopping complex by detailing of RCC drawings, estimating and costing of material

8. Rainwater harvesting
   - Assessment of catchment's area
   - Intensity of rainfall
   - Collection of water
   - Soak pit design
   - Supply of water
   - Monitoring during rainy season

9. Design and construction of septic tank with soak pit for 100 users

10. Preparing plumbing detailed drawings of a two storey building and material estimate and costing

11. Planning and design of sports stadium in a township or cluster of villages

12. Design of small residential building including structural members, specifications, estimating and costing of materials, report writing and municipal drawings for water supply and sewerage system

13. Concrete Mix Design

14. Construction of concrete cubes by mixing appropriate quantity of fly ash with fibres
    (i) the fibres like polypropylene, carbon, steel etc. can be used
    (ii) students will show the comparison between concrete mixed with fibres verses the quality controlled concrete.

15. Estimation and designing of a State Highway Road
    (i) Reconniance survey of proposed road
    (ii) To take L - section and cross sections
    (iii) Fixing of grades
    (iv) Estimation of cutting and filling of earth mass
    (v) Plane tabling survey of proposed road
    (vi) Estimation of proposed road

16. Designing a small height gravity dam
    (i) Constructing of catchment area
    (ii) Calculating the reservoir capacity
    (iii) Designing of gravity dam by taking into account various forces

17. Designing of ferro-cement water tank and toilet. Testing of the ferro-cement products in civil engineering labs.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN CIVIL ENGINEERING	
Course Code: **CIVSI607**	Course Title: **Seminar**
Semester: **6th**	Credits: **2**
Periods Per Week: **4 (L: 0, T: 0, P: 4)**	

COURSE OBJECTIVES:

Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Interact with peers to share thoughts.
4. Present given topic in a seminar.
5. Prepare a report on industrial visit, expert lecture

AIM:

Development of professional awareness in before and after sales and services construction sector.

PRE-REQUISITE:

1. Students should have complete knowledge of design of construction
2. Students should know all the Govt. norms related to construction industry.

COURSE CONTENT

1. Unit-1

Structured industrial visits shall be arranged and report of the same should be submitted by the individual students, to form a part of the term work. (Minimum 2 Visits)
Following are the suggested type of industries / Fields-

a) Visit to RCC framed structure building for details of reinforcement.
b) Visit to water / sewage treatment plant.
c) Visit to works carried out under watershed development / micro-irrigation scheme.
d) Visit to any structure undergoing rehabilitation/ retrofitting.

2. Unit-2

The Guest lecture/s from field / industry experts, professionals to be arranged (2Hrs duration), minimum 2 no.s from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work.

a) HRD and civil engineering projects.
b) Project planning and execution of Civil engineering projects.
c) PWD system of accounts.
d) Contract Management.
e) RCC design and detailing

3. Unit-3

Information Search, data collection and writing a report on the topics

a) Collection of data for valuation of old building.
b) Collection of data and case study of failure of RCC structure.
c) Collection of information on any topic from journal available in library

4. Unit-4

The Students should discuss in group of 6 to 8 students and write a brief report on the same as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are:-

a) Role of Civil engineer in disaster management.
b) Scope of out souring of civil engineering services.
c) Pollution control.

5. Unit-5

Seminar, Presentation

The students should select a topic for Seminar based on recent development in civil engineering field, emerging technology etc.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN CIVIL ENGINEERING	
Course Code: CIV**PE608**	Course Title: **Construction Contracts & Specifications (Elective-IV)**
Semester: **6th**	Credits: **3**
Periods Per Week: **3 (L: 3, T: 0, P: 0)**	

COURSE OBJECTIVES:

This course will enable students to analyze, evaluate and design construction contract documents.

COURSE CONTENT

1. **Unit1**

   1.1 Agreement, Contract, essential conditions, Indian Contract Act 1872, types of contract, terminology of contract. Construction Specifications: standard specifications, general specification, development, interpretation.

2. **Unit2**

   2.1 Tender and tender documents: types of bidding, tender notice, tendering procedure. Construction claims: extra item, excess quantity, deficit quantity, price escalation.

3. **Unit3**

   3.1 Dispute resolution mechanism: litigation, arbitration, conciliation, mediation, dispute resolution board. Contractual Problems: possible contractual problems, creation of claims, development of disputes. Contract document: drafting of clauses, development, and interpretation, CPWD conditions of contract, FIDIC conditions of contract.

4. **Unit4**

   4.1 BOT contract: types of contract, PPP framework, types of risk, concession agreement, drafting of clauses, development, and interpretation.

5. **Unit5**

   5.1 Laws affecting Engineers: Labour Law, Sales Tax, VAT, Service Tax, Excise Duty. Relational Contract: partnering, alliancing, key elements, processes.

COURSE OUTCOME

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

- Develop the tender documents for the project
- Attain the knowledge on arbitration

- Present the contract documents as per CPWD

RECOMMENDED BOOKS:

1. "Managing Engineering and Construction Contracts: Some Perspectives" by Lakshman Prasad
2. "Basics of Construction Contracts" by Sharjeel Faiz
3. Civil Engineering Contract Administration and Control by Ivor H. Seeley

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	12	20
2	12	20
3	12	20
4	12	20
5	12	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOA IN CIVIL ENGINEERING	
Course Code: CIVPE609	Course Title: **Construction Planning and Scheduling (Elective-IV)**
Semester: **VI**	Credits:**3**
Periods Per Week: **3 (L: 3, T: 0, P:0)**	

COURSE OBJECTIVE:

The objective is to comprehensively grasp the core concepts of planning and scheduling, focusing on clarity, conciseness, and practicality. This entails delving into the foundational principles of these techniques and examining their real-world application, including how they are embraced, modified, and applied in various scenarios. Additionally, the aim is to outline the methodologies employed for analyzing equipment productivity, fostering a deeper understanding of equipment utilization and application.

COURSE CONTENT:

1. An Introduction to Planning and Scheduling

A brief history of planning and scheduling Critical path methods Planning programming and scheduling The cost and benefits of planning Types of plans

2. Planning and Scheduling Techniques

Bar charts Flow diagrams Flow charts Work study Network analysis Activity-on-arrow networks Drawing the network Precedence diagrams Drawing the network-precedence diagrams Linked bar charts Space diagrams Time chainage charts Multiple activity charts Line of balance Line of balance – resource scheduling Work Breakdown Structure Pre-tender planning, pre-contract planning, contract planning Pre-tender planning Pre-contract planning Contract planning Activities: selection, sequencing and duration Activity selection Sequencing Assessing the duration of each activity Links, dependencies and constraints Float and contingency Total float Free float Interfering float Independent float Intermittent float Negative float Terminal float Internal float Contingency Manipulation of float

3. Introduction to Critical Chain Project Management & Earned Value Analysis

How does CCPM differ from accepted best practice in project management? Cost Performance Index (CPI) Cost variance Earned value analysis (EVA) Earned value management (EVM)

4. **Equipment Economics and Equipment Used In Construction industry**

   Important Questions Equipment Records The Rent Paid for the Use of Money Cost of Capital Evaluating Investment Alternatives Elements of Ownership Cost Elements of Operating Cost for Bidding Replacement Decisions Rent and Lease Considerations

5. **Planning for Earthwork Construction and Planning for Building Construction**

   Planning Graphical Presentation of Earthwork Quantities Mass Diagram Using the Mass Diagram. Introduction Site Layout Delivery of Structural Components Steel Erection Tilt-Up Construction LIFTING AND SUPPORT EQUIPMENT Cranes Aerial Lift Platforms Integrated Tool Carriers Telescopic Handlers/Forklifts Generators Portable Light Towers Portable Welding Equipment Construction Noise Mitigation Lighting Dust Vibration

COURSE OUTCOME:

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

- Better understand the planning and scheduling methods.
- Understand the application of CPM
- Get acquainted with various civil engg equipments and understand equipment economics.

RECOMMENDED BOOKS:

1. A Handbook for Construction Planning and Scheduling - Andrew Baldwin
2. Construction planning equipment and methods -R. L. Peurifoy
3. Construction Process Planning and Management-Sidney Levy

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED(HRS)	MARKS ALLOTTED (%)
1	6	10
2	12	30
3	6	20
4	12	20
5	8	20
Total	**44**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN CIVIL ENGINEERING	
Course Code: **AU607**	Course Title: **Essence of Indian Knowledge & Tradition**
Semester: **6th**	Credits: **0**
Periods Per Week:**2 (L: 2, T: 0, P: 0)**	

COURSE OBJECTIVES:

The objectives are twofold: firstly, to familiarize students with Indian traditional knowledge, emphasizing the significance of its roots; and secondly, to enable students to comprehend, analyze, and apply this traditional knowledge in their daily lives.

COURSE CONTENT

1. INTRODUCTION TO TRADITIONAL KNOWLEDGE

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge vs. western knowledge traditional knowledge

2. PROTECTION OF TRADITIONAL KNOWLEDGE:

The need for protecting traditional knowledge Significance of TK value of Traditional TK in global economy, Role of Government to Knowledge. Protection, harness

3. LEGAL FRAMEWORK AND TRADITIONAL KNOWLEDGE

A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001(PPVFR Act);

B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

4. TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

5. TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS

Traditional knowledge and engineering, Traditional medicine system, Traditional knowledge and biotechnology, Traditional Knowledge in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of Traditional Knowledge.

COURSE OUTCOME

At the end of the Course, Student will be able to:

- Identify the concept of Traditional knowledge and its importance.
- Explain the need and importance of protecting traditional knowledge.
- Illustrate the various enactments related to the protection of traditional knowledge.
- Interpret the concepts of Intellectual property to protect the traditional knowledge.
- Explain the importance of Traditional knowledge in Agriculture and Medicine.

RECOMMENDED BOOKS:

1. Traditional Knowledge System in India, by AmitJha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Traditional Knowledge System in India by AmitJha Atlantic publishers, 2002.
4. "Knowledge Traditions and Practices of India "Kapil Kapoor, Michel Danino.

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	20
2	10	20
3	10	20
4	10	20
5	10	20
Total	**48**	**100**

CURRICULUM

FOR

SIXTH SEMESTER

DIPLOMA

IN

PHE (CIVIL)

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME – PHE(CIVIL)

SIXTH SEMESTER

Code	Subjects	Study Scheme Periods Per Week			Total Hours L+T+P	Credits			Total Credits L+T+P
		L	T	P		L	T	P	
CIVPC601	Design of Steel Structures & Drawing	4	0	0	4	4	0	0	4
HS602	Entrepreneurship & Start Ups	3	0	0	3	3	0	0	3
Open Elective – III		3	0	0	3	3	0	0	3
CIVOE603	Energy Conservation & Audit								
CIVOE604	Engineering Economics & Accountancy								
CIVOE605	Economic Policies in India								
CIVMP606	Major Project	0	0	14	14	0	0	7	7
CIVSI607	Seminar	0	0	4	4	0	0	2	2
Elective- IV		3	0	0	3	3	0	0	3
CIVPE608	Construction Contracts & Specifications								
CIVPE609	Construction Planning & Scheduling								
AU607	Essence of Indian Knowledge & Tradition	2	0	0	2	0	0	0	0
TOTAL		**15**	**0**	**18**	**33***	**13**	**0**	**9**	**22**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN PHE(CIVIL)	
Course Code: CIV**PC601**	Course Title: **Design of Steel Structures & Drawing**
Semester: **6th**	Credits: **4**
Periods Per Week: **(L: 4, T: 0, P: 0)**	

COURSE OBJECTIVE:

This subject is an applied engineering subject Diploma holders in Civil Engineering will be required to supervise steel construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials. This subject thus deals with elementary design, principles as per BIS code of practice ARE: 800.

COURSE CONTENT

1. Structural Steel and Properties

Advantages and disadvantages of Steel structures, structural steel sections, loads and load combinations, Limit state design- Design considerations, Failure criteria for steel, codal specifications and section classifications as per **IS 800-2007**.

2. **Bolted Connections**

Introduction, advantages and disadvantages of bolted connections, Difference between unfinished bolts and High strength friction grip bolts (HSFG). Behaviors of bolted joints, failure of bolted joints, Simple problems on finding shear strength, bearing strength, tensile strength of bolts (bearing type only).Tensile strength of plate, Efficiency of the joint. Simple Lap Joint Design problems.

Note: Excluding problems on HSFG Bolts and Long joints conditions.

3. Welded Connections

Introduction, advantages of welding, types of joints, weld symbols, specifications, effective area of weld, design strength of fillet weld, Simple problems on welded joints (fillet weld only).

4. Tension and Compression Members

Analysis and design of single angle section tension members and their bolted and welded connections with gusset plate as per IS:800 -2007

Analysis and design of single angle sections compression members (struts) and their Bolted and welded connections with gusset plate as per BIS:800

5. Columns:

Concept of buckling of columns, effective length and slenderness ratio, permissible stresses in compression as per IS:800 for different end conditions.

Analysis and Design of axially loaded single section steel column Types of column bases (Descriptive only) Beam and column, frame and seated connections (descriptive only, no design). Drawing of Column and Column Bases, Column and Beam Connections.

6. Roof Trusses

Form of trusses, pitch of roof truss, spacing of trusses, spacing of purlins, connection between purlin and roof covering. Connection between purlin and principal rafter (no design, only concept). Drawing of Fink Roof Trusses with all important details.

7. Beams

Only concept of Beams. Introduction to plate girder and functions of various elements of a plate girder. Drawing of Plate Girder with important details.

Important Note: Use of IS: 800 and Steel Tables are permitted in examination.

COURSE OUTCOME

After undergoing the subject, students will be able to:

- Explain structural properties of steel and its designation as per Indian Standards
- Select different types of bolted and welded joints
- Analyze and design single and double angle section struts and I section compression members
- Explain different types of trusses, their different components and usability
- Analyze and design of simply supported steel beams
- Select various types of plate girders
- Supervise fabrication and erection of steel structure like trusses, columns and girders

RECOMMENDED BOOKS:

1. Duggal SK, "Design of Steel Structures" by Standard Publishers, Delhi
2. Birinder Singh, "Steel Structures Design and Drawing", Kaption Publishing House, Ludhiana
3. Ram Chandra, "Design of Steel Structures", Standard Publishers,Delhi
4. S Ramamurthan, "Design of Steel Structures",
5. HarbhajanSingh ,"Design of Steel Structures", Abhishek Publishing, Chandigarh
6. IS Code : 800-2007
7. Layal JS "Civil Engineering Drawing", SatyaParkashan, New Delhi
8. Chandel RP " Civil Engineering Drawings"
9. Kumar; NS " Civil Engineering Drawing " IPH, New Delhi
10. Malik RS and Meo GA, "Civil Engineering Drawing" Asian Publishing House, New Delhi
11. Singh, Birinder "RCC Design and Drawing" Kaption Publishing House, New Delhi.

12. Singh, Harbhajan, "Structural Drawings", Abhishek Publishers, Chandigarh

13.B.V. Sikka, Civil Engineering Drawing

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	3	05
2	05	10
3	05	10
4	10	25
5	13	25
6	06	10
7	06	15
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN PHE(CIVIL)	
Course Code: **HS602**	Course Title: **Entrepreneurship and Start-ups**
Semester: **6th**	Credits: **3**
Periods Per Week:**3(L: 3, T: 0, P: 0)**	

COURSE OBJECTIVES:

The objectives include cultivating an entrepreneurial spirit and resourcefulness, understanding diverse applications of human resources for dignified livelihoods, grasping the essence and significance of entrepreneurship for personal and national growth, developing entrepreneurial qualities, competencies, and motivation, and mastering the skills required for creating and managing entrepreneurial ventures.

COURSE CONTENT:

1. INTRODUCTION TO ENTREPRENEURSHIP AND START–UPS

1.1. Definitions, Traits of an entrepreneur, Entrepreneurship, Motivation
1.2. Types of Business Structures,
1.3. Similarities / differences between entrepreneurs and managers.

2. BUSINESS IDEAS AND THEIR IMPLEMENTATION

2.1. Discovering ideas and visualizing the business
2.2. Activity map
2.3. Business Plan

3. IDEA TO START-UP

3.1. Market Analysis– Identifying the target market,
3.2. Competition evaluation and Strategy Development,
3.3. Marketing and accounting,

4. MANAGEMENT

4.1. Company's Organization Structure,
4.2. Recruitment and management of talent.
4.3. Financial organization and management

5. FINANCING AND PROTECTION OF IDEAS

5.1. Financing methods available for start-ups in India
5.2. Communication of Ideas to potential investors– Investor Pitch
5.3. Patenting and Licenses

COURSE OUTCOME:

After undergoing the subject, students will be able to:

- Understanding the dynamic role of entrepreneurship and small businesses
- Organizing and Managing a Small Business
- Financial Planning and Control
- Forms of Ownership for Small Business

- Strategic Marketing Planning
- New Product or Service Development
- Business Plan Creation

RECOMMENDED BOOKS:

1. The Startup Owner's Manual: The Step by Step Guide for Building a Great Company,Steve Blank and Bob Dorf, K & S Ranch ISBN–978-0984999392
2. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Eric Ries, Penguin UK ISBN–978-0670921607
3. Demand: Creating What People Love Before They Know They Want It, Adrian J. Slywotzky with Karl Weber, HeadlinebBook Publishing ISBN–978-0755388974
4. The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business, Clayton M. Chris Tensen, Harvard business ISBN

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	20
2	08	20
3	08	20
4	08	20
5	08	20
Total	**40**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN PHE (CIVIL)	
Course Code:CIV**OE603**	Course Title: **Energy conservation and Audit (Open Elective-III)**
Semester: **5th**	Credits: **3**
Periods per week: **3 (L: 3, T: 0, P:0**)	

COURSE OBJECTIVE:

The subject aims at giving the basic knowledge of energy conservation and audit to the students in order to analyze and optimize the energy usage in various systems such as buildings and transportation for reduction in energy consumption and improving overall efficiency.

COURSE CONTENT

1. Energy Conservation

1.1 Introduction to Energy Conservation:
- 1.1.1 Basic concepts of energy conservation
- 1.1.2 Importance of energy conservation and its impact on the environment and economy
- 1.1.3 Energy conservation policies and regulations

1.2 Energy Auditing:
- 1.2.1 Introduction to energy auditing
- 1.2.2 Energy audit process and methodologies
- 1.2.3 Energy audit tools and techniques
- 1.2.4 Types of energy audits (preliminary, walkthrough, comprehensive)
- 1.2.5 Data collection and analysis for energy auditing

2. Energy Systems and Efficiency:

2.1 Overview of energy systems (electrical, mechanical, thermal)
2.2 Energy efficiency principles and calculations
2.3 Energy performance assessment of various systems and equipment
2.4 Identifying energy loss and waste in systems
2.5 Energy-efficient technologies and practices

3. Building Energy Conservation:

3.1 Energy conservation in residential, commercial, and industrial buildings
3.2 Building envelope and insulation systems
3.3 HVAC (Heating, Ventilation, and Air Conditioning) systems and energy efficiency
3.4 Lighting systems and energy-efficient lighting design
3.5 Renewable energy integration in building

4. Renewable Energy Sources

4.1 Overview of renewable energy sources (solar, wind, hydro, geothermal, biomass)
4.2 Integration of renewable energy systems

4.3 Feasibility analysis of renewable energy projects
4.4 Policies and incentives for renewable energy adoption

5. Energy Management and Planning:

5.1 Energy management strategies for organizations
5.2 Energy conservation planning and implementation
5.3 Monitoring and verification of energy savings
5.4 Energy performance contracting

COURSE OUTCOME

After undergoing the subject, students will be able to:

- Identification of energy conservation opportunities in various industrial processes.
- Gain knowledge on tools and techniques employed in energy auditing.
- Comprehend an Energy Audit report, including economic parameters

RECOMMENDED BOOKS:

1. "Energy Audit Handbook: A Guide for Energy Auditors" by A.K. Gupta and S.P. Kaushik
2. Energy Audit and Management: Principles and Practices" by Manish Goyal
3. Energy Management and Conservation Handbook" by Frank Kreith and D. Yogi Goswami
4. "Energy Audit of Building Systems: An Engineering Approach" by MoncefKrarti
5. "Energy Audit and Conservation" by S. Rao Parulekar

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO	TIME ALLOTED (HRS)	MARKS ALLOTED (%)
1	16	33
2	08	17
3	10	20
4	06	17
5	04	13
TOTAL	**44**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN PHE(CIVIL)	
Course code :CIV**OE604**	Course Title: **Engineering Economics and Accountancy (Open Elective -III)**
Semester:**5th**	Credits:-**3**
Period Per Week **3(L: 3,T: 0,P: 0)**	

COURSE OBJECTIVE:

EEA is a think beyond program which will make the student to examine the application of microeconomics theory as applied to the manager's responsibilities in an organization. To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making. This course should emphasize the quantitative and qualitative applications of economic principle to business analysis

COURSE CONTENT

1. UNIT I:

Business Environment and Managerial Economics Business Environment -Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Latest trends in Business Environment (Entrepreneurship). Managerial Economics - Definition, Nature and Scope of Managerial Economics— Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand, Types, Significance of Elasticity of Demand, Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.

2. UNIT II:

Theory of Production and Cost Analysis. Theory of Production - Production Function — ISO quants and ISO costs, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis - Cost concepts, Opportunity cost, fixed vs. Variable costs, explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)- Determination of Break-Even Point (simple problems) - Managerial Significance and limitations of BEA.

3. UNIT III:

Market structures and Pricing Policies. Introduction to Markets & Market structures -Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. B: Pricing Policies & Methods - Cost plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, PLC based pricing methods. 103

4. UNIT IV:

Capital and Capital Budgeting. Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital

Budgeting - Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

5. UNIT V:

Financial Accounting and Ratios Financial Accounting -Introduction, Accounting principles, Accounting Cycle, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis Through Ratios - Computation, Analysis and Interpretation of Liquidity Ratios(Current Ratio and quick ratio), Activity Ratios(Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

COURSE OUTCOME

After undergoing the subject, students will be able to:

- Evaluate the economics theories, cost concepts & pricing policies.
- Understand accountancy systems and analyze financial statements.
- Understand the basic principle of managerial economics, accountancy and current business environment.
- Understand the quantities and qualitative application of economic principle to business analysis.

RECOMMENDED BOOKS:

1. Aryasri, "Managerial Economics and Financial Analysis", TMH, 2'd edition, 2005.
2. Varshney & Maheswari, "Managerial Economics", 5thEdition Sultan Chand, 2003
3. H. Craig Peterson & W. Cris Lewis, "Managerial Economics", PHI, 4th Edition
4. Domnick Salvatore, "Managerial Economics In a Global Economy", Thomson, 4° Edition.
5. Raghunatha Reddy &Narasimhachary, "Managerial Economics& Financial Analysis", 4th Edition Scitech.
6. S.N.Maheswari& S.K. Maheswari, "Financial Accounting", 6 th Edition Vikas. S. Dwivedi, "Managerial Economics", Vikas, 6th Edition.

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	7	20
2	6	20
3	6	20
4	6	20
5	7	20
Total	**32**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN PHE(CIVIL)	
Course Code: CIV**OE 605**	Course Title: **Economic Policies in India (Open Elective -III)**
Semester: **6th**	Credits:**3**
Periods Per Week: **3 (L: 3, T:0, P:0)**	

COURSE OBJECTIVE:

The objective of this course is to familiarize the students of different streams with the basic concepts, structure, problems and issues concerning Indian economy.

COURSE CONTENT:

1. UNIT-I

Basic features and problems of Indian Economy, Economic history of India, Nature of Indian Economy, Features and Indicators of Development, Poverty: Concept, Causes and Government policies, Unemployment in India: Concept, Causes and Government policies, Inflation: Nature and extent

2. UNIT-II

Sectoral composition of Indian Economy: Issues in Agriculture sector in India, land reforms, Productivity Trends and Crop Patterns, Green Revolution, Recent Issues in Indian Agriculture Growth, Trends and patterns in Agriculture: Rural Credit & Marketing, WTO & Agriculture

3. UNIT-III

Industrial development ,Industrial Sector in Pre-reform Period, Industrial Sector in Post-reform Period, Issues and Problems of Public Sector, small scale and cottage industries, industrial policy, Public sector in India, service sector in India

4. UNIT-IV

Economic policies: Economic planning in India, Implementation of Economic Policies, Parallel Economy, Role of Bureaucracy and Delivery Mechanism in Implementation of Economic Policies, Planning commission v/s NITI Aayog, Five Year Plans, monetary policy in India, Fiscal Policy in India, Centre State Finance Relations, Finance commission in India. LPG policy in India

5. UNIT-V

External sector in India- India's foreign trade value composition and direction, India Balance of payment since 1991, Role of Foreign Capital-FDI and Multinational Corporations, Impact of Globalization on Indian Economy, WTO and India

COURSE OUTCOME:

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

- Understand Indian economic policies, planning strategies
- Analyze economic issues and find solutions to complex economic problems and take correct economic judgment.
- Describe the economic Planning in India.
- Explain the Objective, Strategies and Evaluation of economic Planning in India
- Able to identify the problems and capable to decide the application for future development.

RECOMMENDED BOOKS:

1. The Indian Economy; S.K. Ray; Prentic, Hall of India Private Limited New Delhi.
2. Indian Economy ;Gaurav Datt and Aswani Mahajan; S. Chand and Company LTD. Ram Nagar, New Delhi
3. Dutt Rudder and KPM Sunnderam (2017) Indian Economy S Chand & Co, Ltd. New Delhi.
4. Mishra S.K & VK Puri (2017) Indian Economy and its development experience, Himalaya Publishing House.
5. Singh, Ramesh (2016): Indian Econoy, Tata –McGraw Hill Publications, New Delhi
6. Karam Singh Gill (1978), Evolution of the Indian Economy, NCERT, New Delhi

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	7	15
2	7	20
3	7	20
4	8	30
5	7	15
Total	**36**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN PHE(CIVIL)	
Course Code: **CIVMP606**	Course Title: **Major Project**
Semester: **6th**	Credits: **7**
Periods Per Week:**14 (L: 0, T: 0, P: 14)**	

As far as possible students should be given live project problems with a view to:

i. Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.

ii. Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.

iii. Provide firsthand experience to develop confidence amongst the students to enable them to use and apply classroom based knowledge and skills to solve practical problems of the world of work.

iv. Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience. It is necessary that each organization is visited well in advance by respective teachers and activities to be performed by students are well defined. The chosen activities should be such which are of curricular interest to students and of professional value to industrial/field organizations. Each teacher is expected to supervise and guide 5 - 6 students.

Effort should be made to identify actual field problems to be given as project work to the students. Project selected should not be too complex which is beyond the comprehension level of the students. The placement of the students for such a practical cum project work should match with the competency profile and interest of students. Students may be assessed both by industry and polytechnic faculty.

Some of suggested projects are given below: These are only guidelines, teacher may take any project related to Civil Engineering depending upon the availability of projects. Preference should be given to practical oriented projects.

According to the need of the polytechnic, the following major projects are suggested:

1. Construction of a small concrete road consisting of following activities
   - Survey and preparation of site plan
   - Preparation of drawings i.e. L-Section and X-Section
   - Estimating earth work
   - Preparation of sub grade with stone ballast
   - Laying of concrete
   - Testing of slump, casting of cubes and testing
   - Material estimating and costing with specifications

- Technical report writing

2. Water Supply system for a one or two villages
   - Surveying
   - Design of water requirements and water distribution system
   - Preparation of drawing of overhead tank
   - Material estimating and costing
   - Specifications
   - Technical report writing

3. Construction of seating benches in polytechnic campus

4. Welding of angle iron and Expanded metal jali to prepare fencing in polytechnic campus

5. Construction of toilets and baths for a shopping complex in a township

6. Construction of bridal path 4 kms long

7. Construction of shopping complex by detailing of RCC drawings, estimating and costing of material

8. Rainwater harvesting
   - Assessment of catchment's area
   - Intensity of rainfall
   - Collection of water
   - Soak pit design
   - Supply of water
   - Monitoring during rainy season
9. Design and construction of septic tank with soak pit for 100 users

10. Preparing plumbing detailed drawings of a two storey building and material estimate and costing

11. Planning and design of sports stadium in a township or cluster of villages

12. Design of small residential building including structural members, specifications, estimating and costing of materials, report writing and municipal drawings for water supply and sewerage system

13. Concrete Mix Design

14. Construction of concrete cubes by mixing appropriate quantity of fly ash with fibres
    (i) the fibres like polypropylene, carbon, steel etc. can be used
    (ii) students will show the comparison between concrete mixed with fibres verses the quality controlled concrete.

15. Estimation and designing of a State Highway Road
    (i) Reconniance survey of proposed road
    (ii) To take L - section and cross sections

(iii) Fixing of grades
(iv) Estimation of cutting and filling of earth mass
(v) Plane tabling survey of proposed road
(vi) Estimation of proposed road

16. Designing a small height gravity dam
(i) Constructing of catchment area
(ii) Calculating the reservoir capacity
(iii) Designing of gravity dam by taking into account various forces

17. Designing of ferro-cement water tank and toilet. Testing of the ferro-cement products in civil engineering labs.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN PHE(CIVIL)	
Course Code: **CIVSI607**	Course Title: Seminar
Semester: **6th**	Credits: 2
Periods Per Week: 4 **(L: 0, T: 0, P: 4)**	

COURSE OBJECTIVES:

Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Interact with peers to share thoughts.
4. Present given topic in a seminar.
5. Prepare a report on industrial visit, expert lecture

AIM:

Development of professional awareness in before and after sales and services construction sector.

PRE-REQUISITE:

1. Students should have complete knowledge of design of construction
2. Students should know all the Govt. norms related to construction industry.

COURSE CONTENT

1. Unit-1

Structured industrial visits shall be arranged and report of the same should be submitted by the individual students, to form a part of the term work. (Minimum 2 Visits)

Following are the suggested type of industries / Fields-

a) Visit to RCC framed structure building for details of reinforcement.
b) Visit to water / sewage treatment plant.
c) Visit to works carried out under watershed development / micro-irrigation scheme.
d) Visit to any structure undergoing rehabilitation/ retrofitting.

2. Unit-2

The Guest lecture/s from field / industry experts, professionals to be arranged (2Hrs duration), minimum 2 no.s from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work.

a) HRD and civil engineering projects.
b) Project planning and execution of Civil engineering projects.
c) PWD system of accounts.
d) Contract Management.
e) RCC design and detailing

3. Unit-3

Information Search, data collection and writing a report on the topics

a) Collection of data for valuation of old building.

b) Collection of data and case study of failure of RCC structure.
c) Collection of information on any topic from journal available in library

4. Unit-4

The Students should discuss in group of 6 to 8 students and write a brief report on the same as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are:-

a) Role of Civil engineer in disaster management.
b) Scope of out souring of civil engineering services.
c) Pollution control.

5. Unit-5

Seminar, Presentation

The students should select a topic for Seminar based on recent development in civil engineering field, emerging technology etc.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN PHE(CIVIL)	
Course Code: **CIVPE608**	Course Title: **Construction Contracts & Specifications (Elective-IV)**
Semester: **6th**	Credits: **3**
Periods Per Week: **3 (L: 3, T: 0, P: 0)**	

COURSE OBJECTIVES:

This course will enable students to analyze, evaluate and design construction contract documents.

COURSE CONTENT

1. **Unit1**

   1.1 Agreement, Contract, essential conditions, Indian Contract Act 1872, types of contract, terminology of contract. Construction Specifications: standard specifications, general specification, development, interpretation.

2. **Unit2**

   2.1 Tender and tender documents: types of bidding, tender notice, tendering procedure. Construction claims: extra item, excess quantity, deficit quantity, price escalation.

3. **Unit3**

   3.1 Dispute resolution mechanism: litigation, arbitration, conciliation, mediation, dispute resolution board. Contractual Problems: possible contractual problems, creation of claims, development of disputes. Contract document: drafting of clauses, development, and interpretation, CPWD conditions of contract, FIDIC conditions of contract.

4. **Unit4**

   4.1 BOT contract: types of contract, PPP framework, types of risk, concession agreement, drafting of clauses, development, and interpretation.

5. **Unit5**

   5.1 Laws affecting Engineers: Labour Law, Sales Tax, VAT, Service Tax, Excise Duty. Relational Contract: partnering, alliancing, key elements, processes.

COURSE OUTCOME

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

- Develop the tender documents for the project
- Attain the knowledge on arbitration
- Present the contract documents as per CPWD

RECOMMENDED BOOKS:

1. "Managing Engineering and Construction Contracts: Some Perspectives" by Lakshman Prasad
2. "Basics of Construction Contracts" by Sharjeel Faiz
3. **Civil Engineering Contract Administration and Control by Ivor H. Seeley**

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	12	20
2	12	20
3	12	20
4	12	20
5	12	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN PHE(CIVIL)	
Course Code: CIVPE609	Course Title: **Construction Planning and Scheduling (Elective-IV)**
Semester: **VI**	Credits:**3**
Periods Per Week: **3 (L: 03, T: 0, P:0)**	

COURSE OBJECTIVE:

The objective is to comprehensively grasp the core concepts of planning and scheduling, focusing on clarity, conciseness, and practicality. This entails delving into the foundational principles of these techniques and examining their real-world application, including how they are embraced, modified, and applied in various scenarios. Additionally, the aim is to outline the methodologies employed for analyzing equipment productivity, fostering a deeper understanding of equipment utilization and application.

COURSE CONTENT:

1. An Introduction to Planning and Scheduling

A brief history of planning and scheduling Critical path methods Planning programming and scheduling The cost and benefits of planning Types of plans

2. Planning and Scheduling Techniques

Bar charts Flow diagrams Flow charts Work study Network analysis Activity-on-arrow networks Drawing the network Precedence diagrams Drawing the network-precedence diagrams Linked bar charts Space diagrams Time chainage charts Multiple activity charts Line of balance Line of balance – resource scheduling Work Breakdown Structure Pre-tender planning, pre-contract planning, contract planning Pre-tender planning Pre-contract planning Contract planning Activities: selection, sequencing and duration Activity selection Sequencing Assessing the duration of each activity Links, dependencies and constraints Float and contingency Total float Free float Interfering float Independent float Intermittent float Negative float Terminal float Internal float Contingency Manipulation of float

3. Introduction to Critical Chain Project Management & Earned Value Analysis

How does CCPM differ from accepted best practice in project management? Cost Performance Index (CPI) Cost variance Earned value analysis (EVA) Earned value management (EVM)

4. **Equipment Economics and Equipment Used In Construction industry**

   Important Questions Equipment Records The Rent Paid for the Use of Money Cost of Capital Evaluating Investment Alternatives Elements of Ownership Cost Elements of Operating Cost for Bidding Replacement Decisions Rent and Lease Considerations

5. **Planning for Earthwork Construction and Planning for Building Construction**

   Planning Graphical Presentation of Earthwork Quantities Mass Diagram Using the Mass Diagram. Introduction Site Layout Delivery of Structural Components Steel Erection Tilt-Up Construction LIFTING AND SUPPORT EQUIPMENT Cranes Aerial Lift Platforms Integrated Tool Carriers Telescopic Handlers/Forklifts Generators Portable Light Towers Portable Welding Equipment Construction Noise Mitigation Lighting Dust Vibration

COURSE OUTCOME:

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

- Better understand the planning and scheduling methods.
- Understand the application of CPM
- Get acquainted with various civil engg equipments and understand equipment economics.

RECOMMENDED BOOKS:

1. A Handbook for Construction Planning and Scheduling - Andrew Baldwin
2. Construction planning equipment and methods -R. L. Peurifoy
3. Construction Process Planning and Management-Sidney Levy

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED(HRS)	MARKS ALLOTTED (%)
1	6	10
2	12	30
3	6	20
4	12	20
5	8	20
Total	**44**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN PHE(CIVIL)	
Course Code: **AU607**	Course Title: **Essence of Indian Knowledge & Tradition**
Semester: **VI**	Credits: **0**
Periods Per Week:**2 (L: 2, T: 0, P: 0)**	

COURSE OBJECTIVES:

The objectives are twofold: firstly, to familiarize students with Indian traditional knowledge, emphasizing the significance of its roots; and secondly, to enable students to comprehend, analyze, and apply this traditional knowledge in their daily lives.

COURSE CONTENT

1. INTRODUCTION TO TRADITIONAL KNOWLEDGE

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge vs. western knowledge traditional knowledge

2. PROTECTION OF TRADITIONAL KNOWLEDGE:

The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness Traditional Knowledge.

3. LEGAL FRAMEWORK AND TRADITIONAL KNOWLEDGE

A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001(PPVFR Act);

B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

4. TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

5. TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS

Traditional knowledge and engineering, Traditional medicine system, Traditional knowledge and biotechnology, Traditional Knowledge in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of Traditional Knowledge.

COURSE OUTCOME

At the end of the Course, Student will be able to:

- Identify the concept of Traditional knowledge and its importance.
- Explain the need and importance of protecting traditional knowledge.
- Illustrate the various enactments related to the protection of traditional knowledge.
- Interpret the concepts of Intellectual property to protect the traditional knowledge.
- Explain the importance of Traditional knowledge in Agriculture and Medicine.

RECOMMENDED BOOKS:

1. Traditional Knowledge System in India, by AmitJha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Traditional Knowledge System in India by AmitJha Atlantic publishers, 2002.
4. "Knowledge Traditions and Practices of India "Kapil Kapoor, Michel Danino.

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	20
2	10	20
3	10	20
4	10	20
5	10	20
Total	**48**	**100**

CURRICULUM

FOR

SIXTH SEMESTER

DIPLOMA

IN

Q S C M

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME - QSCM

SIXTH SEMESTER

Code	Subjects	Study Scheme Periods Per Week			Total Hours L+T+P	Credits			Total Credits L+T+P
		L	T	P		L	T	P	
CIVPC601	Design of Steel Structures & Drawing	4	0	0	4	4	0	0	4
HS602	Entrepreneurship & Start Ups	3	0	0	3	3	0	0	3
QSPC603	Advanced Quantity Surveying & Valuation	3	0	0	3	3	0	0	3
CIVMP606	Major Project	0	0	14	14	0	0	7	7
CIVSI607	Seminar	0	0	4	4	0	0	2	2
elective- III		3	0	0	3	3	0	0	3
CIVPE608	Construction Contracts & Specifications								
CIVPE609	Construction Planning & Scheduling								
AU607	Essence of Indian Knowledge & Tradition	2	0	0	2	0	0	0	0
TOTAL		**15**	**0**	**18**	**33**	**13**	**0**	**9**	**22**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN QSCM	
Course Code: CIV**PC601**	Course Title: **Design of Steel Structures & Drawing**
Semester: **VI**	Credits: **4**
Periods Per Week: **(L: 4, T: 0, P: 0)**	

COURSE OBJECTIVE:

This subject is an applied engineering subject Diploma holders in Civil Engineering will be required to supervise steel construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials. This subject thus deals with elementary design, principles as per BIS code of practice ARE: 800.

COURSE CONTENT

1. Structural Steel and Properties

Advantages and disadvantages of Steel structures, structural steel sections, loads and load combinations, Limit state design- Design considerations, Failure criteria for steel, codal specifications and section classifications as per **IS 800-2007**.

2. Bolted Connections

Introduction, advantages and disadvantages of bolted connections, Difference between unfinished bolts and High strength friction grip bolts (HSFG). Behaviors of bolted joints, failure of bolted joints, Simple problems on finding shear strength, bearing strength, tensile strength of bolts (bearing type only).Tensile strength of plate, Efficiency of the joint. Simple Lap Joint Design problems.

Note: Excluding problems on HSFG Bolts and Long joints conditions.

3. Welded Connections

Introduction, advantages of welding, types of joints, weld symbols, specifications, effective area of weld, design strength of fillet weld, Simple problems on welded joints (fillet weld only).

4. Tension and Compression Members

Analysis and design of single angle section tension members and their bolted and welded connections with gusset plate as per IS:800 -2007

Analysis and design of single angle sections compression members (struts) and their Bolted and welded connections with gusset plate as per BIS:800

5. Columns:

Concept of buckling of columns, effective length and slenderness ratio, permissible stresses in compression as per IS:800 for different end conditions.

Analysis and Design of axially loaded single section steel column Types of column bases (Descriptive only) Beam and column, frame and seated connections (descriptive only, no design). Drawing of Column and Column Bases, Column and Beam Connections.

6. Roof Trusses

Form of trusses, pitch of roof truss, spacing of trusses, spacing of purlins, connection between purlin and roof covering. Connection between purlin and principal rafter (no design, only concept). Drawing of Fink Roof Trusses with all important details.

7. Beams

Only concept of Beams. Introduction to plate girder and functions of various elements of a plate girder. Drawing of Plate Girder with important details.

Important Note: Use of IS: 800 and Steel Tables are permitted in examination.

COURSE OUTCOME

After undergoing the subject, students will be able to:

- Explain structural properties of steel and its designation as per Indian Standards
- Select different types of bolted and welded joints
- Analyze and design single and double angle section struts and I section compression members
- Explain different types of trusses, their different components and usability
- Analyze and design of simply supported steel beams
- Select various types of plate girders
- Supervise fabrication and erection of steel structure like trusses, columns and girders

RECOMMENDED BOOKS:

1. Duggal SK, "Design of Steel Structures" by Standard Publishers, Delhi
2. Birinder Singh, "Steel Structures Design and Drawing", Kaption Publishing House, Ludhiana
3. Ram Chandra, "Design of Steel Structures", Standard Publishers,Delhi
4. S Ramamurthan, "Design of Steel Structures",
5. HarbhajanSingh ,"Design of Steel Structures", Abhishek Publishing, Chandigarh
6. IS Code : 800-2007
7. Layal JS "Civil Engineering Drawing", SatyaParkashan, New Delhi
8. Chandel RP " Civil Engineering Drawings"
9. Kumar; NS " Civil Engineering Drawing " IPH, New Delhi
10. Malik RS and Meo GA, "Civil Engineering Drawing" Asian Publishing House, New Delhi
11. Singh, Birinder "RCC Design and Drawing" Kaption Publishing House, New Delhi.
12. Singh, Harbhajan, "Structural Drawings", Abhishek Publishers, Chandigarh
13. B.V. Sikka, Civil Engineering Drawing

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	3	05
2	05	10
3	05	10
4	10	25
5	13	25
6	06	10
7	06	15
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN QSCM	
Course Code: **HS602**	Course Title: **Entrepreneurship and Start-ups**
Semester: **VI**	Credits: **3**
Periods Per Week: **3 (L: 3, T: 0, P: 0)**	

COURSE OBJECTIVES:

The objectives include cultivating an entrepreneurial spirit and resourcefulness, understanding diverse applications of human resources for dignified livelihoods, grasping the essence and significance of entrepreneurship for personal and national growth, developing entrepreneurial qualities, competencies, and motivation, and mastering the skills required for creating and managing entrepreneurial ventures.

COURSE CONTENT:

1. INTRODUCTION TO ENTREPRENEURSHIP AND START–UPS

1.1. Definitions, Traits of an entrepreneur, Entrepreneurship, Motivation
1.2. Types of Business Structures,
1.3. Similarities / differences between entrepreneurs and managers.

2. BUSINESS IDEAS AND THEIR IMPLEMENTATION

2.1. Discovering ideas and visualizing the business
2.2. Activity map
2.3. Business Plan

3. IDEA TO START-UP

3.1. Market Analysis– Identifying the target market,
3.2. Competition evaluation and Strategy Development,
3.3. Marketing and accounting,

4. MANAGEMENT

4.1. Company's Organization Structure,
4.2. Recruitment and management of talent.
4.3. Financial organization and management

5. FINANCING AND PROTECTION OF IDEAS

5.1. Financing methods available for start-ups in India
5.2. Communication of Ideas to potential investors– Investor Pitch
5.3. Patenting and Licenses

COURSE OUTCOME:

After undergoing the subject, students will be able to:

- Understanding the dynamic role of entrepreneurship and small businesses
- Organizing and Managing a Small Business
- Financial Planning and Control
- Forms of Ownership for Small Business
- Strategic Marketing Planning
- New Product or Service Development
- Business Plan Creation

RECOMMENDED BOOKS:

1. The Startup Owner's Manual: The Step by Step Guide for Building a Great Company,Steve

Blank and Bob Dorf, K & S Ranch ISBN–978-0984999392

2. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Eric Ries, Penguin UK ISBN–978-0670921607
3. Demand: Creating What People Love Before They Know They Want It, Adrian J. Slywotzky with Karl Weber, HeadlinebBook Publishing ISBN–978-0755388974
4. The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business, Clayton M. Chris Tensen, Harvard business ISBN

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	20
2	08	20
3	08	20
4	08	20
5	08	20
Total	**40**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN QSCM	
Course Code: QSPC603	Course Title: **Advanced Quantity Surveying & Valuation**
Semester: **VI**	Credits: **3**
Periods per week**: 3 (L:3, T:0, P:0)**	

COURSE OBJECTIVE:

Diploma holders in Quantity Surveying are supposed to prepare material estimates for various Quantity Surveying works namely, buildings, irrigation works, public health works and roads etc. In addition they must have basic knowledge regarding analysis of rates, contracting, principles of valuation etc.

COURSE CONTENT:

1. Detailed Estimating

1.1 Estimating & Costing of Double Storey and Framed Structure Building.

1.1.1. Sub Structure, Foundation and Superstructure, Lintels, Beams, Slab, RCC Shelves, Flooring, Roofing, Woodwork, Plastering, White Washing.

1.1.2. Plumbing, Water Supply and Sanitary Fittings

2. Culverts and Bridges

2.1 One Span Culvert
2.2 Multi Span Steel Bridge (small)
2.3 Multi Span RCC Bridge (major)

3. Cross Drainage Structures

3.1 Syphon Aqueduct
3.2 Super Passage
3.3 Earthen Dam
3.4 Masonry Dam
3.5 Concrete Dam

4. Tanks

4.1 Overhead RCC Water Tank

COURSE OUTCOME:

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

- Prepare Estimates for Double Storey Buildings
- Prepare Estimates of Cross Drainage Works.
- Prepare Estimates of Bridges.
- Prepare Estimates of Overhead Tanks

RECOMMENDED BOOKS:

1. Pasrija HD, Arora CL, Inderjit Singh, "Estimating, Costing & Valuation (Civil)", New Asian Publishers Delhi
2. Rangwala SC, "Estimating & Costing" AnandCharotar Book Stall
3. Chakraborty M, "Estimating, Costing & Specifications in Civil Engineering"
4. Dutta BN, "Estimating & Costing"
5. Mahajan Sanjay,"Estimating& Costing", SatyaPrakash, Delhi

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO	TIME ALLOTTED (HRS)	MARK ALLOTTED (%)
01	16	32
02	12	24
03	10	22
04	10	22
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN QSCM	
Course Code: **CIVMP606**	Course Title: **Major Project**
Semester: **VI**	Credits: **7**
Periods Per Week: **14 (L: 0, T: 0, P: 14)**	

As far as possible students should be given live project problems with a view to:

i) Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.

ii) Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.

iii) Provide firsthand experience to develop confidence amongst the students to enable them to use and apply classroom based knowledge and skills to solve practical problems of the world of work.

iv) Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience. It is necessary that each organization is visited well in advance by respective teachers and activities to be performed by students are well defined. The chosen activities should be such which are of curricular interest to students and of professional value to industrial/field organizations. Each teacher is expected to supervise and guide 5 - 6 students.

Effort should be made to identify actual field problems to be given as project work to the students. Project selected should not be too complex which is beyond the comprehension level of the students. The placement of the students for such a practical cum project work should match with the competency profile and interest of students. Students may be assessed both by industry and polytechnic faculty.

Some of suggested projects are given below: These are only guidelines, teacher may take any project related to QSCM depending upon the availability of projects. Preference should be given to practical oriented projects.

According to the need of the polytechnic, the following major projects are suggested:

1. Construction of a small concrete road consisting of following activities
   - Survey and preparation of site plan
   - Preparation of drawings i.e. L-Section and X-Section
   - Estimating earth work
   - Preparation of sub grade with stone ballast
   - Laying of concrete
   - Testing of slump, casting of cubes and testing

- Material estimating and costing with specifications
- Technical report writing

2. Water Supply system for a one or two villages
   - Surveying
   - Design of water requirements and water distribution system
   - Preparation of drawing of overhead tank
   - Material estimating and costing
   - Specifications
   - Technical report writing

3. Construction of seating benches in polytechnic campus

4. Welding of angle iron and Expanded metal jali to prepare fencing in polytechnic campus

5. Construction of toilets and baths for a shopping complex in a township

6. Construction of bridle path 4 kms long

7. Construction of shopping complex by detailing of RCC drawings, estimating and costing of material

8. Rainwater harvesting
   - Assessment of catchment's area
   - Intensity of rainfall
   - Collection of water
   - Soak pit design
   - Supply of water
   - Monitoring during rainy season

9. Design and construction of septic tank with soak pit for 100 users

10. Preparing plumbing detailed drawings of a two storey building and material estimate and costing

11. Planning and design of sports stadium in a township or cluster of villages

12. Design of small residential building including structural members, specifications, estimating and costing of materials, report writing and municipal drawings for water supply and sewerage system

13. Concrete Mix Design

14. Construction of concrete cubes by mixing appropriate quantity of fly ash with fibres
    (i) the fibers like polypropylene, carbon, steel etc. can be used
    (ii) Students will show the comparison between concrete mixed with fibres verses the quality controlled concrete.

15. Estimation and designing of a State Highway Road
    (i) Reconniance survey of proposed road
    (ii) To take L - section and cross sections
    (iii) Fixing of grades
    (iv) Estimation of cutting and filling of earth mass
    (v) Plane tabling survey of proposed road
    (vi) Estimation of proposed road

16. Designing a small height gravity dam
    (i) Constructing of catchment area
    (ii) Calculating the reservoir capacity
    (iii) Designing of gravity dam by taking into account various forces

17. Designing of ferro-cement water tank and toilet. Testing of the ferro-cement products in QSCM labs.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN QSCM	
Course Code: **CIVSI607**	Course Title: **Seminar**
Semester: **VI**	Credits: **2**
Periods Per Week: **4 (L: 0, T: 0, P: 4)**	

COURSE OBJECTIVES:

Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Interact with peers to share thoughts.
4. Present given topic in a seminar.
5. Prepare a report on industrial visit, expert lecture

PRE-REQUISITE:

1. Students should have complete knowledge of design of construction
2. Students should know all the govt norms related to construction industry.

COURSE CONTENT:

1. Unit-1

1.1 Structured industrial visits shall be arranged and report of the same should be submitted by the individual students, to form a part of the term work. (Minimum 2 Visits)
Following are the suggested type of industries / Fields-

a) Visit to RCC framed structure building for details of reinforcement.
b) Visit to water / sewage treatment plant.
c) Visit to works carried out under watershed development / micro-irrigation scheme.
d) Visit to any structure undergoing rehabilitation/ retrofitting.

2. Unit-2

2.1 The Guest lecture/s from field / industry experts, professionals to be arranged (2Hrs duration), minimum 2 nos. from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work.

a) HRD and QSCM projects.
b) Project planning and execution of QSCM projects.
c) PWD system of accounts.

d) Contract Management.
e) RCC design and detailing

3. Unit-3

3.1 Information Search, data collection and writing a report on the topics
a) Collection of data for valuation of old building.
b) Collection of data and case study of failure of RCC structure.
c) Collection of information on any topic from journal available in library

4. Unit-4

4.1 The Students should discuss in group of 6 to 8 students and write a brief report on the same as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are:-
a) Role of Civil engineer in disaster management.
b) Scope of out souring of QSCM services.
c) Pollution control.

5. Unit-5

5.1 Seminar Presentation
The students should select a topic for Seminar based on recent development in QSCM field, emerging technology etc.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN QSCM	
Course Code: **CIVPE608**	Course Title: **Construction Contracts & Specifications (Elective-III)**
Semester: **VI**	Credits: **3**
Periods Per Week: **3 (L: 3, T: 0, P: 0)**	

COURSE OBJECTIVES:

This course will enable students to analyze, evaluate and design construction contract documents.

COURSE CONTENTS

1. **Unit one**
   - 1.1 Agreement, Contract, essential conditions, Indian Contract Act 1872, types of contract, terminology of contract. Construction Specifications: standard specifications, general specification, development, interpretation.

2. **Unit two**
   - 2.1 Tender and tender documents: types of bidding, tender notice, tendering procedure. Construction claims: extra item, excess quantity, deficit quantity, price escalation.

3. **Unit three**
   - 3.1 Dispute resolution mechanism: litigation, arbitration, conciliation, mediation, dispute resolution board. Contractual Problems: possible contractual problems, creation of claims, development of disputes. Contract document: drafting of clauses, development, and interpretation, CPWD conditions of contract, FIDIC conditions of contract.

4. **Unit four**
   - 4.1 BOT contract: types of contract, PPP framework, types of risk, concession agreement, drafting of clauses, development, and interpretation.

5. **Unit five**
   - 5.1 Laws affecting Engineers: Labour Law, Sales Tax, VAT, Service Tax, Excise Duty. Relational Contract: partnering, alliancing, key elements, processes.

COURSE OUTCOMES

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

- Develop the tender documents for the project
- Attain the knowledge on arbitration
- Present the contract documents as per CPWD

RECOMMENDED BOOKS:

1. "Managing Engineering and Construction Contracts: Some Perspectives" by Lakshman Prasad
2. "Basics of Construction Contracts" by Sharjeel Faiz
3. QSCM Contract Administration and Control by Ivor H. Seeley

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	12	20
2	12	20
3	12	20
4	12	20
5	12	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOA IN QSCM	
Course Code: **CIVPE609**	Course Title: **Construction Planning and Scheduling (Elective-III)**
Semester: **VI**	Credits:**3**
Periods Per Week: **3 (L:03, T:0, P:0)**	

COURSE OBJECTIVE:

The objective is to comprehensively grasp the core concepts of planning and scheduling, focusing on clarity, conciseness, and practicality. This entails delving into the foundational principles of these techniques and examining their real-world application, including how they are embraced, modified, and applied in various scenarios. Additionally, the aim is to outline the methodologies employed for analyzing equipment productivity, fostering a deeper understanding of equipment utilization and application.

COURSE CONTENT:

1. An Introduction to Planning and Scheduling

A brief history of planning and scheduling Critical path methods Planning programming and scheduling The cost and benefits of planning Types of plans

2. Planning and Scheduling Techniques

Bar charts Flow diagrams Flow charts Work study Network analysis Activity-on-arrow networks Drawing the network Precedence diagrams Drawing the network-precedence diagrams Linked bar charts Space diagrams Time chainage charts Multiple activity charts Line of balance Line of balance – resource scheduling Work Breakdown Structure Pre-tender planning, pre-contract planning, contract planning Pre-tender planning Pre-contract planning Contract planning Activities: selection, sequencing and duration Activity selection Sequencing Assessing the duration of each activity Links, dependencies and constraints Float and contingency Total float Free float Interfering float Independent float Intermittent float Negative float Terminal float Internal float Contingency Manipulation of float

3. Introduction to Critical Chain Project Management & Earned Value Analysis

How does CCPM differ from accepted best practice in project management? Cost Performance Index (CPI) Cost variance Earned value analysis (EVA) Earned value management (EVM)

4. Equipment Economics and Equipment Used In Construction industry

Important Questions Equipment Records The Rent Paid for the Use of Money Cost of Capital Evaluating Investment Alternatives Elements of Ownership Cost Elements of Operating Cost for Bidding Replacement Decisions Rent and Lease Considerations

5. Planning for Earthwork Construction and Planning for Building Construction

Planning Graphical Presentation of Earthwork Quantities Mass Diagram Using the Mass Diagram. Introduction Site Layout Delivery of Structural Components Steel Erection Tilt-Up Construction LIFTING AND SUPPORT EQUIPMENT Cranes Aerial Lift Platforms Integrated Tool Carriers Telescopic Handlers/Forklifts Generators Portable Light Towers Portable Welding Equipment Construction Noise Mitigation Lighting Dust Vibration

COURSE OUTCOME:

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

- Better understand the planning and scheduling methods.
- Understand the application of CPM
- Get acquainted with various civil engg equipments and understand equipment economics.

RECOMMENDED BOOKS:

1. A Handbook for Construction Planning and Scheduling - Andrew Baldwin
2. Construction planning equipment and methods -R. L. Peurifoy
3. Construction Process Planning and Management-Sidney Levy

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED(HRS)	MARKS ALLOTTED (%)
1	6	10
2	12	30
3	6	20
4	12	20
5	8	20
Total	**44**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN QSCM	
Course Code: **AU607**	Course Title: **Essence of Indian Knowledge & Tradition**
Semester: **VI**	Credits: **0**
Periods Per Week: **2 (L: 2, T: 0, P: 0)**	

COURSE OBJECTIVES:

The objectives are twofold: firstly, to familiarize students with Indian traditional knowledge, emphasizing the significance of its roots; and secondly, to enable students to comprehend, analyze, and apply this traditional knowledge in their daily lives.

COURSE CONTENT

1. INTRODUCTION TO TRADITIONAL KNOWLEDGE

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge vs. western knowledge traditional knowledge

2. PROTECTION OF TRADITIONAL KNOWLEDGE:

The need for protecting traditional knowledge Significance of TK value of Traditional Knowledge. TK in global economy, Role of Government to Protection, harness

3. LEGAL FRAMEWORK AND TRADITIONAL KNOWLEDGE

A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001(PPVFR Act);

B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

4. TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

5. TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS

Traditional knowledge and engineering, Traditional medicine system, Traditional knowledge and biotechnology, Traditional Knowledge in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of Traditional Knowledge.

COURSE OUTCOME

At the end of the Course, Student will be able to:

- Identify the concept of Traditional knowledge and its importance.
- Explain the need and importance of protecting traditional knowledge.
- Illustrate the various enactments related to the protection of traditional knowledge.
- Interpret the concepts of Intellectual property to protect the traditional knowledge.
- Explain the importance of Traditional knowledge in Agriculture and Medicine.

RECOMMENDED BOOKS:

1. Traditional Knowledge System in India, by AmitJha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Traditional Knowledge System in India by AmitJha Atlantic publishers, 2002.
4. "Knowledge Traditions and Practices of India "Kapil Kapoor, Michel Danino.

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	20
2	10	20
3	10	20
4	10	20
5	10	20
Total	**48**	**100**

CURRICULUM
FOR
SIXTH SEMESTER
OF
THREE-YEAR DIPLOMA
COURSE
IN
COMPUTER
ENGINEERING

STUDY SCHEME FOR SIXTH SEMESTER COMPUTER ENGINEERING

Code	Subjects	Study Scheme			Total Hours L+T+P	CREDITS			Total Credits L+T+P
		Periods Per Week							
		L	T	P		L	T	P	
COPC601	Software Project Management	3	0	0	3	3	0	0	3
COPC602	Artificial Intelligence and Neural Networks	3	0	0	3	3	0	0	3
COPC603	Artificial Intelligence and Neural Networks Lab	0	0	2	2	0	0	1	1
****	Elective-III	3	0	0	3	3	0	0	3
****	Elective-III Lab	0	0	2	2	0	0	1	1
	Open Elective	3	0	0	3	3	0	0	3
MP607	Major Project	0	0	16	16	0	0	8	8
		12	**0**	**20**	**32***	**12**	**0**	**10**	**22**

***Extra two hours shall be taken as supplementary classes per week**

***: The students have to choose Elective-III from the common pool of program electives and Open Elective from the list of Open Electives given at the end of the curriculum for Computer Engineering/IT. Furthermore, for the lab courses of program electives, it is mandatory that the lab course chosen is the corresponding lab course of the program elective only.

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING	
Course Code: CO**PC601**	Course Title: **Software Project Management**
Semester: **6th**	Credit: **3**
Periods Per Week: **3 (L: 03, T: 0, P: 0)**	

COURSE OBJECTIVE:

This course is designed to develop an understanding of basic software engineering techniques with the focus on requirements , design , planning and development of the software applications, with will be used by the students at industry level.

COURSE CONTENT:

1. Introduction to Software S/W Engineering

1.1 Introduction, size factors. Quality and productivity factors.
1.2 Management issues, Models: waterfall, spiral, prototyping, fourth generation techniques, s/w process
1.3 Introduction to agile technologies

2. Planning

2.1 The development process
2.2 an organizational structure
2.3 other planning activities

3. Software Cost Estimations

3.1 Cost factors.
3.2 Estimations techniques. Staffing level estimation, estimating software maintenance costs.
3.3 Cost model.
3.4 COCOMO model.

4. Software Requirements Definitions

4.1 Problem analysis, requirement engineering.
4.2 The software requirements specifications (SRS).

4.3 Formal specifications techniques, characteristics of a good SRS
4.4 Characteristics of a good SRS

5. Software Design and Implementation Issue

5.1 Fundamental design, concept design notations, design techniques
5.2 Structured coding techniques coding styles,
5.3 Documentation guidelines

6. Verification and Validation Techniques

6.1 Quality assurance work through and inspections static analysis
6.2 Symbolic execution unit testing, formal verifications
6.3 Black box and white box testing techniques

7. Software Maintenance

7.1 Maintenance Overview.
7.2 Configuration Management
7.3 Software Quality

COURSE OUTCOME:

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

- Apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment
- Work in one or more significant application domains
- Work as an individual and as part of a multidisciplinary team to develop and deliver quality software
- Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle

RECOMMENDED BOOKS:

1. Software Engineering by Rajib Mall, PHI Publishers, New Delhi
2. An Integrated Approach to Software Engineering by Pankaj Jalote, Narosa Publishing House Pvt Ltd, Darya Ganj, New Delhi 110002
3. Software Engineering, Sangeeta Sabharwal, New Age International, Delhi
4. Software Engineering by KK Aggarwal and Yogesh Singh
5. Software Engineering – A Practitioner's Approach by RS Pressman, Tata McGraw Hill Publishers, New Delhi
6. Eagles's Software Engineering By Gaurav Gupta, Dipika Goel

UNIT WISE TIME AND MARKS DISTRIBUTION

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	15
2	07	15
3	09	20
4	07	15
5	07	15
6	05	10
7	05	10
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING	
Course Code: **COPC602**	Course Title: **Artificial Intelligence and Neural Networks**
Semester: **6th**	Credit: **3**
Periods Per Week: **03 (L: 03, T: 00, P: 00)**	

COURSE OBJECTIVES:

This course aims to provide students with a comprehensive understanding of Artificial Intelligence (AI) fundamentals and their practical applications. Through a series of hands-on practicals, students will gain proficiency in key AI concepts such as search techniques, knowledge representation, machine learning, and neural networks. By the end of the course, students will be able to develop basic chatbots, solve complex problems using search algorithms, analyze data with regression and classification models, and implement neural networks for various tasks. Additionally, they will explore the ethical implications and societal impact of AI technologies, equipping them to contribute responsibly in the field of AI development and application.

COURSE CONTENT:

1. INTRODUCTION TO ARTIFICIAL INTELLIGENCE

1.1. Introduction to AI and its applications,
1.2. Brief historical perspective of AI
1.3. Agent and Environment
1.4. Types of AI systems
1.5. Applications of AI in healthcare, gamming and education.

2. SEARCH TECHNIQUES

2.1. Uniformed Search Techniques:
  2.1.1. Breadth First Search
  2.1.2. Depth First Search
2.2. Heuristic Search Techniques
  2.2.1. Hill climbing
  2.2.2. Best first search
  2.2.3. Mini-max search
  2.2.4. A* algorithm

3. KNOWLEDGE REPRESENTATION

3.1 Prepositional Logic—formulation of compound Prepositional from simpler ones using AND, OR, NOT, IMPLES and IFF connectives
3.2 Predicate Logic/First Order Logic) –Rule Based deduction systems, problem solving using predicates and quantifiers (Universal Quantifier, Existential Quantifier)

4. FUNDAMENTALS OF MACHINE LEARNING

- 4.1. Introduction to Machine Learning.
- 4.2. Overview of Supervised, Unsupervised and reinforcement Learning.
- 4.3. Various Learning techniques:
  - 4.3.1. Regression (Supervised ML)
    - 4.3.1.1. Linear Regression Algorithm
  - 4.3.2. Classification (Supervised ML)
    - 4.3.2.1. KNN Algorithm
  - 4.3.3. Clustering (Unsupervised ML).
    - 4.3.3.1. K-Means Clustering Algorithm

5. FUNDAMENTALS OF NEURAL NETWORKS

- 5.1. Introduction to neural networks and their applications,
- 5.2. Structure and working principles of artificial neurons (Perceptron)
- 5.3. Activation functions and their significance
- 5.4. Basic Overview of the Concept of Back-Propagation
- 5.5. Types of neural networks (feedforward, convolutional, recurrent)

COURSE OUTCOME:

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

- Understand the fundamentals of Artificial Intelligence (AI) and its various applications in healthcare, gaming, and education.
- Explain the history and evolution of AI, and recognize different types of AI systems, with a focus on expert systems.
- Apply heuristic search techniques, including Hill climbing, Branch and Bound, Best-first search, and A* algorithm, for problem-solving purposes.
- Gain a foundational understanding of Neural Networks, including their applications, artificial neuron structure, and activation functions.
- Demonstrate basic knowledge of Machine Learning and its main types: Supervised, Unsupervised, and Reinforcement Learning, along with various learning techniques like Regression, Classification, Transfer Learning, and Clustering.

RECOMMENDED BOOKS:

1. "Introduction to Artificial Intelligence"Author: Pradip K. Das Publisher: PHI Learning Private Limited
2. "Fundamentals of Neural Networks":Author: Mohan M. Trivedi Publisher: John Wiley & Sons Inc
3. "Fundamentals of Machine Learning":Author: S. B. Kotsiantis Publisher: Informatics
4. "Artificial Intelligence: Foundations of Computational Agents" by David L. Poole and Alan K. Mackworth

5. "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig
6. "Deep Learning with Python" by Francois Chollet
7. "Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques for Building Intelligent Systems" by Aurélien Géron

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	15
2	08	15
3	11	25
4	10	20
5	11	25
TOTAL	**64**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING	
Course Code: **COPC603**	Course Title: **Artificial Intelligence and Neural Networks Lab**
Semester: **6th**	Credit: **1**
Periods Per Week: **02 (L: 00, T: 00, P: 02)**	

COURSE OBJECTIVE

This course aims to provide students with a comprehensive understanding of Artificial Intelligence (AI) fundamentals and their practical applications. Through a series of hands-on practicals, students will gain proficiency in key AI concepts such as search techniques, knowledge representation, machine learning, and neural networks. By the end of the course, students will be able to develop basic chatbots, solve complex problems using search algorithms, analyze data with regression and classification models, and implement neural networks for various tasks. Additionally, they will explore the ethical implications and societal impact of AI technologies, equipping them to contribute responsibly in the field of AI development and application.

LIST OF PRACTICALS TO BE PERFORMED

1. Review of Python
2. Brief Introduction to Python Libraries-numpy, pytorch, TensorFlow, pygame etc
3. Basic Chatbot Development in Python
4. Implementation of Simple Problems using Breadth First Search Algorithm
5. Implementation of Simple Problems using Depth First Search Algorithm
6. Simple Optimization with Hill Climbing Algorithm
7. Interactive A* Pathfinding in Python
8. Truth Table Generator in Python
9. Introductory Rule-Based System in Python
10. Feedforward Neural Network in PyTorch
11. Activation Function Exploration in TensorFlow

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING AND INFORMATION TECHNOLOGY	
Course Code: **MP607**	**Course Title**: **Major Project**
Semester: **6th**	Credit: **8**
Periods Per Week: **16 (L: 0, T: 0, P: 16)**	

Introduction: Major Project Work in the 3-year diploma course aims to enhance students' innovative skills by applying the knowledge and skills acquired during their coursework to solve specific problems or undertake projects. As students possess diverse aptitudes and strengths, project assignments should align with their capabilities. This document outlines the guidelines for major project assignments, including types of projects and collaboration with industry.

General Guidelines

1. **Student Preferences:**
   - Students should be encouraged to identify the type of project work they are interested in executing.
   - Faculty should facilitate a process for students to express their preferences regarding project assignments.
2. **Faculty Brainstorming:**
   - Faculty members within each department should collaborate to identify suitable project assignments for students.
   - Projects should be tailored to match students' strengths and interests.
3. **Group Assignments:**
   - Project work can be assigned either individually or in groups.
   - For group assignments, the maximum group size should not exceed five students.
4. **Advance Planning:**
   - Students should either identify themselves or accept the given project assignment at least two to three months in advance.
   - Adequate time should be provided for planning and execution of the project.
5. **Industry Collaboration:**
   - Projects identified in collaboration with industry partners should be preferred.
   - Collaboration with industry helps in real-world application and enhances the relevance of projects.
6. **Faculty Guidance:**
   - Each teacher is expected to guide the project work of 5–6 students.
   - Faculty members should provide necessary support and supervision throughout the project duration.

Types of Project Assignments:

The project assignments may include, but are not limited to:

- Artificial Intelligence and Machine Learning applications
- Internet of Things (IoT) projects
- Game Development
- Enterprise Resource Planning (ERP) Systems
- Project Management Systems
- Cybersecurity solutions and practices
- Cloud computing projects
- Mobile application development
- Virtual and Augmented Reality applications
- Data analytics and visualization projects
- Programming customer-based applications
- Web designing with database connectivity
- Database applications
- Projects on Networking and Network security
- Software Development
- Fabrication of computer-related components/equipment
- Fault diagnosis and rectification of computer systems and peripherals
- Improvements in existing systems/equipment
- Multimedia projects
- Computer Graphics projects

Conclusion: These guidelines aim to ensure that major project work in the 3-year diploma course provides students with opportunities to apply their knowledge and skills effectively. By aligning project assignments with student preferences and industry collaboration, students can enhance their practical skills and contribute meaningfully to the field of computer science.

CURRICULUM

FOR

SIXTH SEMESTER

OF

THREE-YEAR DIPLOMA COURSE

IN

INFORMATION TECHNOLOGY

STUDY SCHEME 6TH SEMESTER INFORMATION TECHNOLOGY

Code	Subjects	Study Scheme			Total Hours L+T+P	CREDITS			Total Credits L+T+P
		Periods Per Week							
		L	T	P		L	T	P	
ITPC601	Network Management	3	0	0	3	3	0	0	3
ITPC602	Network Management Lab	0	0	2	2	0	0	1	1
ITPC603	Data and Information Security	3	0	0	3	3	0	0	3
	Elective-III	3	0	0	3	3	0	0	3
	Elective-III Lab	0	0	2	2	0	0	1	1
	Open Elective	3	0	0	3	3	0	0	3
MP607	Major Project	0	0	16	16	0	0	8	8
		12	**0**	**20**	**32***	**12**	**0**	**10**	**22**

***Extra two hours shall be taken as supplementary classes per week**

PROGRAM: THREE YEAR DIPLOMA IN INFORMATION TECHNOLOGY	
Course Code: **ITPC601**	**Course Title: Network Management**
Semester: **6th**	Credit: **3**
Periods Per Week: **3 (L: 03, T: 0, P: 0)**	

COURSE OBJECTIVE:

This course provides an introduction to the principles, concepts, and practices of network management. Students will learn about the design, implementation, monitoring, and troubleshooting of computer networks. The course covers network architectures, protocols, network devices, and network management tools.

COURSE CONTENT:

1. Introduction to Network Management
- 1.1 Overview of network management principles and concepts
- 1.2 Network management standards and protocols (SNMP, CMIP, etc.)
- 1.3 Network management models (FCAPS)of digital image processing

2. Network Architecture and Design
- 2.1 Network topologies and architectures (bus, star, mesh, etc.)
- 2.2 Network protocols and services (TCP/IP, DNS, DHCP, etc.)
- 2.3 Network security considerations

3. Network Devices and Technologies
- 3.1 Network switches, routers, and access points
- 3.2 VLANs (Virtual Local Area Networks) and trunking.
- 3.3 Wireless networking technologies (Wi-Fi, Bluetooth, etc.)

4. Network Monitoring and Troubleshooting
- 4.1 Network performance monitoring and analysis
- 4.2 Fault management and troubleshooting techniques
- 4.3 Concept of RAID levels
- 4.4 Network diagnostics and tools

5. Network Security and Access Control
- 5.1 Network security concepts and best practices
- 5.2 Firewalls and Intrusion Detection Systems (IDS)
- 5.3 Virtual Private Networks (VPNs) and secure remote access

6. Network Management Tools and Software
- 6.1 Network management systems (NMS) and their components
- 6.2 SNMP (Simple Network Management Protocol) and MIBs (Management Information Bases)
- 6.3 Configuration management

COURSE OUTCOME:

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

- Understand network management principles and concepts.
- Design and implement computer networks.
- Monitor and troubleshoot network performance.
- Configure and manage network devices and services
- Utilize network management tools and software

RECOMMENDED BOOKS:

1. "Network Management: Principles and Practice" by Mani Subramanian
2. "Network Management: MIBs and MPLS Principles, Design and Implementation" by Stephen B. Morris
3. "Network Management: Concepts and Tools" by Richard L. Peterson and Nils H. Morris.
4. Network Monitoring and Troubleshooting: Title: "Network Troubleshooting Tools"Author: Joseph D. Sloan Publisher: O'Reilly Media
5. Network Security and Access Control: Title: "Network Security Essentials: Applica-tions and Standards" Authors: William Stallings Publisher: Pearson
6. Network Management Tools and Software: Title: "Essential SNMP" Authors: Douglas R. Mauro, Kevin J. Schmidt Publisher: O'Reilly Media

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	05	10
2	07	15
3	07	15
4	09	20
5	10	20
6	10	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA IN INFORMATION TECHNOLOGY	
Course Code: **ITPC602**	**Course Title: Network Management Lab**
Semester: **6th**	Credits: **01**
Periods Per Week :**2 (L: 0, T: 0, P:2)**	

COURSE OBJECTIVES:

Gain hands-on experience with network management tools, Configure and manage network devices, Perform network diagnostics and analysis, Configure network services and protocols.

LIST OF PRACTICAL TO BE PERFORMED:

1. Configure network devices (routers, switches, firewalls) with appropriate IP addresses, VLANs, and routing protocols.
2. Set up a network monitoring system (NMS) to monitor network performance metrics such as bandwidth utilization, latency, and packet loss.
3. Use network monitoring tools to analyze network traffic and identify performance bottlenecks or anomalies.
4. Configure and test firewalls to filter network traffic based on security policies and rules.
5. Implement Virtual Private Networks (VPNs) for secure remote access to the network.

PROGRAM: THREE YEAR DIPLOMA IN INFORMATION TECHNOLOGY	
Course Code:**ITPC603**	**Course Title: Data and Information Security**
Semester: **6th**	Credit: **3**
Periods Per Week: **3 (L: 03, T: 0, P: 0)**	

COURSE OBJECTIVE:

After completing this course the student must demonstrate the knowledge and ability to Identify the threats to information security, Show how to protect information recourses, Show how to maintaining and protecting information system.

COURSE CONTENT:

1. Introduction to Data and Information Security

Introduction to Data and Information Security, attacks, computer crime, security services, security mechanisms, Cyber Crimes, Information Technology Act.

2. Data Security over internet.

Confusion, Diffusion, Introduction to basic encryption and decryption, concept of symmetric and asymmetric key cryptography, overview of DES, RSA and PGP. Introduction to Hashing: MD5, SSL, SSH, HTTPS, Digital Signatures.

3. Program Security.

Program security, Program Errors, Malicious Codes, virus, Trapdoors, program security issues, protecting programs.
Protection in OS: memory and Address protection, File protection

4. Database Security.

Database security requirements, Reliability, Integrity, Sensitive Data, Multilevel security, types of crimes, Ethical issues in Security.

5. Virtual Private Network (VPN)

Basics, setting of VPN, VPN diagram, configuration of required objects, exchanging keys.

COURSE OUTCOME:

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

- Understand the importance of data and information security in the modern digital landscape.
- Identify and assess potential threats and vulnerabilities to data and information systems.
- Comprehend legal and ethical issues related to data protection and privacy.
- Gain practical experience with security tools and techniques through hands-on exercises.

RECOMMENDED BOOKS:

1. "Principles of Information Security" by Michael E. Whitman and Herbert J. Mattord
2. "Network Security Essentials: Applications and Standards" by William Stallings
3. "Cryptography and Network Security: Principles and Practice" by William Stallings
4. "Principles of Information Security" by Michael E. Whitman and Herbert J. Mattord. Publisher: Cengage Learning.
5. "Cryptography and Network Security: Principles and Practice" by William Stallings. Publisher: Pearson.
6. "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws" by Dafydd Stuttard and Marcus Pinto. Publisher: Wiley.
7. "Security in Computing" by Charles P. Pfleeger, Shari Lawrence Pfleeger, and Jonathan Margulies. Publisher: Pearson.
8. "Database Security and Auditing: Protecting Data Integrity and Accessibility" by Hassan A. Afyouni. Publisher: Cengage Learning.

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	07	15
2	14	30
3	10	20
4	10	20
5	07	15
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING AND INFORMATION TECHNOLOGY	
Course Code: **MP607**	**Course Title**: **Major Project**
Semester: **6th**	Credit: **8**
Periods Per Week: **16 (L: 0, T: 0, P: 16)**	

Introduction: Major Project Work in the 3-year diploma course aims to enhance students' innovative skills by applying the knowledge and skills acquired during their coursework to solve specific problems or undertake projects. As students possess diverse aptitudes and strengths, project assignments should align with their capabilities. This document outlines the guidelines for major project assignments, including types of projects and collaboration with industry.

Guidelines:

1. **Student Preferences:**
   - Students should be encouraged to identify the type of project work they are interested in executing.
   - Faculty should facilitate a process for students to express their preferences regarding project assignments.
2. **Faculty Brainstorming:**
   - Faculty members within each department should collaborate to identify suitable project assignments for students.
   - Projects should be tailored to match students' strengths and interests.
3. **Group Assignments:**
   - Project work can be assigned either individually or in groups.
   - For group assignments, the maximum group size should not exceed five students.
4. **Advance Planning:**
   - Students should either identify themselves or accept the given project assignment at least two to three months in advance.
   - Adequate time should be provided for planning and execution of the project.
5. **Industry Collaboration:**
   - Projects identified in collaboration with industry partners should be preferred.
   - Collaboration with industry helps in real-world application and enhances the relevance of projects.
6. **Faculty Guidance:**
   - Each teacher is expected to guide the project work of 5–6 students.
   - Faculty members should provide necessary support and supervision throughout the project duration.

Types of Project Assignments:

The project assignments may include, but are not limited to:

- Artificial Intelligence and Machine Learning applications
- Internet of Things (IoT) projects
- Game Development
- Enterprise Resource Planning (ERP) Systems
- Project Management Systems
- Cybersecurity solutions and practices
- Cloud computing projects
- Mobile application development
- Virtual and Augmented Reality applications
- Data analytics and visualization projects
- Programming customer-based applications
- Web designing with database connectivity
- Database applications
- Projects on Networking and Network security
- Software Development
- Fabrication of computer-related components/equipment
- Fault diagnosis and rectification of computer systems and peripherals
- Improvements in existing systems/equipment
- Multimedia projects
- Computer Graphics projects

Conclusion: These guidelines aim to ensure that major project work in the 3-year diploma course provides students with opportunities to apply their knowledge and skills effectively. By aligning project assignments with student preferences and industry collaboration, students can enhance their practical skills and contribute meaningfully to the field of computer science.

CURRICULUM
OF
PROGRAM/CORE ELECTIVE SUBJECTS
AND
OPEN ELECTIVES
FOR
THREE-YEAR DIPLOMA COURSE
IN

1. **COMPUTER ENGINEERING**
2. **INFORMATION TECHNOLOGY**

The student has to choose amongst the following list of electives for the core elective subjects to be chosen in 5th and 6th Semester and Open Elective for 6th Semester. In case of Core Elective, it is mandatory to choose also the corresponding lab course of the same elective i.e. if a student chooses Data Warehousing and Mining as Core Elective in 5th Sem Computer Engineering, then he/she has to also choose the Course "Data Warehousing and Mining Lab" as its corresponding Elective Lab. Besides it is to be ensured that student does not choose any course as elective which is otherwise a core subject in the branch and also does not choose the same course twice during the diploma ie. Choosing Same subject in 5th and 6th semester is not allowed.

A : LIST OF CORE ELECTIVE SUBJECTS TO BE OFFERED IN 5TH AND 6TH SEMESTER FOR (Computer Engineering and Information Technology).		
S.NO.	**COURSE CODE**	**SUBJECT NAME**
01	COPE01	LINUX PROGRAMMING
02	COPE02	LINUX PROGRAMMING LAB
03	ITPE01	DATA WAREHOUSING AND MINING
04	ITPE02	DATA WAREHOUSING AND MINING LAB
05	COPE03	OPEN-SOURCE TECHNOLOGIES
06	COPE04	OPEN-SOURCE TECHNOLOGIES LAB
07	ITPE03	BLOCK CHAIN TECHNOLOGY
08	ITPE04	BLOCK CHAIN TECHNOLOGY LAB
09	ITPEO5	ROBOTICS
10	ITPEO6	ROBOTICS LAB
11	COPE05	NETWORK SECURITY
12	COPE06	NETWORK SECURITY LAB
13	ITPEO7	CLOUD COMPUTING
14	ITPEO8	CLOUD COMPUTING LAB
15	COPE07	MACHINE LEARNING
16	COPE08	MACHINE LEARNING LAB
17	ITPE09	GRID COMPUTING

18	ITPE10	GRID COMPUTING LAB
19	COPE09	DATA COMMUNICATION
20	COPE10	DATA COMMUNICATION LAB
21	COPE11	R PROGRAMMING
22	COPE12	R PROGRAMMING LAB
23	ITPE11	E- COMMERCE
24	ITPE12	E- COMMERCE LAB
25	ITPE13	DATA AND INFORMATION SECURITY
26	ITPE14	DATA AND INFORMATION SECURITY LAB
27	COPE13	FUNDAMENTALS OF DATA SCIENCE
28	COPE14	FUNDAMENTALS OF DATA SCIENCE LAB
B: LIST OF OPEN ELECTIVE SUBJECTS TO BE OFFERED IN 6TH SEMESTER FOR (Computer Engineering and Information Technology)		
01	COOE601	DISCRETE MATHEMATICS
02	COOE602	OPERATION RESEARCH AND OPTIMIZATION
03	COOE603	STATISTICS & PROBABILTIY
04	COOE604	ADVANCED MICROPROCESSORS
05	ITOE601	CYBER LAWS AND INTELLECTUAL PROPERTY RIGHTS
06	ITOE602	MOBILE APPLICATION DEVELOPMENT
07	ITOE603	WIRELESS AND MOBILE COMMUNICATION

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN COMPUTER AND INFORMATION TECHNOLOGY	
Course Code: **COPE01**	Course Title: **Linux Programming**
Periods Per Week: **3 (L: 03, T: 0, P: 0)**	**Credit:3**

COURSE OBJECTIVE:

The Objective of the course is to Introduce students to the Linux operating system and teach fundamental Linux commands and file management, besides develop in them basic scripting skills using Bash and familiarize students with Linux application development.

1. **Introduction to Linux**
   - 1.1. Introduction to the Linux operating system.
   - 1.2. History and significance of Linux.
   - 1.3. Open-Source Code Vs Free Code
   - 1.4. Various Linux distributions
2. **Basic Linux Commands**
   - 2.1. Command-line interface (CLI) and Terminal.
   - 2.2. Navigating the Linux file system.
   - 2.3. Common Linux commands (ls, cd, pwd, touch, mkdir, rmdir, etc.).
3. **File Management**
   - 3.1. File permissions and ownership.
   - 3.2. Copying, moving, and deleting files and directories.
   - 3.3. File compression and archiving (tar, gzip, zip).
4. **Introduction to Bash Scripting**
   - 4.1. Shell script
   - 4.2. Writing and executing basic Bash scripts.
   - 4.3. Variables, input/output, and conditional statements in scripts.
5. **Flow Control in Bash**
   - 5.1. Loops (for and while) in Bash scripts.
   - 5.2. Conditional statements (if, else, elif) in scripts.
   - 5.3. Writing simple interactive scripts.
6. **Introduction to Linux Application Development**
   - 6.1. Overview of Linux application development tools.
   - 6.2. Introduction to C programming in Linux.
   - 6.3. Writing and compiling a simple C program in Linux.

COURSE OUTCOME:

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

- Demonstrate Proficiency in Linux Operating Systems

- Navigate and Utilize the Linux Command Line Interface (CLI).
- Manage Files and Directories
- Develop Bash Scripts
- Implement Flow Control in Bash Scripts
- Apply Practical Bash Scripting
- Understand Basics of Linux Application Development

RECOMMENDED BOOKS:

1. "Linux Command Line and Shell Scripting Bible" by Richard Blum and Christine Bresnahan
2. "Linux Pocket Guide" by Daniel J. Barrett
3. "Linux for Beginners: An Introduction to the Linux Operating System and Command Line" by Jason Cannon
4. "Bash Pocket Reference" by Arnold Robbins
5. "The Linux Programming Interface: A Linux and UNIX System Programming Handbook" by Michael Kerrisk

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	15
2	10	20
3	10	20
4	06	15
5	08	15
6	08	15
Total	**48 hours**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN COMPUTER ENGINEERING/INFORMATION TECHNOLOGY	
Course Code: **COPE02**	Course Title: **Linux Programming Lab**
Periods Per Week: **2 (L: 0, T: 0, P: 2)**	**Credit:1**

COURSE OBJECTIVE:

The "Linux Programming Lab" is a companion lab for the theory course, allowing students to practice what they've learned. It provides hands-on experience with Linux systems and scripting. The lab sessions should align with the corresponding theory units and may include the following practical activities:

LIST OF PRACTICALS:

Lab 1: Linux Basics
- Setting up a Linux environment (e.g., using VirtualBox).
- Basic Linux commands and file management.

Lab 2: Bash Scripting Basics
- Writing simple Bash scripts to perform file operations.
- Using variables and conditional statements in scripts.

Lab 3: Advanced Bash Scripting
- Writing more complex Bash scripts with loops.
- Creating interactive scripts.

Lab 4: Bash Scripting Projects
- Independent scripting projects and assignments.
- Debugging and troubleshooting scripts.

Lab 5: Linux Application Development
- Setting up a development environment for C programming.
- Writing and compiling C programs in Linux.

Note: In the lab, students will work with a Linux distribution of their choice, and the instructor should be available to provide guidance and support as needed during practical sessions.

PROGRAM: THREE YEAR DIPLOMA IN ENGINEERING AND TECHNOLOGY /INFORMATION TECHNOLOGY	
Course Code: **ITPE01**	Course Title: **Data Warehousing and Mining**
Periods Per Week: **3 (L: 03, T: 0, P: 0)**	Credit: **3**

COURSE OBJECTIVE:

The objective of this course is to provide diploma students with a comprehensive understanding of data warehousing and data mining concepts and techniques. Students will learn how to design, implement and generate reports from large datasets.

COURSE CONTENT:

1. Introduction

1.1 Definition and purpose of data warehousing
1.2 Difference from operational databases
1.3 Differences between OLAP and OLTP.

2. Data Warehouse

2.1 Concepts of dimensions, facts, cubes, attribute, hierarchies,
2.2 Schemas for multidimensional data models (star, snowflake, fact constellation)
2.3 Data warehousing architecture - A three tier Data warehouse architecture
2.4 Types of OLAP systems (ROLAP, MOLAP, HOLAP)
2.5 OLAP operations (roll-up, drill-down, slice & dice, pivot, etc.)
2.6 Data warehouse Back-End Tools and Utilities
2.7 Metadata Repository
2.8 Data warehouse Implementation.

3. Data Preprocessing

Data cleaning, Data integration and transformation, Data reduction, Data discretization and Concept hierarchy.

4. Basics of Data Integration (Extraction Transformation Loading)

4.1 Concepts of data integration need and advantages of using data integration
4.2 Introduction to common data integration approaches
4.3 Introduction to ETL.

5. Basics of Enterprise Reporting

5.1 Introduction to enterprise reporting
5.2 Concepts of dashboards, balanced scorecards
5.3 Introduction to Reporting Architecture.

6. Data Mining architecture

6.1 Data Mining Functionalities, Interestingness of pattern, classification of data mining system, major issues Data Mining primitives
6.2 Task relevant data, interestingness measures
6.3 Presentation and visualization of patterns
6.4 Data Mining Architecture
6.5 Concept, Description, Data Generalization and Summarization
6.6 Attributed oriented induction
6.7 Analytical characterization
6.8 Mining class comparisons.

RECOMMENDED BOOKS:

1. Data Mining: Concepts and Techniques By J.Han and M.Kamber By Morgan Kaufman publishers, Harcourt India Pvt. Ltd. Latest Edition.
2. Data Mining Introductory and Advance Topics By Dunham, Pearson Education, Latest Edition.
3. Business intelligence for the enterprise by Mike Biere, Addison Weseley, Latest Edition

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Topic	Time (Hrs.)	Marks (%)
1	Introduction	04	10
2	Data Warehouse	16	30
3	Data Processing	06	15
4	Basics of Data Integration (Extraction Transformation Loading)	08	15
5	Basics of Enterprise Reporting	04	10
6	Data Mining Architecture	10	20
	Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING/ INFORMATION TECHNOLOGY	
Course Code: **ITPE02**	Course Title: **Data Warehousing and Mining Lab**
Periods Per Week: **2 (L: 0, T: 0, P: 2)**	Credit: **1**

COURSE OBJECTIVE:

The objective of this course is to provide comprehensive understanding of data warehousing and data mining concepts and techniques. Students will learn how to design, implement, generate reports from large datasets.

LIST OF PRACTICALS

1. To prepare multidimensional model for a given database problem.
2. To prepare concept hierarchy, star, snowflake model.
3. To use open source software such as Pentaho, Kettle for Data Integration.
4. To perform Data Transformation using Pentaho software.
5. To prepare Data Reports using Microsoft SQL server Reporting services.
6. To use Data Mining Software such as WEKA Rapid Mines or SPSS, Mathematica.

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING/ INFORMATION TECHNOLOGY	
Course Code: **COPE03**	Course Title: **Open-Source Technologies**
Periods Per Week: 0**3 (L: 03, T: 00, P: 00)**	Credit: **3**

COURSE OBJECTIVE:

This course enables student to build solid understanding of open-source technologies and their applications. They will be able to work with open-source operating systems, develop web applications using PHP and MySQLi, utilize open-source tools for development and collaboration, and gain insights into networking and security using open-source solutions.

COURSE CONTENT:

Unit 1: Introduction to Open-Source Technologies

1.1 Concept of open-source technologies,
1.2 Benefits and advantages of open-source software,
1.3 Introduction to various open-source licenses,
1.4 Overview of open-source communities and collaboration platforms.

Unit 2: Open-Source Operating Systems and Android

2.1 Introduction to open source operating systems (e.g., Linux distributions)
2.2 Installation and basic configuration of an open source OS
2.3 File systems and command-line interface in open source OS
2.4 Introduction to Android operating system and its features
2.5 Introduction to Android development using open-source tools (e.g., Android Studio)

Unit 3: Open-Source Web Technologies with PHP and MySQLi

3.1 Introduction to web development with open-source technologies.
3.2 Building dynamic webpages using HTML, CSS, and JavaScript (simple pages). Introduction to server-side scripting with PHP.
3.3 Interacting with databases using MySQLi (MySQL improved)
3.4 Deploying open source web applications

Unit 4: Open Source Tools

4.1 Introduction to popular open source development tools (e.g., Git, GitHub)
4.2 Basics of version control using Git and GitHub for collaboration
4.3 Introduction to open source networking tools (e.g., Wireshark, Nmap)
4.4 Explore open-source firewalls and their role in network protection.
4.5 Secure communication protocols in open source (e.g., OpenVPN)

COURSE OUTCOME

- Understand the concept and benefits of open-source technologies.
- Gain practical skills in using open-source operating systems, web technologies, and development tools.
- Learn to develop dynamic webpages and interact with databases using open-source tools.
- Acquire knowledge of open-source networking tools and secure communication protocols**.**

RECOMMENDED BOOKS

1 "Open Source for You: All About Open Source Software" by N. S. Shekar
2 "Open Source Technologies for Maximizing the Creation, Deployment, and Use of Digital Resources and Information" by Sushil K. Sharma and Arun K. Agarwal.
3 "The Linux Command Line" by Shotts Jr., William E.
4 "Android Application Development Cookbook" by Wei-Meng Lee
5 "PHP 7: The Complete Guide" by Malti Bansal and Kunal Chandratre
6 "MySQLi for Beginners" by Rahul Shetty
7 "Git Essentials" by Ferdinando Santacroce
8 "Network Security: A Practical Approach" by Brijendra Singh

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Introduction to Open-Source Technologies	10	20
2	Open-Source Operating Systems and Android	14	30
3	Open-Source Web Technologies with PHP and MySQLi	14	30
4	Open Source Tools	10	20
Total		**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING/ INFORMATION TECHNOLOGY	
Course Code: **COPE04**	Course Title: **Open-Source Technologies Lab**
Periods Per Week: 0**2 (L: 00, T: 00, P: 02)**	Credit: **1**

COURSE OBJECTIVE:

The aim of the course tends to explore open-source software. Practice students Install open source software. Also students will get a knowhow how to develop an Android application using Android Studio, build a webpage using HTML, CSS, and JavaScript and Set up and use repository.

LIST OF PRACTICALS :

1 Install an open-source software of your choice and explore its features

2 Install a Linux distribution (e.g., Ubuntu) on a virtual machine or dual-boot on your computer

3 Create a simple Android application that displays a welcome message on the screen using Android Studio

4 Build a simple webpage using HTML, CSS, and JavaScript to display your personal information.

5 Create a contact form on a webpage using PHP and validate user inputs. Store the form data in a MySQL database using MySQLi

6 Set up a Git repository, create a new branch, make some changes, and push them to the repository on GitHub

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING / INFORMATION TECHNOLOGY	
Course Code: **ITPE03**	Course Title: **Block Chain Technology**
Periods Per Week: **(L: 03, T: 00, P: 0)**	Credit: 03

COURSE OBJECTIVE:

This course covers blockchain technologies, technical aspects of cryptocurrencies, and distributed consensus. Students will explore applications for Bitcoin-like cryptocurrencies and learn to engineer secure software for interacting with the Bitcoin network and other cryptos, gaining a comprehensive understanding of decentralized systems.

COURSE CONTENT:

1 Introduction

1.1 Basic of Blockchain Architecture – Challenges – Applications – Block chain Design Principles
1.2 The Blockchain Ecosystem
1.3 Abstract Models for BLOCKCHAIN - GARAY model, RLA Model
1.4 Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS).

2 CRYPTOGRAPHIC FUNDAMENTALS

2.1 Cryptographic basics for crypto currency
2.2 A short overview of Hashing, cryptographic algorithm – SHA 256,signature schemes, encryption schemes
2.3 Introduction to Hyperledger- Hyperledger framework - Public and Private Ledgers

3 BIT COIN

3.1 Bit coin - Wallet - Blocks - Merkley Tree
3.2 Hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bit coin
3.3 Bitcoin blockchain, the challenges, and solutions
3.4 Proof of work, Proof of stake
3.5 Alternatives to Bitcoin consensus
3.6 Bitcoin scripting language and their uses.

4 ETHEREUM

4.1 Ethereum - Ethereum Virtual Machine (EVM)
4.2 Wallets for Ethereum
4.3 Smart Contracts - some attacks on smart contracts

4.4 The Turing Completeness of Smart Contract Languages and verification challenges
4.5 Comparing Bitcoin scripting vs. Ethereum Smart Contracts

5 BLOCK CHAIN-RECENT TREND

5.1 Blockchain Implementation Challenges
5.2 Zero Knowledge proofs and protocols in Block chain
5.3 Succinct non interactive argument for Knowledge (SNARK)
5.4 Attacks on Blockchains – such as Sybil attacks, selfish mining

COURSE OUTCOME:

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

- Understand emerging abstract models for Block chain Technology
- Analyse the concept of bit coin and mathematical background behind it
- Apply the tools for understanding the background of crypto currencies
- Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain
- Enumerate applications in Block Chain Technology.

RECOMMENDED BOOKS:

1. Melanie Swan, "Block Chain: Blueprint for a New Economy", O"Reilly, first edition – 2015.
2. Daniel Drescher, "Block Chain Basics", Apress; 1stedition, 2017
3. Anshul Kaushik, "Block Chain and Crypto Currencies", Khanna Publishing House, Delhi.
4. Imran Bashir, "Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Packt Publishing, first edition – 2012.

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	INTRODUCTION	10	20
2	CRYPTOGRAPHIC FUNDAMENTALS	15	25
3	BIT COIN	12	20
4	ETHEREUM	12	15
5	BLOCK CHAIN-RECENT TREND	15	25
	Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING /INFORMATION TECHNOLOGY	
Course Code: **ITPE04**	Course Title: **Block Chain Technology Lab**
Periods Per Week: **02 (L: 00, T: 00, P: 02)**	Credit: **1**

COURSE OBJECTIVES:

This course aims to give understanding of latest advances and its applications in Block Chain Technology. Also to use one of the open source tool available for Block chain Technology in a case study

LIST OF PRACTICALS TO BE PERFORMED:

1. Understand Block chain Technology
2. Develop Block chain based solutions and write smart contract using Hyperledger Fabric and Ethereum Framework.
3. Build and deploy Block chain application for on premise architecture.
4. Build and deploy Block chain application for cloud based architecture.
5. Integrate ideas from various domains and implement them using block chain technology in different perspectives.
6. To develop any one of the block chain application.

Understand the security features in block technology and develop application

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING /INFORMATION TECHNOLOGY	
Course Code: **ITPEO5**	Course Title: **Robotics**
Periods Per Week: **3 (L: 3, T: 0, P: 0)**	Credit: **3**

COURSE OBJECTIVES:

The objectives of this course are Identify robots and its peripherals for satisfactory operation and control of robots for industrial and non-industrial applications.

PRE REQUISTES: Internet of Things

Note: The student should be offered only after ensuring sufficient equipment required for the Lab is available.

COURSE CONTENT:

1. Introduction and classification:

1.1 Definition,
1.2 History of robots,
1.3 Application of robots,
1.4 Industrial applications,
1.5 Classification of Robots,
1.6 Actuators and Grippers

2. Transformations

1.1 Kinematic constraints,
1.2 Degrees of freedom and mobility,
1.3 Pose of a rigid body,
1.4 Coordinate Transformations,
1.5 DH Parameters

3. Kinematics

3.1 Forward position analyses,
3.2 Inverse position analyses,
3.3 Velocity analyses, Jacobian Matrix, Singularity,
3.4 Forward and Inverse Velocity analyses,
3.5 Acceleration analyses,
3.6 Manipulator Design Requirements

4. Dynamics and Control

4.1 Euler-Lagrange equations of motion for serial type manipulators;
4.2 Inverse and Forward dynamic analyses,
4.3 Linear control techniques,
4.4 Transfer function and state space representation of dynamic system,
4.5 A Robotic joint,
4.6 PID control.

COURSE OUTCOMES:

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

- list and explain the basic elements of industrial robots
- analyse robot kinematics and its control methods.
- classify the various sensors used in robots for better performance.
- summarize various industrial and non-industrial applications of robots.

Books Recommended

1. Saha S. K., Introduction to Robotics, McGraw Hill Education (India).
2. Craig J. J., Introduction to Robotics, Mechanics and Control, Pearson Education.

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	8	20
2	8	20
3	12	30
4	12	30
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING /INFORMATION TECHNOLOGY	
Course Code: **ITPEO6**	Course Title: **Robotics Lab**
Periods Per Week: **3 (L: 3, T: 0, P: 0)**	Credit: **3**

COURSE OBJECTIVES:

The objectives of this course are Identify robots and its peripherals for satisfactory operation and control of robots for industrial and non-industrial applications.

LIST OF PRACTICALS:

1. Introduction to Robot Components:**
   - Identify and name different components of a robot (e.g., motors, sensors, wheels, microcontroller).

2. Building a Simple Robot Chassis:
   - Assemble a basic robot chassis using commonly available materials (e.g., cardboard or plastic).

3. Sensor Interfacing:
   - Connect and program sensors (e.g., ultrasonic, infrared) to measure distance or detect obstacles.
   - Display sensor data on a screen or LED.

4. Basic Motor Control:
   - Write code to control the movement of a robot using DC motors.
   - Implement forward, backward, left, and right movements.

5. Line Following Robot:
   - Build a robot capable of following a black line on a white surface using infrared sensors.
   - Program the robot to stay on the line.

6. Obstacle Avoidance Robot:
   - Develop a robot that can navigate around obstacles using ultrasonic or infrared sensors.
   - Implement collision avoidance algorithms.

These practicals cover a range of basic robotics concepts and can help students develop a strong foundation in robotics.

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING /INFORMATION TECHNOLOGY	
Course Code: **COPE05**	Course Title: **Network Security**
Semester: **6th**	Credit: **3**
Periods Per Week: **3 (L: 3, T: 0, P: 0)**	

COURSE OBJECTIVE:

The main objective of this course is to provide students with a solid foundation in network security principles, practical skills in implementing security measures, and the ability to analyze and respond to security incidents. By achieving these objectives, students are prepared to contribute to the secure design, implementation, and management of network infrastructures in various professional roles.

COURSE CONTENT:

1. **Introduction to Network Security**
   - 1.1. Importance of network security in modern computing,
   - 1.2. Key security objectives: confidentiality, integrity, availability.
   - 1.3. Overview of network security concepts and principles
   - 1.4. Ethical hacking, Hacking, Threats, vulnerabilities, and risks

2. **Computer Network Attacks**
   - 2.1. Active Attacks and Passive Attacks
   - 2.2. Social Engineering, Bugs and Backdoors.
   - 2.3. Denial-of-Service Attacks, Botnets, Phishing Attacks.

3. **Cryptography and Encryption**
   - 3.1. Introduction to Symmetric and Asymmetric encryption.
   - 3.2. Overview of DES, RSA and PGP.
   - 3.3. Introduction to Hashing: MD5, SSL, SSH, HTTPS, Digital Signatures.

4. **Intrusion Detection System and Firewalls**
   - 4.1. IDS, Classification of IDS, Host-based IDS and Network based IDS.
   - 4.2. Anomaly Vs Signature Detection, Teardrop attacks
   - 4.3. Firewalls, Types of Firewalls and Limitations of Firewalls.

5. **Introduction to Virtual Private Network (VPN)**
   - 5.1 Definition and purpose of VPNs
   - 5.2. Types of VPNs: remote access, site-to-site, client-to-site

5.3. VPN protocols: IPsec, SSL/TLS, PPTP, L2TP

6. Wireless Network Security

6.1. Wi-Fi security standards (e.g., WEP, WPA, WPA2)
6.2. Wireless intrusion detection and prevention
6.3. Securing wireless network devices

COURSE OUTCOME

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

- Understand the fundamental concepts of network security, including threats, vulnerabilities, and risk management.
- Identify and evaluate different types of network attacks and develop strategies to prevent, detect, and mitigate them.
- Demonstrate knowledge of various network security technologies, protocols, and tools, including firewalls, intrusion detection systems, encryption algorithms, and VPNs.
- Apply cryptography techniques to ensure confidentiality, integrity, and authenticity of network communications and data.
- Demonstrate the ability to configure and manage security solutions such as firewalls, intrusion detection systems, and VPNs.

RECOMMENDED BOOKS:

1. Cryptography and Network Security by Forouzon, Tata Mc Graw Hill Education Pvt Ltd, New Delhi
2. Cryptography and Network Security by Atul Kahate, Tata Mc Graw Hill Education Pvt Ltd, New Delhi
3. Cryptography and Network Security by Padmanabham, Wiley India Pvt Ltd. Daryaganj, New Delhi
4. Network Security by Eric Cole, Bible, Wiley- India Pvt Ltd. Daryaganj, New Delhi
5. Network security by William Stalling

UNIT WISE TIME AND MARKS DISTRIBUTION

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	16
2	08	16
3	08	18
4	10	20
5	08	16
6	06	14
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING /INFORMATION TECHNOLOGY	
Course Code: **COPE06**	Course Title**:** **Network Security Lab**
Periods Per Week :**2 (L: 0, T: 0, P:2)**	Credits: **01**

COURSE OBJECTIVES:

The objectives for practical on Network Security are designed to provide students with hands-on experience in implementing, configuring, and managing various network security technologies and tools.

LIST OF PRACTICAL:

1. Implementation of Basic Encryption /Decryption Algorithms:
    - Caesar Cipher
    - Substitution Cipher
    - Transposition Cipher
2. Network Scanning and Enumeration
    - Use tools like Nmap to scan a network.
    - Enumerate hosts and services.
    - Identify potential security risks based on scan results.
3. Firewall Configuration and Management
    - Install and configure a firewall (e.g., iptables).
    - Create rules to allow/deny traffic based on specific criteria.
    - Test firewall rules effectiveness using simulated attacks.
4. Intrusion Detection Systems (IDS)
    - Install and configure an open-source IDS (e.g., Snort).
    - Define rules to detect common attack patterns.
    - Analyze IDS logs and respond to detected threats.
5. VPN Implementation
    - Configure VPN server and client software (e.g., OpenVPN).
    - Establish secure communication channels over a public network.
    - Test VPN connectivity and security measures.

6. Web Application Security
    - Use tools like OWASP ZAP to perform web application security testing.
    - Identify common vulnerabilities (e.g., SQL injection, XSS).
    - Implement 01 or 02 practices in web development to prevent the above vulnerabilities.

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING /INFORMATION TECHNOLOGY	
Course Code: **ITPEO7**	Course Title: **Cloud Computing**
Periods Per Week: **3 (L: 03, T: 0, P: 0)**	Credit: **3**

COURSE OBJECTIVE:

The objective of the cloud computing course is to provide students with a comprehensive understanding of cloud computing concepts, technologies, and best practices. The course aims to equip students with the knowledge and skills to effectively utilize cloud-based services, design and deploy scalable cloud architectures, and manage cloud resources efficiently. Through practical hands-on exercises and real-world case studies, students will learn to leverage cloud computing to enhance business productivity, agility, and cost-effectiveness while ensuring security and compliance.

COURSE CONTENT

1 Cloud Computing fundamentals:
- 1.1 Essential characteristics
- 1.2 Architectural Influences
- 1.3 Technological Influences
- 1.4 Operational Influences

2 Cloud Computing Architecture:
- 2.1 Cloud Delivery models
- 2.2 Cloud Software as a Service (SaaS)
- 2.3 Cloud Platform as a Service(PaaS)
- 2.4 Cloud Infrastructure as a Service(IaaS)
- 2.5 Cloud deployment models: Public Clouds, Community Clouds, Hybrid Clouds

3 Cloud Computing Software Security fundamentals
- 3.1 Cloud Information Security Objectives
- 3.2 Confidentiality, Integrity, Availability
- 3.3 Cloud Security Services
- 3.4 Relevant Cloud Security Design Principles
- 3.5 Secure Cloud Software Requirements
- 3.6 Secure Development practices

4 Cloud Computing Risk Issues:
- 4.1 The CIA Traid
- 4.2 Privacy and Compliance Risks

4.3 Threats to Infrastructure
4.4 Data and Access Control
4.5 Cloud Access Control Issues
4.6 Cloud Service Provider Risks.

5 Cloud Simulators- CloudSim and GreenCloud

5.1 Introduction to Simulator
5.2 Understanding CloudSim simulator
5.3 CloudSim Architecture(User code, CloudSim, GridSim, SimJava)
5.4 Understanding working platform for CloudSim
5.5 Introduction to GreenCloud

RECOMMENDED BOOKS:

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010

2. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

3. Ronald L. Krutz, Russell Dean Vines, "Cloud Security A comprehensive Guide to secure Cloud Computing" Wiley.

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	15
2	10	20
3	10	25
4	10	20
5	10	20
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING/ INFORMATION TECHNOLOGY	
Course Code: **ITPEO8**	Course Title: **Cloud Computing Lab**
Periods Per Week: **1 (L:0, T: 0, P: 2)**	Credit: **1**

COURSE OBJECTIVE:

The objective of the cloud computing practical course is to enable students to gain hands-on experience in working with various cloud computing platforms and tools. The course aims to develop practical skills in provisioning and managing virtual machines, deploying applications in the cloud, configuring and securing cloud environments, and optimizing cloud resource utilization. Through practical exercises and projects, students will learn to implement and troubleshoot cloud-based solutions.

LIST OF PRACTICALS:

1 Account Setup: Students will learn how to create accounts on popular cloud platforms like Amazon Web Services (AWS), Google Cloud Platform (GCP), or Microsoft Azure. They will explore the account management interface and understand the basic navigation and settings.

2 Cloud-Based File Transfer: Students can learn how to use cloud-based file transfer services like WeTransfer or Dropbox Transfer to share large files or assignments with their peers or teachers. They can explore the process of uploading and downloading files securely.

3 Cloud-Based Photo Editing: Students can experiment with cloud-based photo editing tools like Adobe Photoshop Express or Pixlr. They can learn how to upload images, apply basic edits such as cropping or adjusting brightness, and save or share the edited images.

4 Virtual Machine Deployment: Students will provision virtual machines (VMs) on a cloud platform and learn how to configure their specifications such as CPU, memory, and storage. They will deploy a simple web server application on the VM and access it through the internet.

5 Cloud Storage: Students can create an account on a cloud storage platform such as Dropbox or Google Drive. They can learn how to upload and share files with their classmates and teachers. They can also explore features like folder organization and collaboration.

6 Cloud Networking: Students will explore cloud networking concepts like virtual networks, subnets, and security groups. They will learn how to create and configure these components to establish secure communication between different cloud resources.

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING/ INFORMATION TECHNOLOGY	
Course Code: **COPE07**	Course Title: **Machine Learning**
Periods Per Week: **3 (L: 03, T: 00, P: 0)**	Credit:3

COURSE OBJECTIVE:

This course aims to provide a comprehensive understanding of machine learning, covering supervised, unsupervised, and reinforcement learning. Students will learn probability, linear algebra, and various techniques, such as regression, neural networks, decision trees, and ensemble methods. By the end, students will be skilled in applying machine learning to real-world data and problem-solving.

COURSE CONTENT:

1 Introduction

1.1 Introduction to Machine Learning
1.2 Types of learning-Supervised Learning
1.3 Unsupervised Learning
1.4 Reinforcement Learning
1.5 Fundamentals of Machine Learning

2 Basics

2.1 Probability Basics
2.2 Linear Algebra
2.3 Statistical Decision Theory – Regression & Classification
2.4 Bias – Variance
2.5 Linear Regression
2.6 Multivariate Regression

3 Machine Learning Techniques

3.1 Dimensionality Reduction
3.2 Subset Selection
3.3 Shrinkage Methods
3.4 Principle Components Regression
3.5 Linear Classification
3.6 Logistic Regression
3.7 Linear Discriminant Analysis
3.8 Optimization
3.9 Classification-Separating Hyperplanes Classification

4 Advanced Machine Leaning Techniques

4.1 Artificial Neural Networks (Early models, Back Propagation, Initialization, Training & Validation)
4.2 Parameter Estimation (Maximum Likelihood Estimation, Bayesian Parameter Estimation)
4.3 Decision Trees
4.4 Evaluation Measures

4.5 Hypothesis Testing
4.6 Ensemble Methods
4.7 Graphical Models

5 Hybrid Machine Learning Techniques

5.1 Clustering
5.2 Gaussian Mixture Models
5.3 Spectral Clustering
5.4 Ensemble Methods
5.5 Learning Theory, Reinforcement Learning

COURSE OUTCOME:

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

- Identify the characteristics of datasets and compare the trivial data and big data for various applications.
- Understand machine learning techniques and computing environment that are suitable for the applications under consideration
- Solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.
- Develop scaling up machine learning techniques and associated computing techniques and technologies for various applications.
- Implement various ways of selecting suitable model parameters for different machine learning techniques.
- Integrate machine learning libraries, and mathematical and statistical tools with modern technologies

RECOMMENDED BOOKS:

1. Machine Learning for Absolute Beginners – Oliver Theobald
2. Machine Learning: A Practitioner's Approach - Vinod Chandra and Anand Hareendran S
3. "Pattern Recognition and Machine Learning" by Christopher Bishop (Publisher: Springer)
4. "Introduction to Machine Learning" by Ethem Alpaydin (Publisher: The MIT Press)
5. "Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy (Publisher: The MIT Press)
6. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron (Publisher: O'Reilly Media)
7. "The Elements of Statistical Learning: Data Mining, Inference, and Prediction" by Trevor Hastie, Robert Tibshirani, and Jerome Friedman (Publisher: Springer)

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	15
2	08	15
3	11	25
4	11	25
5	10	20
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING/ INFORMATION TECHNOLOGY	
Course Code: **COPE08**	Course Title: **Machine Learning Lab**
Periods Per Week: **2 (L: 0, T: 0, P: 2)**	Credit:**1**

COURSE OBJECTIVE:

Course Objective: Learn basic algorithms and data analysis techniques through practical implementations in Python. Develop skills in clustering, classification, regression, prediction, and simulations for simple experiments. Build a foundation for further studies in data science and machine learning.

LIST OF PRACTICALS:

1. Guess the Output:
   Create a small dataset with input-output pairs (e.g., x -> y) where the relationship is straightforward (e.g., y = 2x + 1). Try to implement a simple algorithm that guesses the output based on the input data.

2. Grouping Objects:
   Have a small set of objects with some visible attributes (color, size, shape). Implement a basic clustering algorithm to group similar objects together based on a single attribute (e.g., grouping objects of the same color).

3. Pass or Fail Classifier:
   Build a simple pass or fail classifier using a small dataset of exam scores (e.g., pass if the score is greater than 50, fail otherwise). Use basic if-else conditions to make predictions.

4. Predicting Numeric Values:
   Create a tiny dataset with a few input-output pairs. Try to implement a basic linear regression model to predict a numeric value based on the input data (e.g., y = 2x + 3).

5. Guess the Next Number:
   Design a small dataset of sequential numbers and their corresponding next numbers. Use this data to create a simple algorithm that can predict the next number in the sequence.

6. Coin Toss Simulation:
   Simulate a coin toss experiment using random number generation. Implement a basic probability calculation to determine the likelihood of getting heads or tails.

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING AND TECHNOLOGY	
Course Code: **ITPEO9**	Course Title: **Grid Computing**
Periods Per Week: 0**3 (L: 03, T: 00, P: 00)**	Credit: **3**

COURSE OBJECTIVES:

This course covers Grid Computing, its evolution, anatomy, and real-world applications. Students will learn about Grid Services, Tool Kits like Globus GT 4 and Hadoop, and security considerations. Gain practical skills for working with Grid Computing systems and applications.

COURSE CONTENT:

1 Introduction

1.1 Definitions of Grid Computing
1.2 Evolution of the Grid
1.3 Differences with similar efforts (Meta, cluster, heterogeneous, Internet)
1.4 Examples of usage
1.5 Scope in Grid Computing

2 The Grid Computing Anatomy

2.1 The Grid Problem.
2.2 Anatomy Computing
2.3 Business on Demand and Infrastructure Virtualization
2.4 Service-Oriented Architecture and Grid
2.5 Semantic Grids

3 Grid Services

3.1 Introduction to Open Grid Services Architecture (OGSA)
3.2 Motivation
3.3 Functionality Requirements
3.4 Practical & Detailed view of OGSA/OGSI
3.5 Data intensive grid service models
3.6 OGSA services

4 Grid Computing Tool Kits

4.1 Globus GT 4 Toolkit
4.2 Architecture
4.3 Main components and Programming model
4.4 Introduction to Hadoop Framework
4.5 Design of Hadoop file system

5 Security

5.1 Trust models for Grid security environment
5.2 Authentication and Authorization methods
5.3 Grid Security infrastructure

COURSE OUTCOME:

After the completion of the course the student will be able:

- Apply grid computing techniques to solve large scale scientific problems.
- Apply the concept of virtualization.
- Use the grid and cloud tool kits.
- Apply the security models in the grid and the cloud environment.

RECOMMENDED BOOKS:

1 Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.

2 Joshy Joseph & Craig Fellenstein, "Grid Computing", PHI, PTR-2003.

3 Ahmar Abbas, "Grid Computing: A Practical Guide to technology and Applications", Charles River media – 2003.

4 Tom White, "Hadoop The Definitive Guide", First Edition. O'Reilly, 2009. Bart Jacob , "Introduction to Grid Computing", IBM Red Books, Vervante, 2005

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Introduction	08	15
2	The Grid Computing Anatomy	09	20
3	Grid Services	14	30
4	Grid Computing Tool Kits	09	20
5	Security	08	15
Total		**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING AND TECHNOLOGY	
Course Code: **ITPE10**	Course Title: **Grid Computing Lab**
Periods Per Week: 0**2 (L: 0, T: 0, P: 2)**	Credit: **1**

COURSE OBJECTIVE:

This course focuses on Grid computing with the Globus Toolkit. Students will learn to develop Web Services, Grid Services using Apache Axis, and secure applications. They will also create Grid portals for job submission and result retrieval. By course end, students will be skilled in deploying efficient Grid-based solutions.

LIST OF PRACTICALS:

1. Use Globus Toolkit or equivalent and do the following:
2. Develop a new Web Service for Calculator.
3. Develop new OGSA-compliant Web Service.
4. Using Apache Axis develop a Grid Service.
5. Develop applications using Java or C/C++ Grid APIs
6. Develop secured applications using basic security mechanisms available in Globus Toolkit.
7. Develop a Grid portal, where user can submit a job and get the result. Implement it with and without GRAM concept.

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING/INFORMATION TECHNOLOGY	
Course Code: **COPE09**	Course Title: **Data Communication**
Periods Per Week: **3 (L: 03, T: 0, P: 0)**	Credit: **3**

COURSE OBJECTIVE:

This course is designed to develop an understanding of basic data communication concepts. For the transmission and reception of signals, the basic knowledge of communication engineering is essential. This course examines the important concepts and techniques related to data communication and enable students to have an insight into the technology which is involved to make the data communication possible.

COURSE CONTENT

1 Concepts of Data Communication

1.1. Introduction, basic communication models, components of data communication systems, data representation, types of communication.

1.2. Mode of communication, data flow: simplex, half-duplex, full-duplex; network attributes: performance, reliability, security; physical structure: types of connections, topologies; categories: LAN, WAN, MAN, interconnection: circuit, packet, protocols and standards; ISO OSI Reference model, a layer architecture.

2 Signals and Transmission

2.1 Introduction to analog and digital data, basic concepts of analog and digital signals, analog and digital data transmission: baseband, broadband; impairments: effect of noise, attenuation, distortion; composite signal and transmission medium, channel bandwidth: bit interval, bit rate, baud rate, data rate limits.

2.2 Transmission modes: parallel, serial, asynchronous and synchronous; classification based on the technique of transmission; modulation, need of modulation, types of modulation systems; data encoding: digital data to analog signals; digital data to digital signals; multiplexing.

3 Error Detection and Correction

3.1 Types of errors, forward error correction versus retransmission, error detection: repetition codes, parity bits, checksums, CRC error correction: automatic repeat requests, fixed size framing, variable size framing, flow and error control techniques, stop and wait, sliding window.

3.2 HDLC protocol; point to point protocol; ALOHA, CSMA, CSMA/CD.

4 Transmission Media

4.1 Guided: twisted pair, co-axial, fibre-optics; unguided: wireless – radio, micro-wave, infra-red; switched networks, circuit switching, packet switching, structure of packet switch.

4.2 Network devices: repeaters, hubs, bridges, switches, routers, gate-ways.

COURSE OUTCOME

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

- Understand the fundamental concepts related to the data communication systems.
- Distinguish between analog, digital signals and the transmission thereof.
- Use the bandwidth in the optimal means by the learned techniques.
- Interpret how and why the errors occur during the transit of signal or data and what are the remedial techniques to correct the same.
- Understand the behavior of data communication devices and the underlying technologies involved in manufacturing of those devices.

RECOMMENDED BOOKS:

1. Dr. Sanjay Sharma, Data Communication and Computer Networks, Kataria Publications.
2. William Stallings, Data Communication and Networks, Prentice Hall India
3. Behrouz A. Forouzan, Data Communications and Networking , McGraw Hill Edn.

UNIT WISE TIME AND MARKS DISTRIBUTION

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	20
2	16	35
3	12	25
4	10	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA IN COMPUTER ENGINEERING/INFORMATION TECHNOLOGY	
Course Code: **COPE10**	Course Title: **DATA COMMUNICATION LAB**
Periods Per Week :**2 (L: 0, T: 0, P:2)**	Credits: **01**

COURSE OBJECTIVES:

The objectives of the course are to make the student familiar with the different scenarios exhibiting the implementation of data communication concepts.

LIST OF PRACTICALS TO BE PERFORMED:

1. Study of analog and digital signals.
2. Study of error detection and error correction techniques.
3. Study of twisted pair, coaxial cable and fibre-optics cable.
4. Study of lab network (type of network topology, bandwidth and switches used)
5. Demonstration of cables, crimping of a UTP cable, straight-through and cross-cable and their implementation.
6. Establish a communication between two peer-to-peer nodes connecting with a twisted pair cable.
7. Establish a communication between two or more nodes using a connecting device like a hub, repeater and switch.
8. Study of network connectivity devices: switches, routers, modems etc. installed in the lab.
9. Configuration of LAN and browser settings; assigning of point to point protocols.
10. Diagnose the local machine checking the connectivity issues using TCP/IP utility commands.

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING AND INFORMATION TECHNOLOGY	
Course Code: **COPE11**	Course Title: **R Programming**
Periods Per Week: **(L: 03, T: 00, P: 0)**	Credit:**3**

COURSE OBJECTIVE:

This course is designed to teach the fundamentals of R programming language. R is a popular open-source programming language used for statistical computing, data analysis, and visualization. It provides a wide range of statistical and graphical techniques, making it one of the most widely used languages for data analysis and research.

COURSE CONTENT:

1 Introduction
- 1.1 Introduction to R Programming
- 1.2 Why use R
- 1.3 Using RStudio IDE for R Programming

2 R Basics
- 2.1 R Syntax
- 2.2 R Datatypes
- 2.3 R Variables
- 2.4 R Strings
- 2.5 R Operators
- 2.6 R If…Else
- 2.7 R While Loop
- 2.8 R For Loop
- 2.9 R Functions

3 R Data Structures
- 3.1 R Vectors
- 3.2 R Lists
- 3.3 R Matrices
- 3.4 R Arrays
- 3.5 R Data Frames
- 3.6 R Factors

4 R Graphics
- 4.1 R Plot
- 4.2 R Line Graph
- 4.3 R Scatterplot
- 4.4 R Pie Charts
- 4.5 R Bars

5 R Statistics
- 5.1 R Statistics Intro

5.2 R Data Set
5.3 R Max and Min
5.4 R Mean Median Mode
5.5 R Percentiles

COURSE OUTCOME

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

4. Use R programming for data analysis and data visualization
5. Do statistical computing and modeling
6. Use R data structures and R graphics for your own data analysis
7. Use flow control statements in R programming
8. Write functions in R programming
9. Perform basic file i/o operations in Python code

RECOMMENDED BOOKS:

1. R for Data Science - Garrett Grolemund and Hadley Wickham
2. The Art of R Programming – A Tour of Statistical Software Design - Norman Matloff
3. R for Dummies - Joris Meys and Andrie de Vries
4. Beginner's Guide for Data Analysis using R Programming – Jeeva Jose
5. R in Action - Dr Robert L. Kabacoff

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	5	10
2	8	10
3	10	25
4	15	30
5	**10**	**25**
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING AND INFORMATION TECHNOLOGY	
Course Code: **COPE12**	Course Title: **R PROGRAMMING LAB**
Semester:	Credits:**1**
Periods Per Week :**2 (L: 0, T: 0, P:2)**	

COURSE OBJECTIVES:

The objectives of the course are to use the learned R Programming concepts and apply them to solve problems. Student should be able to understand the basic concepts of R. They should be able to explore and create practical solutions using R data structures, R graphics, R statistics and functions.

LIST OF PRACTICAL:

1 Learn all the basics of R-Programming (Data types, Variables, Operators etc,.)

2 Write a program to find list of even numbers from 1 to n using R Loops

3 Create a function to print squares of numbers in sequence.

4 Write a R program to print the numbers from 1 to 100. Print "Fizz" for multiples of 3, print "Buzz" for multiples of 5, and print "FizzBuzz" for multiples of both

5 Create a function in R programming that will return the sum of 2 integers.

6 Write a program to join columns and rows in a data frame using cbind() and rbind() in R

7 Implement different String Manipulation functions in R.

8 Implement different data structures in R (Vectors, Lists, Data Frames, Matrices, Arrays and Factors)

9 Write a program to read a csv file and analyze the data in the file in R.

10 Create scatterplot, line graph, pie chart and bar chart using R.

11 Create a data set and do statistical analysis on the data using R. Find Max, Min, Mean, Median, Mode and Percentiles.

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING AND INFORMATION TECHNOLOGY	
Course Code: **ITPE11**	Course Title: **E-Commerce**
Periods Per Week: **3 (L: 03, T: 0, P: 0)**	Credit: **3**

COURSE OBJECTIVE:

This course aims to lay foundation knowledge of Electronic commerce and its application, to build a theoretical background of the mobile commerce systems; its characteristics and functions. It also explain different business models with examples and familiarize students with network security and numerous online payment methods, also build a sound understanding of content encryption to provide data security during electronic mode of payment

COURSE CONTENT:

1 Introduction

What is E-Commerce, Forces behind E-Commerce Industry Framework, Brief history of E-Commerce, Inter Organizational E-Commerce, Intra Organizational E-Commerce, and Consumer to Business Electronic Commerce, benefits of e-Commerce?

2 Mobile Commerce

Mobile Commerce systems-characteristics and functions, Mobile Computing technology-mobile clients, mobile client software, Wireless Application Protocols, payment issues, introduction to Ucommerce: the next step after m-commerce.

3 Web Security

Introduction to Web security, Firewalls & Transaction Security, Client Server Network, Emerging Client Server Security Threats, Network Security. Encryption, Secret Key Encryption, Public Key Encryption, Virtual Private Network (VPN), Implementation Management Issues.

4 Electronic Payments & Net Commerce

Overview of Electronics payments, Digital Token based Electronics Payment System (EPS), Smart Cards, Credit Card/Debit Card based EPS, Emerging financial Instruments, Home Banking, Online Banking, EDA, EDI Application in Business, Legal requirement in E -Commerce, Introduction to supply Chain Management, CRM, issues in Customer Relationship Management.

COURSE OUTCOME:

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

- Breeze through the elementary knowledge of market, buyers, sellers, traditional commerce and electronic commerce.
- Understand and classify the benefits of mobile commerce system of marketing.
- Know the objective of network security threats.
- Understand the basic issues related to online marketing management.

RECOMMENDED BOOKS:

1 Greenstein and Feinman, "E-Commerce", TMH
2 Ravi Kalakota, Andrew Whinston, "Frontiers of Electronic Commerce", Addision Wesley
3 Denieal Amor, "The E-Business Revolution", Addision Wesley
4 Diwan, Sharma, "E-Commerce" Excel
5 Bajaj & Nag, "E-Commerce: The Cutting Edge of Business", TMH

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	20
2	10	20
3	12	25
4	16	35
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN COMPUTER AND INFORMATION TECHNOLOGY	
Course Code: **ITPE12**	**Course Title: E-Commerce Lab**
Periods Per Week :**2 (L: 0, T: 0, P:1)**	Credits: **01**

(* Common to Computer and IT Engineering Branches,)

COURSE OBJECTIVES

This course provides an introduction to information systems for business and management. It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems about Electronic commerce and provide data security during electronic mode of payment.

LIST OF PRACTICAL:

1 Visit most popular e-commerce sites on the internet and comment on their design related issues.

2 Crate a site which enables the acceptance of credit card.

3 Create a site that includes shopping card to shop on any e-shop.

4 List down the security level of various sites their strengths and limitations.

5 How you can integrate an e-commerce site with other sites to make a distributed network.

6 Role-play an online credit card payment process, understanding the steps involved and security measures in place.

7 Set up a virtual private network (VPN) to demonstrate secure communication over a public network.

8 Learn about credit card security features and how to protect personal information.

9 Explore online banking options by logging into a demo account.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN COMPUTER AND INFORMATION TECHNOLOGY	
Course Code: **ITPE13**	Course Title: **Data and Information Security**
Periods Per Week: **3 (L: 03, T: 0, P: 0)**	Credit: **3**

COURSE OBJECTIVE:

After completing this course the student must demonstrate the knowledge and ability to Identify the threats to information security, Show how to protect information recourses, Show how to maintaining and protecting information system.

COURSE CONTENT

1 Introduction to Data and Information Security

Introduction to Data and Information Security, attacks, computer crime, security services, security mechanisms, Cyber Crimes, Information Technology Act..

2 Data Security over internet.

Confusion, Diffusion, Introduction to basic encryption and decryption, concept of symmetric and asymmetric key cryptography, overview of DES, RSA and PGP. Introduction to Hashing: MD5, SSL, SSH, HTTPS, Digital Signatures.

3 Program Security.

Program security, Program Errors, Malicious Codes, virus, Trapdoors, program security issues, protecting programs.
Protection in OS: memory and Address protection, File protection

4 Database Security.

Database security requirements, Reliability, Integrity, Sensitive Data, Multilevel security, types of crimes, Ethical issues in Security.

5 Virtual Private Network (VPN)

Basics, setting of VPN, VPN diagram, configuration of required objects, exchanging keys.

COURSE OUTCOME:

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

- Understand the importance of data and information security in the modern digital landscape.
- Identify and assess potential threats and vulnerabilities to data and information systems.
- Comprehend legal and ethical issues related to data protection and privacy.
- Gain practical experience with security tools and techniques through hands-on exercises.

RECOMMENDED BOOKS:

1 "Principles of Information Security" by Michael E. Whitman and Herbert J. Mattord

2 "Network Security Essentials: Applications and Standards" by William Stallings

3 "Cryptography and Network Security: Principles and Practice" by William Stallings

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	15
2	16	30
3	10	20
4	08	20
5	08	15
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN COMPUTER AND INFORMATION TECHNOLOGY	
Course Code: **ITPE14**	Course Title: **Data and Information Security Lab**
Periods Per Week :**2 (L: 0, T: 0, P:2)**	Credits: **01**

COURSE OBJECTIVES:

Evaluate vulnerability of an information system and establish a plan for risk management. Demonstrate how to detect and reduce threats in Web security. Implementation of various cryptographic techniques

LIST OF PRACTICAL:

1. Transposition Techniques, using any High Level Programming Language.
2. Random Number Generation.
3. Block Ciphers and the Data Encryption Standard.
4. Hash Algorithms: MD5 Message Digest Algorithm, Authentication Protocols.
5. Firewall Configuration: Set up a basic firewall on a computer or network router to control incoming and outgoing traffic.
6. File and Folder Permissions: Create a sample folder structure and apply different levels of permissions to various user accounts.
7. Digital Signature: Generate a digital signature for a document using a tool or software that supports digital signatures.
8. VPN Setup: Set up a simple Virtual Private Network (VPN) using readily available software, and connect two devices securely.
9. Database Access Control: Create a sample database and implement user access controls to restrict different users' privileges.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN COMPUTER AND INFORMATION TECHNOLOGY	
Course Code: **COPE13**	Course Title: **Fundamental of Data Science**
Periods Per Week: **3 (L: 03, T: 0, P: 0)**	**Credit:3**

COURSE OBJECTIVE:

This course is designed to demonstrate knowledge of statistical data analysis techniques utilized in business decision making. Apply principles of Data Science to the analysis of business problems. Use data mining software to solve real-world problems. Employ cutting edge tools and technologies to analyze Big Data.

COURSE CONTENT:

01 Introduction to Data Science
- Definition
- Key concept & terminology
- Big Data and Data Science Hype
- The Data Science Process
- Role of data scientist

02 Mathematical Preliminaries and Data Munging
- Mathematics and Statistics Fundamentals
- Linear algebra
- Probability theory
- Descriptive statistics
- Inferential statistics
- Correlation Analysis
- Properties of Data
- Languages for Data Science
- Collecting & Cleaning Data

03 Programming Languages and Tools
- Introduction to Python or R-Programming
- Basic data structures (e.g., lists, arrays, dictionaries)
- Data manipulation and analysis libraries
- Data visualization libraries

04 Scores and Rankings
- Developing Scoring Systems
- Z-scores and Normalization
- Advanced Ranking Techniques

05 Statistical Analysis
- Sampling from Distributions
- Statistical Distributions
- Statistical Significance

Permutation Tests and P-values

06 Visualizing Data:
- Exploratory Data Analysis
- Developing a Visualization Aesthetic
- Chart Types
- Great Visualizations

COURSE OUTCOME:

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

- Describe the significance of data science and understand the Data Science process.
- Explain how data is collected, managed and stored for data science.
- Build, and prepare data for use with a variety of statistical methods and models
- Analyze Data using various Visualization techniques.

RECOMMENDED BOOKS:

1. Data Science for Business by Foster Provost and Tom Fawcett
2. Data Science from Scratch by Joel Grus
3. Python Data Science Handbook by Jake VanderPlas
4. Data Visualization: A Practical Introduction by Kieran Healy
5. Introduction to Statistical Learning with applications in R by Gareth James

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	15
2	10	20
3	10	20
4	06	15
5	08	15
6	08	15
Total	**48 hours**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN COMPUTER AND INFORMATION TECHNOLOGY	
Course Code: **COPE14**	Course Title: **Fundamental of Data Science Lab**
Periods Per Week: **2 (L: 0, T: 0, P: 2)**	**Credit:1**

COURSE OBJECTIVE:

This course teaches essential data science skills, including statistics, data cleaning, visualization, correlation analysis, linear regression, probability simulation, Z-score calculation, and data sampling. Using Python or R, students will gain practical experience to analyze and interpret data effectively.

LIST OF PRACTICALS:

1. Descriptive Statistics: Calculate the mean, median, and standard deviation of a given dataset using Python or R.
2. Data Cleaning: Take a messy dataset and clean it by handling missing values, duplicates, and outliers.
3. Data Visualization: Create a bar chart or histogram to visualize the distribution of a categorical or numerical variable.
4. Correlation Analysis: Calculate the correlation coefficient between two numerical variables and interpret the results.
5. Linear Regression: Perform a simple linear regression using Python or R to model the relationship between two variables.
6. Probability Simulation: Simulate a simple probability experiment, such as flipping a coin or rolling a dice, and calculate the experimental probability.
7. Z-score Calculation: Calculate the Z-scores for a set of data points and identify outliers.
8. Data Sampling: Randomly sample a subset of data from a larger dataset and perform statistical analysis on the sample.

CURRICULUM
FOR
OPEN ELECTIVES

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING / INFORMATION TECHNOLOGY	
Course Code: **COOE601**	Course Title: **DISCRETE MATHEMATICS (OPEN ELECTIVE)**
Semester: **6TH**	Credit: 3
Periods Per Week: 3 **(L: 03, T: 00, P: 0)**	

COURSE OBJECTIVE

Discrete Mathematics is an essential subject that provides students with foundational knowledge and skills in various mathematical concepts crucial for computer science, engineering, and related disciplines. Throughout the course, students will explore key topics such as logic and proof, set theory, counting principles, graph theory, and trees. By the course's end, students will possess a solid understanding of discrete mathematics, enabling them to tackle complex problems and excel in their academic and professional endeavors.

COURSE CONTENT

1. **LOGIC AND PROOF**
   - 1.1. Overview of Propositional Logic
   - 1.2. Predicates and Quantifiers
   - 1.3. Proof Techniques
     - 1.3.1. Direct Proof
     - 1.3.2. Proof by Contradiction
     - 1.3.3. Mathematical Induction
2. **SET THEORY**
   - 2.1. Introduction to sets, subsets, and set operations (union, intersection, difference)
   - 2.2. Cartesian product and relations
   - 2.3. Closure of Relations
   - 2.4. Partial Ordering
   - 2.5. Equivalence Relations
   - 2.6. Functions and Their Properties and Types
3. **COUNTING**
   - 3.1. Basics of Counting
   - 3.2. Pigeonhole Principles
   - 3.3. Permutations and Combination Basics
   - 3.4. Recurrence Relations- basic concepts.
4. **GRAPH THEORY**
   - 4.1. Graphs and Graph Models
   - 4.2. Basic terminology: graph, vertices, edges.
   - 4.3. Types of graphs: directed, undirected, weighted.
   - 4.4. Graph representations and isomorphism.
5. **TREES**
   - 5.1. Introduction of Trees
   - 5.2. Application of Trees
   - 5.3. Tree Traversal
   - 5.4. Spanning Trees and Minimum Spanning Trees

COURSE OUTCOMES

After the completion of the course the student will be able to

- Apply propositional logic, predicates, and quantifiers to construct and evaluate logical arguments.
- Employ various proof techniques, including direct proof, proof by contradiction, and mathematical induction, to solve problems effectively.
- Utilize concepts of sets, subsets, and set operations to solve problems related to combinatorics, probability, and logic.
- Analyze relationships between sets and apply closure properties in relation to functions and relations.
- Solve counting problems using principles such as permutations, combinations, and recurrence relations.
- Analyze and model real-world problems using graph theory concepts such as vertices, edges, and paths.
- Analyze the properties and applications of tree structures in data storage, search algorithms, and hierarchical relationships.
- Apply tree traversal techniques to efficiently navigate and manipulate tree data structures.

REFERENCES:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw- Hill Publishing Company Limited, New Delhi, Latest Edition
2. James Strayer, Elementary Number Theory, Waveland Press, Latest Edition

UNITS AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	8	20
2	10	20
3	10	20
4	10	20
5	10	20
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING / INFORMATION TECHNOLOGY	
Course Code:**CEOE602**	Course Title: **OPERATION RESEARCH AND OPTIMIZATION (OPEN ELECTIVE)**
Semester: **6TH**	Credit: 3
Periods Per Week: 3 **(L: 03, T: 00, P: 0)**	

COURSE OBJECTIVE

The course "Operation Research and Optimization" offers a comprehensive understanding of operational research principles and techniques. Beginning with historical context and scope exploration, it covers linear programming, including formulation and solution methods like graphical and simplex techniques. Transportation and assignment problems are addressed with initial solution methods and optimization strategies. Game theory is introduced, focusing on zero-sum games and solving techniques. Decision theory covers decision-making under risk and uncertainty, including expected monetary value and decision criteria. Real-world applications of decision theory are highlighted throughout the course. Through theoretical knowledge and practical applications, students develop analytical skills essential for addressing complex optimization problems across various domains.

COURSE CONTENT

1. INTRODUCTION
- 1.1. Definition and Meaning of Operational Research
- 1.2. Historical Development of Operations Research
- 1.3. Scope and Applications of Operations Research

2. LINEAR PROGRAMMING
- 2.1. FORMULATION OF THE PROBLEM STATEMENT
  - 2.1.1. Decision Variables, Objective Function, Constraints
  - 2.1.2. Standard and Canonical Forms
- 2.2. SOLUTION BY GRAPHICAL METHOD
  - 2.2.1. Graphical Representation of Constraints
  - 2.2.2. Identifying Feasible Region and Optimal Solution
- 2.3. SOLUTION BY SIMPLEX METHOD
  - 2.3.1. Introduction to Simplex Algorithm
  - 2.3.2. Initialization, Pivot Operation, Iterative Process

3. TRANSPORTATION PROBLEM
- 3.1. Methods for Finding Initial Feasible Solution (Northwest Corner Rule, Least Cost Method)
- 3.2. Optimization Methods (Modified Distribution Method, Stepping-Stone Method)

4. **ASSIGNMENT PROBLEM**
- 4.1. Formulation of Assignment Problem
- 4.2. Hungarian Method for Solving Assignment Problem

5. GAME THEORY
- 5.1. Introduction to Game Theory
- 5.2. Zero-Sum Games and Matrix Representation
- 5.3. Solving Zero Sum Games (Linear Programming Method)

6. DECISION THEORY

6.1. Introduction to Decision Theory
6.2. Decision Making Under Risk
  6.2.1. Expected Monetary Value (EMV)
  6.2.2. Decision Criteria (Maximax, Maximin)
6.3. Decision Making Under Uncertainty
  6.3.1. Probability Assessment Techniques (Subjective, Objective)
6.4. Applications of Decision Theory in Real-World Scenarios

COURSE OUTCOMES

After the completion of the course the student will be able to

- Formulate and solve linear programming problems effectively, demonstrating proficiency in defining decision variables, constructing objective functions, and imposing constraints to optimize outcomes.
- Apply graphical and simplex methods with confidence to identify feasible regions and optimal solutions in linear programming contexts, facilitating efficient problem-solving techniques.
- Implement various methods, such as the Northwest Corner Rule and the Hungarian Method, to find initial feasible solutions and optimize transportation and assignment problems in diverse scenarios.
- Analyze zero-sum games using matrix representations and solve them using linear programming methods, enabling strategic decision-making in competitive environments.
- Evaluate decision-making processes under risk and uncertainty, employing techniques like expected monetary value and decision criteria such as Maximax and maximin to make informed choices.
- Apply theoretical knowledge and practical insights to real-world scenarios, demonstrating the relevance and applicability of operational research and optimization principles across various domains.

REFERENCES:

1. Operation Research – AN introduction- Hamdy Taha, Prentice Hall of India, Latest Edition
2. Operations Research Theory and Applications- J K Sharma, Macmillan Business books, Latest Edition
3. Introduction to Operations Research by Frederick S. Hillier and Gerald J. Lieberman

UNITS AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	03	10
2	15	25
3	10	20
4	06	15
5	07	15
6	07	15
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING / INFORMATION TECHNOLOGY	
Course Code: **CEOE603**	Course Title: **STATISTICS & PROBABILTIY (OPEN ELECTIVE)**
Semester: **6TH**	Credit: 3
Periods Per Week: 3 **(L: 03, T: 00, P: 0)**	

COURSE OBJECTIVE

Probability and Statistics serve as the foundation for understanding and analyzing data in the realm of Data Science. This course aims to equip students with a comprehensive understanding of fundamental statistical concepts and probabilistic principles essential for data analysis and interpretation

COURSE CONTENT

1. DATA SCIENCE/STATISTICS

1.1. Statistics introduction- Population vs Sample
1.2. collection of data, primary and secondary data,
1.3. Types of variables: dependent and independent
1.4. Categorical and Continuous variables,
1.5. data visualization- Bar Charts, Line Charts, Pie Charts, Scatter Plot and Histogram. (Implementation using MS Excel)
1.6. Measures of central tendency (Mean, Mode, Median) for both ungrouped and grouped/frequency distributed data.
1.7. Measures of dispersion (variance, standard deviation)

2. PROBABILITY

2.1. Introduction and Probability axioms,
2.2. addition law and multiplicative law of probability,
2.3. conditional probability,
2.4. Baye's theorem (without proof).

3. RANDOM VARIABLE AND PROBABILITY DISTRIBUTIONS:

3.1. Random variables (discrete and continuous),
3.2. probability density functions,
3.3. probability distribution - Binomial, Poisson and normal distribution-their properties (mathematical expectation and variance)

4. CORRELATION

4.1. Correlation, correlation coefficient,
4.2. rank correlation,

5. REGRESSION

5.1. Regression and lines of regression,
5.2. regression coefficients,
5.3. principle of least squares and curve fitting (straight Line, parabola).

6. ESTIMATION

6.1. Parameter, statistic,
6.2. sampling distribution,
6.3. point estimation,
6.4. properties of estimators,
6.5. interval estimation

COURSE OUTCOMES

After the completion of the course the student will be able to

- Master data visualization in MS Excel.
- Apply central tendency and dispersion measures effectively.
- Compute probabilities and make predictions.
- Understand and use probability distributions.
- Analyze relationships with correlation methods.
- Conduct regression analysis for predictive modeling.
- Employ estimation techniques for reliable inferences.

REFERENCES:

1. "Introduction to Probability and Statistics" by J. Susan Milton and Jesse C. Arnold.
2. "Probability and Statistics for Engineers and Scientists" by Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, and Keying Ye.
3. "Probability and Statistics for Data Science" by Norman Matloff.

UNITS AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	14	30
2	09	15
3	10	20
4	5	11
5	5	12
6	5	12
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING / INFORMATION TECHNOLOGY	
Course Code: **COOE604**	Course Title: **Advanced Microprocessor (OPEN ELECTIVE)**
Semester: **6TH**	Credit: 3
Periods Per Week: 3 **(L: 03, T: 00, P: 0)**	

COURSE OBJECTIVES:

The Advanced Microprocessor course offers to detail the microprocessor architecture and its components containing a wide range of concepts like CPU and memory systems, including memory circuits and technologies, and explores various microprocessors, notably the 8085. Students learn instructions, timing, and programming models like those in the 8085. The course delves into bus systems, interrupts, and interfacing with input/output devices. It also examines the 8086 architectures, addressing modes, and interface signals. Students stay updated on the latest advancements in microprocessor technology. This comprehensive approach equips students with practical skills and theoretical understanding, preparing them for challenges in computer engineering and related fields.

COURSE CONTENTS:

1. **Introduction to microprocessor**
   - 1.1 Overview of Microcomputer Structure and Organization
   - 1.2 Basic Elements: CPU, Memory System
   - 1.3 Basic Microprocessor Architecture
   - 1.4 Memory Technologies Overview.

2. **Instructions and Timing (8085)**
   - 2.1 Instructions and Timing
   - 2.2 Registers and their functions
   - 2.3 Fetch and Execute Operation of CPU
   - 2.4 Instruction Set and Addressing Modes
   - 2.5 Basic Programming Operations
   - 2.6 Microprocessor Arithmetic
   - 2.7 Program Flow Control with Looping and Branching
   - 2.8 Stack and Subroutines

3. **Bus System and Interrupts (8085)**
   - 3.1 Overview of Bus Systems
   - 3.2 System Bus Structure and Operations
   - 3.3 Timing and Control
   - 3.4 Address Decoding
   - 3.5 Introduction to Interrupts Mechanism
   - 3.6 Types and Priority of Interrupts
   - 3.7 Interrupt Vector Table
   - 3.8 Enabling and Disabling Interrupts

4. **Interfacing (8085)**
   - 4.1 Basics of Interfacing
   - 4.2 I/O Interfacing Techniques
   - 4.3 Parallel Input/Output
   - 4.4 Memory-Mapped I/O
   - 4.5 Introduction to DMA
   - 4.6 Serial Communication Interface

4.7 Interfacing Input/Output Devices
4.8 Programmable Peripheral Interface (PPI)

5. Introduction to 8086 Architecture
5.1 Overview of 8086 Architecture
5.2 Main Features and Addressing Modes
5.3 Maximum and Minimum Mode Systems
5.4 Interface Signals
5.5 Brief Overview of Latest Developments in Microprocessor Technology

COURSE OUTCOMES:

After the completion of the course, students should be able to

- Grasp fundamental microprocessor concepts, including architecture and technology.
- Master microprocessor programming, covering instruction sets, arithmetic, and flow control.
- Understand bus systems, interrupts, and interfacing techniques.
- Analyze 8086 microprocessor architecture and its operation modes.
- Stay current with evolving microprocessor technology trends.

BOOKS RECOMMENDED:

1. Microprocessor Architecture, Programming, and Applications with the 8085 by Ramesh S. Gaonkar, Wiley India.
2. Microprocessors and Microcontrollers: Architecture, Programming and Interfacing by A. Nagoor Kani, McGraw Hill Education.
3. Advanced Microprocessors and Peripherals by A.K. Ray and K.M. Bhurchandi, McGraw Hill Education.
4. Microprocessors and Interfacing Techniques by Sunil Mathur, PHI Learning.
5. Microprocessors: Principles and Applications by Charles M. Gilmore, Dhanpat Rai Publications.
6. Berry B Brey ,"The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386 And 80486, Pentium and Pentium ProProcessor Architecture, Programming and Interfacing", Pearson Education 2003.

UNITS AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	20
2	15	30
3	09	20
4	09	20
5	05	10
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING / INFORMATION TECHNOLOGY	
Course Code: IT**OE601**	Course Title: **CYBER LAWS AND INTELLUCTUAL PROPERTY RIGHTS (OPEN ELECTIVE)**
Semester: **6TH**	Credit: 3
Periods Per Week: 3 **(L: 03, T: 00, P: 0)**	

COURSE OBJECTIVES:

This course encompasses technical, legal, and societal dimensions pertinent to cybercrimes and the legal frameworks governing them, alongside the ethical considerations inherent in cyberspace. Cybercrime, a comprehensive concept, are offenses wherein computers serve as both targets and instrumentalities, as well as instances where they facilitate ancillary functions, such as furnishing evidentiary support for criminal activities. Moreover, a nuanced comprehension of Cyber Ethics and its attendant implications is imperative for a comprehensive understanding of the subject matter. The course objective is to provide the fundamental skill to understand cyber laws, the legal frameworks, and overview of intellectual property, rights, ordinances and legal procedures relevant to the subject matter.

COURSE CONTENTS:

1. **Introduction to Cyberspace**
   a. Understanding the impact of the internet on society
   b. Importance of Cyber Law and Ethics
   c. Basics of Cyber Jurisprudence and Arbitration
2. **Cyber Legislation Overview**
   a. Freedom of Speech and Expression online
   b. Right to Access the Internet and Privacy
   c. Key elements of the Information Technology Act, 2000
3. **Cyber Crimes and Offenses**
   a. Cyber Crimes and Legal Framework
   b. Types of Cyber Crimes: Hacking, Forgery, Cyber Bullying, etc.
   c. Understanding Cyber Terrorism and Defamation
   d. Interface of Cyber Laws with Copyright and Patent Laws
4. **Ethical Considerations in Cyberspace**
   a. Principles of Cyber Ethics
   b. Addressing Cyber Bullying, Hacking, and Copyright Issues
   c. Introduction to Artificial Intelligence and Blockchain Ethics
5. **Intellectual Property Rights (IPR)**
   a. Introduction to Copyright, Patent, Trademark, and Trade Secrets
   b. Enforcement and Litigation of IP Rights
   c. International Perspectives on Intellectual Property Law

COURSE OUTCOMES:
After completion of this course the students will be able to:

- Identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
- Locate and apply case law and common law to current dilemmas in the technology field.
- Understand rights, intellectual property, cybercrime and ethical practices.
- Describe Information Technology act and Related Legislation related to cybercrime.

BOOKS AND REFERENCE MATERIAL:

1. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi, (2012).
2. Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute, New Delhi, (2004)
3. Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher
4. Cyber Ethics 4.0, Christoph Stuckelberger, Pavan Duggal, by Globethic
5. Information Security policy & Implementation Issues, NIIT, PHI
6. Legal Dimensions of Cyber Space, Verma S, K, Mittal Raman, Indian Law Institute, New Delhi,
7. Cyber Law, Jonthan Rosenoer, Springer, New York, (1997).
8. Information Technology Act, 2000, S. R. Bhansali,, University Book House Pvt. Ltd., Jaipur (2003).
9. The Information Technology Act, 2005: A Handbook, OUP Sudhir Naib, New York, (2011)
10. Cyber Crimes and Law Enforcement, Vasu Deva, Commonwealth Publishers, New Delhi, (2003).

UNITS AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	14	30
2	12	25
3	12	25
4	10	20
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER ENGINEERING / INFORMATION TECHNOLOGY	
Course Code: **ITOE602**	Course Title: **Mobile Application Development (Open Elective)**
Semester: **6th**	Credit: **3**
Periods Per Week: **3 (L:3, T: 0, P: 0)**	

COURSE OBJECTIVE:

This course aims to teach mobile application development essentials. Topics include UI controls, activity lifecycles, and layouts. Learners will understand mobile device basics, OS differences, and smartphone hardware. They'll also delve into mobile application programming components like versions, languages, and security.

COURSE CONTENT

1. **Introduction to Mobile Application Development**
   1.1. Understanding mobile devices and their significance
   1.2. Exploring various types of mobile applications: native, web, hybrid
2. **Smartphone Hardware Architecture**
   2.1. Evolution and key features of smartphones
   2.2. Understanding System on Chip (SoC) and its components
   2.3. Disassembling and examining smartphone hardware
3. **Mobile Operating Systems**
   3.1. Overview of different mobile operating systems
   3.2. Architecture of iOS and Android operating systems
   3.3. Setting up virtual environments for iOS and Android
4. **Programming Components of Android**
   4.1. Versions of Android and programming languages used
   4.2. Understanding Model-View-Controller (MVC) architecture
   4.3. Developing basic Android applications using Activities, Services, etc.
5. **Developing Android Applications with UI Controls**
   5.1. Lifecycle of Android Activities and UI design principles
   5.2. Designing user interfaces with different layouts
   5.3. Implementing UI controls in Android apps
6. **Advanced Topics in Mobile Application Development**
   6.1. Data storage in mobile apps
   6.2. Implementing advanced features like database integration, API calls, etc.
   6.3. Testing and debugging mobile applications

COURSE OUTCOME:

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

- Define various types of mobile devices and mobile application development.
- Explain the key features of a smartphone and understand System on Chip (SoC) architecture.
- Compare and contrast different mobile operating systems, particularly iOS and Android OS.
- Set up an Android development environment using Android Studio or Eclipse IDE.
- Develop Android applications using UI controls and understand their lifecycle and callback functions.
- Develop basic android applications with data storage and api calls.

RECOMMENDED BOOKS:

1. Android App Development for Dummies
2. Head First Android Development: A Brain-Friendly Guide
3. Android Programming with Kotlin for Beginners by John Horton
4. Android Programming for Beginners
5. Android Programming: The Big Nerd Ranch Guide

UNITS AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	4	10
2	7	15
3	7	15
4	10	20
5	10	20
6	10	20
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN COMPUTER EGINEERING AND INFORMATION TECHONLOGY	
Course Code: **ITOE603**	Course Title: **Wireless and mobile communication**
Periods Per Week: **3 (L: 03, T: 0, P: 0)**	Credit: **3**

COURSE OBJECTIVE:

The student should be able to understand the emerging technologies used in wireless and mobile communications.

COURSE CONTENT:

Unit I: Introduction:

Introduction to wireless communication and Mobile communication principals, evolution and classification. Radio frequency basics-Modulation, demodulation , Multiplexing techniques

Unit 2: Mobile communication

Introduction to advance Mobile Phone systems (AMPS), GSM(Global system for mobile communication), CDMA, cellular network, global positioning system(GPS) and Personal Network Area(PNA)

Unit 3: Wireless networks

Wireless LAN-IEEE 802.11 standard architecture-services-hiper LAN, Bluetooth and security features.

Unit 4: Security
Wireless security: Threats, Risks and protection mechanism.

Unit 5: Latest wireless technology
Advancement in wireless communication, 3G, 4G and 5G technology.

Unit 6: Mobile IP

Working of Mobile IP, components of Mobile IP
Mobile IP and Home agent-solution to mobility issues in wireless networks

RECOMMENDED BOOKS:

1. Wireless communication, principle and practicebBy Thedore S Reppaport.
2. Wireless and Mobile Communication, by T.G. Palanivelu and R.Nakeeran
3. Introduction to wireless and mobile system , by Dharma Prakash Agarwal,Qing-an Zeng
4. Wireless and mobile communication , by VK Sangar, Ishan Publications.
5. Handbook of wireless networks and Mobile computing , by Stojmenvoic, willey India Pvt. Ltd.

Unit wise Time and Marks Distribution

Unit No.	Topic	Time Allotted (Hrs)	Marks Alloted (%)
1	Introduction	07	15
2	Mobile Communication	10	20
3	Wireless networks	07	15
4	Security	07	15
5	Latest wireless technology	07	15
6	Mobile IP	10	20
Total		**48**	**100**

CURRICULUM
FOR
SIXTH SEMESTER
OF
THREE-YEAR DIPLOMA COURSE
IN
ELECTRONICS
&
COMMUNICATION ENGINEERING

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME - ELECTRONICS & COMM.ENGG.

SIXTH SEMESTER

Code	Subjects	Study Scheme Hours			Total Hours L+T+P	Credits			Total Credits L+T+P
		L	T	P		L	T	P	
ECPC601	Computer Networks	3	0	0	3	3	0	0	3
ECPC602	Computer Networks Lab	0	0	2	2	0	0	1	1
ECPC603	Optical Fiber Communication	3	0	0	3	3	0	0	3
ECPC604	Optical Fiber Communication Lab	0	0	2	2	0	0	1	1
***	PE- III (Branch specific elective)	3	0	0	3	3	0	0	3
***	Open Elective-III	3	0	0	3	3	0	0	3
ECPR601	Major project	0	0	14	14	0	0	7	7
ECPR602	Seminar	0	0	2	2	0	0	1	1
Total		**12**	**0**	**20**	**32***	**12**	**0**	**10**	**22**

**Extra Hours to be managed through supplementary classes for project work*.

PE- III(Branch specific elective):- Artificial Intelligence (ECPE601)/Digital Signal Processing(ECPE602)

Open Elective III:-E-commerce (ECOE601)/Entrepreneurship and Startups(ECPE602)

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPC601	Course Title: Computer Networks
Semester: 6th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVE

Today global connectivity is achieved through computer networks. The knowledge about hardware and software requirements of networks is therefore essential.

COURSE CONTENTS

1. Networks Basics (5 hrs)

   1.1 Concept of network

   1.2 Models of network computing

   1.3 Peer-to –peer Network

   1.4 Server Client Network

   1.5 LAN, MAN and WAN

   1.6 Network Topologies

   1.7 Switching Techniques

2. OSI Model (7 hrs)

   2.1 Standards

   2.2 OSI Reference Model

   2.3 OSI seven layer model ; layer concepts with functionality of each layer.

3. Introduction to TCP/IP (7 hrs)

3.1 TCP/IP four layer model of network.

3.2 Concept of physical and logical addressing.

3.3 Different classes of IP addressing, special IP address.

3.4 Sub netting and super netting

3.5 IPV4 and IPV6 packet Format

3.6 Configuring IPV4 and IPV6

4. Protocol Suites (5 hrs)

4.1 Models and Protocols

4.2 Network IPX/SPX

4.3 Intranet Protocols

5. Network Architecture (5 hrs)

5.1Ethernet Specification and Standardization:

10 Mbps (Traditional Ethernet), 100 Mbps (Fast Ethernet) and 1000 Mbps (Gigabit Ethernet).

5.2 Introduction to Media Connectivity (Leased lines, ISDN, PSTN, RF, VSAT, Optical and IPLC)

6. Network Connectivity (7 hrs)

6.1 Network connectivity Devices

6.1.2 NICs

6.1.3 Hubs

6.1.4 Repeaters

6.1.5 Multiplexers

6.1.6 Modems

6.2 Routers and Protocols,

6.2.1 Firewall

6.2.2 ATM

6.2.3 VOIP and Net-to-Phone Telephony,

7. Network Administration (7 hrs)

7.1 Client/Server Technology

7.2 Server Management

7.3 RAID management and mirroring

8. Network Trouble Shooting Techniques (5 hrs)

8.1 Trouble Shooting process in networking.

8.2 Trouble Shooting Tools: PING,IPCONFIG, IFCONFIG, NETSTAT, TRACEROOT

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

CO1: Describe the computer networks and their types.

CO2: Describe the different levels of OSI model .

CO3: Analyze TCP/IP protocol of connection .

CO4: Study different types of wireless networking models.

RECOMMENDED BOOKS

1. Computer Networks by Tanenbaum, Prentice Hall of India, New Delhi

2. Data Communications and Networking by Forouzan, Tata McGraw Hill Education Pvt Ltd.

3. Data and Computer Communication by William Stallings, Pearson Education, New Delhi

4. Local Area Networks by Peter Hudson

5. Understanding Local Area Network by Neil Jenkins

6. Computer Network and Communications By V.K. Jain and Narija Bajaj, Cyber Tech

Publications, New Delhi.

7. Computer Network by J.S. Katre, Tech-Max Publication, Pune

DISTRIBUTION OF MARKS

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Networks Basics	5	10
2	OSI Model	7	15
3	Introduction to TCP/IP	7	15
4	Protocol Suites	5	10
5	Network Architecture	5	10
6	Network Connectivity	7	15
7	Network Administration / Security	7	15
8	Network Troubleshooting Techniques	5	10
Total		48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPC602	**Course Title**: Computer Networks lab
Semester: 6th	**Credits:** 1
Periods Per Week : 2 (L:0 , T:0, P: 2)	

COURSE OBJECTIVES :

This subject is a lab course supplementing the theory subject and aims to develop proficiency and understanding of practical outcomes of the subjects treated in theory.

COURSE CONTENTS:

LIST OF PRACTICALS

1. Recognize the physical topology and cabling (coaxial, OFC, UTP, STP) of a network.
2. Recognition and use of various types of connectors RJ-45, RJ-11,BNC and SCST
3. Recognition of network devices (Switches, Hub, Routers of access points for WiFi)
4. Making of cross cable and straight cable
5. Identify the IP address of a workstation and the class of the address and configure the IP Address on a workstation
6. Managing user accounts in windows and LINUX
7. Study and Demonstration of sub netting of IP address
8. Use of Netstat and its options.
9. Connectivity troubleshooting using PING, IPCONFIG, IFCONFIG
10. Installation of Network Operating System(NOS)
11. Study of wireless LAN and personal area network.
12. Visit to nearby industry for latest networking techniques

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPC603	**Course Title**: Optical Fibre Communication
Semester: 6th	**Credits:** 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVE

Progressing from communication over copper wire to today's fibre optic communication, we have increased our ability to transmit more information, more quickly and over longer distances. This has expanded our boundaries and is finding a good slot in communication system. Optical fibers has replaced existing transmission media due to its advantages. As a result the technicians are supposed to have knowledge of optical communication. This subject will provide basic concepts and requisite knowledge and skill required.

COURSE CONTENTS

1.Introduction (12 hrs)

1.1 Historical perspective, basic communication systems, optical frequency range, advantages of optical fibre communication, application of fibre optic communication

1.2 Electromagnetic spectrum used, Advantages and disadvantages of optical communication.

1.3 Principle of light penetration, reflection, critical angle.

2.Optical Fibers and Cables

2.1 Constructional details of various optical fibers, multimode and mono-mode fibers, step index and graded index fibers, acceptance angle and types of optical fiber cables.

2.2 Optical Fibers cable connectors and splicing techniques

3.Losses in Optical Fiber Cable:

3.1 Absorption Losses: Scattering Losses, Radiation losses, Connector losses, Bending loses.
3.2 Dispersion: Types and its effect on data rate.

4.Optical Sources

4.1 Characteristics of light used in optical communication.

4.2 Principle of operation of LED, different types of LED structures used and their brief description.

4.3 Injection laser diode, principle of operation, different injection laser diodes, comparison of LED and ILD.

5.Optical Detectors

5.1 Characteristics of photo detectors used in optical communication; PIN diode and avalanche photo diode (APD).

5.2 Noise in detectors

6.Optical Amplifiers

6.1 Basic features of optical amplifiers.

6.2 Types of optical amplifiers
i)Semiconductor optical amplifiers(SOAs)
a)Fabry-Perot Amplifier b)Travelling wave amplifier
ii) Erbium doped optical amplifiers
iii) Raman amplifiers.

7.Optical Fiber System

7.1 Block diagram explanation of Optical transmitter circuit.
7.2 Block diagram explanation of Optical receiver circuit.
7.3 Multiplexing in optical fibre communiction: WDM (Wavelength Division Multiplexing).
7.4 Modulation in fibre optics.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

CO1: Describe the mechanism of optical fiber communication.
CO2: Describe the different optical sources at transmission end.
CO3: Describe the different optical detectors at receiver end. .
CO4: Study different types of optical amplifiers.

RECOMMENDED BOOKS

1. Optical fiber Communication by John M Senior, Prentice Hall of India.
2. Optical fiber Communication by J. Gower , Prentice Hall of India.
3. Optical fiber Communication by Gerd Keiser, McGraw Hill International Editions
4. Optical Communications – Components and Systems by JH Franz and VK Jain, Narosa Publishing House, New Delhi
5. Optical Fiber Communication by Sangar and Sahdev, Uneek Publications, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Introduction	6	15
2	Optical Fibers and Cables	8	15
3	Losses in Optical Fiber Cable:	6	15
4	Optical Sources	8	15
5	Optical Detectors	6	10
6	Optical Amplifiers	8	15
7	Optical Fiber System	6	15
Total		42	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPC604	**Course Title**: Optical Fibre Communication Lab
Semester: 6th	**Credits:** 1
Periods Per Week : 2 (L:0 , T:0, P:2)	

COURSE OBJECTIVES :

This subject is a lab course supplementing the theory subject and aims to develop proficiency and understanding of practical outcomes of the subjects treated in theory.

COURSE CONTENTS:

LIST OF PRACTICALS

1. Introduction to various components and tools used in optical fiber communication
2. Setting up of optical fibre analog link.
3. Setting up of fibre digital link.
4. Measurement of bending losses in optical fibers.
5. To observe and measure the splice or connector loss.
6. To measure and calculate numerical aperture of optical fiber.
7. To observe characteristics of optical source.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPE601	Course Title: Program Elective Artificial Intelligence
Semester: 6th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVES

This course endeavours to introduce students to the domain of Artificial Intelligence which is a field that is bound to have huge ramifications for technology of the future.

COURSE CONTENTS

Unit 1 – Introduction to Artificial Intelligence

1.1Artificial Intelligence (AI) definition

1.2 Goals of AI

1.3 History of AI

1.4 Applications of AI

Unit 2 – Agents and Environments

2.1 Agent Terminology, Types of Agents – Simple Reflex Agents, Model Based Reflex Agents, Goal based Agents

2.2 Nature of Environments, Properties of Environments

Unit 3 – Search Algorithms Terminology

3.1 Brute Force Search Strategies – Breadth First Search, Depth First Search.

3.2 Heuristic Search Strategies, Local Search Algorithms.

Unit 4 – Fuzzy Logic Systems

4.1 Introduction to Fuzzy Logic and Fuzzy systems,

4.2 Membership functions,

4.3 Fuzzification/Defuzzification

Unit 5 – Neural Networks

Basic structure of Neural Networks

- Perceptron
- Back-propagation

Course outcomes:

Student will have general idea about Artificial Intelligence, will be able to explore AI tools effectively.

Recommended Books:

1. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India)
2. https://nptel.ac.in/courses/106106126/
3. Stefan Edelkamp and Stefan Schroedl. Heuristic Search, Morgan Kaufmann.
4. Pamela McCorduck, Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence, A K Peters/CRC Press
5. Elaine Rich and Kevin Knight. Artificial Intelligence, Tata McGraw Hill.
6. Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, Prentice Hall
7. M.C. Trivedi, A classical approach to Artificial Intelligence, Khanna Publishing House

DISTRIBUTION OF MARKS

UNITS	Name of Topic	TIME ALLOTTED (Hrs.)	MARKS ALLOTTED (%)
1	Introduction to Artificial Intelligence	08	20
2	Agents and Environments	10	20
3	Search Algorithms Terminology	10	20
4	Fuzzy Logic Systems	10	20
5	Neural Networks	10	20
TOTAL		48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPE602	Course Title: Digital Signal Processing
Semester: 6th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVE

Digital signal processing (DSP) is an important area, with DSP chips being used widely in communication industry and consumer electronics etc. Therefore , study of digital signal processing is an important part of modern electronics.

COURSE CONTENTS

1. Introduction

   1.1 Basic elements of a digital signal processing system.

   1.2 Classification of signals, continuous time versus discrete time signals

   1.3 Concept of frequency in continuous time and discrete time signals

2. Discrete time signals and systems:
   (8 hrs)

   2.1 Block diagram representation of discrete time systems

   2.2 Linearity , Stability and Causality.

   2.3 Convolution and correlation of signals.

   2.4 Autocorrelation.

3. Discrete time systems

   3.1 Implementation of discrete time systems.

   3.2 Recursive and non-recursive FIR systems.

4. Z-transform

   4.1 Z-transform and its application to LTI systems:

4.2Direct and inverse Z transform

4.3 Properties of Z transform.

5. Filter structure design

Design of Filter structures - Direct Form I, II, cascade and Parallel form

6. Introduction to Fourier Transform.

6.1Discrete Fourier transform, properties of DFT (No proof).

6.2 Multiplication of time DPTS and circular convolution

6.3 Use of DFT in linear filtering.

7. Fast Fourier transforms

7.1 Efficient computation of DFT; FFT, DIT algorithm

7.2 Efficient computation of DFT; FFT, DIT algorithm

8. Introduction to IIR and FIR filters, Application of DSP baffles system

RECOMMENDED BOOKS

1. Theory and Applications of Digital Signal Processing by Rabiner and Gold; Prentice Hall of India

2 Digital Signal Processing Using MATLAB by Vinay K Inge and John G Proakis; Vikas Publishing House, New Delhi

3 Digital Signal Processing (Principles, Algorithms and Applications) by John G. Proakis ; Prentice Hall of India

4. Digital Signal Processing by AV Oppenheim and RW Ronald W Schafer; Prentice Hall of India

5. DSP ,A computer based approach Mitra Sanjit TMH Publication
6. DSP, A Practical approach by Ifeachor, Emmanual Pearson Education.

UNIT WISE DISTRIBUTION OF MARKS

Sr. No	**Topic**	**Time Allotted (hrs)**	**Marks Allocation**
1.	Introduction	6	15
2.	Discrete Time Signals and Systems	6	15
3.	Implementation of Discrete Time System	6	10
4.	Z-Transform and its Application	6	15
5.	Filter structures design	6	10
6.	Discrete Fourier Transform	8	15
7.	Fast Fourier Transform	6	10
8.	Introduction to IIR and FIR filters	4	10
Total		**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECOE601	Course Title: E-commerce (Open Elective)
Semester: 6th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVE

The electronic commerce has changed the way the world is buying commodities with direct contact between business , consumer and other businesses. This subject aims at understanding the technology and methodology of electronic commerce.

COURSE CONTENTS

UNIT I
Introduction to E-Commerce
- 1.1 Brief History of E-Commerce
- 1.2 Forces behind E-Commerce
- 1.3 E-Commerce Industry Framework.
  - Inter Organizational E-Commerce(B2B)
  - Intra Organizational E-Commerce
  - Consumer to Business Electronic Commerce(C2B)

UNIT III
Architectural framework of e-commerce.
- 2.1 Network Infrastructure for E-Commerce.
- 2.2 Market forces behind I-way(Information super highway)
- 2.3 Components of I –Way.
- 2.4 Access Equipment, Global Information Distribution Network, Broadband Telecommunication.

UNIT III
Introduction to Mobile Commerce
- 3.1 Mobile Computing Application,
- 3.2 Wireless Application Protocols, WAP Technology,
- 3.3 Mobile Information Devices.

UNITIV
Introduction to Web Security
- 4.1 Firewalls & Transaction Security
- 4.2 Client Server Network, Emerging Client Server Security Threats
- 4.3 Firewalls & Network Security.
- 4.4 World Wide Web & Security,

4.5 Encryption,
Transaction security,
Secret Key Encryption,
Public Key Encryption,
4.6 Virtual Private Network (VPN).

UNITV

Implementation Management Issues.

5.1 Overview of Electronics payment,
Digital Token based Electronics Payment System(EPS),
Smart Cards, Credit Card/Debit Card based EPS,
5.2 Emerging financial Instruments
Home Banking,
Online Banking.
EDI(Electronic data interchange), EDI Application in Business.

UNITVI

Legal requirement in E-Commerce,

6.1 Introduction to supply Chain Management,
6.2 CRM(Customer Relationship Management), Issues in CRM.

COURSE OUTCOMES

After studying the course a student is expected to have competencies in the following.

BOOKS RECOMMENDED

1. Frontiers of Electronic Commerce, Ravi Kalakota, Andrew Winston
2. E-Commerce the cutting edge of Business, Bajaj and Nag

DISTRIBUTION OF MARKS

UNITS	Name of Topic	TIME ALLOTTED (Hrs.)	MARKS ALLOTTED (%)
1	Introduction to E-Commerce	06	15
2	Architectural framework of e-commerce.	08	15
3	Introduction to Mobile Commerce	08	15
4	Introduction to Web Security	10	25
5	Implementation Management Issues.	08	15
6	Legal requirement in E-Commerce	08	15
TOTAL		48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECOE602	Course Title: Entrepreneurship and Startups
Semester: 6th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVE

Entrepreneurship Development and Start Ups aims at developing conceptual understanding for setting-up one's own business venture/enterprise. This aspect of Human Resource Development has become important in the era, when wage employment prospects have become meagre.

COURSE CONTENTS

1. Introduction to Entrepreneurship (12 hrs)

    1.1 Concept/Meaning and its need
    1.2 Competencies/qualities of an entrepreneur
    1.3 Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/ organizations at State/National level.

2. Market Survey and Opportunity Identification (Business Planning)

    2.1 How to start a small scale industry
    2.2 Procedures for registration of small-scale industry
    2.3 List of items reserved for exclusive manufacture in small-scale industry
    2.4 Assessment of demand and supply in potential areas of growth.
    2.5 Understanding business opportunity
    2.6 Considerations in product selection
    2.7 Data collection for setting up small ventures.

3. Project Report Preparation

3.1 Preliminary Project Report
3.2 Techno-Economic Feasibility Report
3.3 Exercises on Preparation of Project Report in a group of 3-4 students

4. Start Ups & Modern world

4.1 Use of modern tools for success of Startups
Concept of inbound marketing
Concept of content marketing
Concept of conversion path and CTAs(call to action) in online marketing.
Introduction to closed loop marketing.
Social prospecting
4.2 Decision making strategies in Startups

Course Outcome:
Upon completion of the course, the student will be able to demonstrate knowledge of the following topics:

1. Understanding the dynamic role of entrepreneurship and small businesses
2. Organizing and Managing a Small Business
3. Financial Planning and Control
4. Forms of Ownership for Small Business
5. Strategic Marketing Planning
6. New Product or Service Development
7. Business Plan Creation

SUGGESTED BOOKS
1.The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company BY Steve Blank and Bob Dorf
2.The Lean Startup: How Today's Entre- preneurs Use Continuous Innovation to Create Radically Successful Businesses by Eric Ries
3.Demand: Creating What People Love Before They Know They Want It by Adrian J. Slywotzky with Karl Weber
4.The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business by Clayton M. Chris- tensen

DISTRIBUTION OF MARKS

UNITS	Name of Topic	TIME ALLOTTED (Hrs.)	MARKS ALLOTTED (%)
1	Introduction to entrepreneurship	04	10
2	Market Survey and Opportunity Identification (Business Planning)	16	30
3	Project Report Preparation	14	30
4	Start Ups & Modern world	14	30
TOTAL		48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPR601	Course Title: Major Project
Semester: 6th	Credits: 7
Periods Per Week : 14 (L:0 , T:0, P: 14)	

COURSE OBJECTIVE

Major Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place students for project oriented practical training in actual work situation for the stipulated period with a view to:

i) Develop understanding regarding the size and scale of operations and nature of field-work in which students are going to play their role after completing the courses of study.
ii) Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
iii) Develop first hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems related to the world of work.
Iv) Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group.

The project work identified in collaboration with industry should be preferred.
This practical training cum project work should not be considered as merely conventional industrial training in which students are sent at work places with either

minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/ field organizations. Each teacher is expected to supervise and guide 5-6 students.

NOTE:

a) The list is only the guideline for selecting a project; however a student is at liberty to select any other related project of his choice independently under guidance of his teacher.

b) Projects can also be chosen in collaboration with the industry wherever possible ,wherein a specialized area of study/additional coursework or skillmanship/problem solution can be taken.

c) FOR EVALUATION PATTERN, GENERAL GUIDELINES ARE TO BE FOLLOWED

Some of the project activities are given below.

a) Projects related to designing small electronic equipment / instruments.
b) Projects related to increasing productivity in electronic manufacturing areas.
c) Projects related to quality assurance.
d) Projects connected with repair and maintenance of plant and equipment.
e) Projects related to design of PCBs.
f) Projects related to suggesting substitutes of electronics components being used.
g) Projects related to design of small oscillators and amplifier circuits.
h) Projects related to design, fabrication, testing and application of simple digital circuits and components.
i) Projects related to microprocessor/microcontroller/Arduino based circuits/ instruments.

A. SOME OF THE PROJECTS BASED ON ABOVE AREAS ARE LISTED BELOW FOR THE BENEFIT OF STUDENTS:

1. Microprocessor/Microcontroller/Arduino based rolling display/bell and calendar
2. Microprocessor/Microcontroller/Arduino based stepper motor control.

3. Speed control of DC Machines by Microprocessor/Microcontrollers/Arduino
4. Temperature monitoring using Microprocessor/Microcontroller/Arduino based systems.
5. Microprocessor/Microcontroller/Arduino based liquid level indicator and control
6. Fabrication and assembling of digital clock.
7. Fabrication of PCB circuits using ORCAD/ EAGLE Software.
8. Fabrication of ON line/OFF line UPS of different ratings and inverters
9. Design, fabrication and testing of different types of experimental boards
10. Repair of oscilloscope, function generator
11. Design and developing web sites of organizations
12. Installation of computer network (LANS).
13. Microprocessor/Microcontroller based solar tracking system
14. GSM based car or home security system
15. Bank token display using microcontroller
16. Printer sharing unit
17. Microprocessor/Microcontroller Based A/D converter
18. Microprocessor/Microcontroller Based D/A converter
19. Simulation of half wave and full wave rectifiers using Simulation Software
20. Simulation of class A, Class B, Class AB and Class C amplifiers
21. Simulation of different wave forms like sine, square, triangular waves etc.
22. GPS based vehicle tracking system
23. Calculate Bit Error Rate (BER) of various modulation techniques
24. Design ALU using CPLD/FPGA
25. Design Display System using CPLD/FPGA
26. Electronic Weighing Machines
27. Inverter/Emergency light circuit using power transistors
28. SCR based automatic battery charger
29. SCR operated illumination controller
30. SCR operated automatic water level controller
31. SCR based speed controller for DC shunt motor
32. Three phase full wave rectifier using power diodes
33. Timer circuit using 555-IC
34. SCR controlled rectifier circuit
35. Speed control circuit of DC shunt motor using SCR
36. Inverting and non-inverting amplifiers using OP AMP(741)
37. Comparator circuits using OP AMP (741)

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: ECPR602	Course Title: Seminar
Semester: 6th	Credits: 1
Periods Per Week : 2 (L:0 , T:0, P: 2)	

Students will have the opportunity to deliver one or two seminars aimed at enhancing their presentation skills, deepening their understanding of specific topics, and fostering collaboration between academia and industry. These seminars will provide a platform for students to showcase their knowledge, research abilities, and innovative thinking to industry professionals and fellow students. The seminars will be structured as follows:

1. **Seminar Topic Selection:**
   - Students will choose topics relevant to current trends, emerging technologies, or challenges in the field of Electronics and Communication Engineering.
2. **Preparation Phase:**
   - Students will conduct in-depth research on their chosen topic, gathering information from academic journals, industry reports, and reputable online sources.
   - They will create comprehensive presentation materials, including slides, diagrams, and multimedia content to support their seminar.
3. **Practice Sessions:**
   - Prior to the seminar, students will participate in practice sessions to refine their presentation skills, receive feedback from peers and instructors, and ensure clarity and coherence in their delivery.
4. **Seminar Delivery:**
   - On the designated day, students will deliver their seminars in front of an audience comprising industry professionals, faculty members, and fellow students.
   - Each seminar will typically last 20-30 minutes, followed by a question-and-answer session to facilitate discussion and exchange of ideas.
5. **Feedback and Evaluation:**
   - Following each seminar, participants will provide constructive feedback to the presenter, highlighting strengths and areas for improvement.
   - Faculty members and industry experts will evaluate the content, delivery, and overall effectiveness of the seminar, providing valuable insights for student development.
6. **Reflection and Learning:**
   After completing their seminars, students will reflect on their experiences, identifying lessons learned, challenges overcome, and areas for future growth. They will document their reflections in their industrial training reports, integrating insights gained from the seminar experience into their overall learning journey.

By participating in these seminars, students will not only enhance their communication and presentation skills but also deepen their understanding of key concepts and issues in

computer engineering. Moreover, the interaction with industry professionals will provide valuable networking opportunities and industry insights, enriching their overall educational experience.

COURSE EVALUATION:

Evaluation of students' performance during the seminar presentations will be conducted by industry experts(if available) and faculty members. The assessment criteria will focus on various aspects of the seminar, including content, delivery, engagement, and overall effectiveness. Here's a draft of how students' performance will be evaluated:

1. **Content (40% of total evaluation):**
   - Relevance: The extent to which the seminar topic is pertinent to the field of computer engineering.
   - Depth of Research: The thoroughness and depth of the student's research on the chosen topic.
   - Clarity of Concepts: The ability to explain complex concepts clearly and concisely.
   - Originality and Innovation: The presentation of fresh insights or innovative perspectives on the topic.
2. **Delivery (30% of total evaluation):**
   - Organization: The logical structure and flow of the presentation, including introduction, main points, and conclusion.
   - Visual Aids: The effectiveness of visual aids (e.g., slides, diagrams) in enhancing understanding and engagement.
   - Verbal Communication: The clarity, articulation, and pace of the student's speech.
   - Body Language: The use of appropriate gestures, eye contact, and overall confidence during the presentation.
3. **Engagement (20% of total evaluation):**
   - Audience Interaction: The student's ability to engage the audience through questions, anecdotes, or interactive elements.
   - Interest Generation: The degree to which the presentation captures and maintains the audience's interest throughout.
   - Relevance to Audience: The alignment of the content with the audience's background and interests.
4. **Overall Effectiveness (10% of total evaluation):**
   - Impact: The overall impact of the seminar in terms of stimulating discussion, raising awareness, or inspiring further inquiry.
   - Time Management: The ability to manage time effectively and cover the key points within the allotted time frame.

Each evaluator will assign scores based on these criteria, and the final evaluation will be a weighted average of the scores given by all evaluators and will necessarily give each evaluated student the feedback on his/her performance, highlighting strengths and areas for improvement.

A complete compiled report for the same is to be submitted by the concerned evaluator to the concerned HOD/Principal for record and reference.

CURRICULUM FOR THE SIXTH SEMESTER OF THREE-YEAR DIPLOMA COURSE IN ELECTRICAL ENGINEERING

Study Scheme 6th semester of Electrical Engineering

Code	Subjects	Classes per week			Total Hours	Credits			Total credits L+T+P
		L	T	P		L	T	P	
EEPC601	Power system protection	3	0	0	3	3	0	0	3
EEPC602	Power system protection Lab	0	0	2	2	0	0	1	1
***	Elective – IV	3	0	0	3	3	0	0	3
***	Elective - IV Lab	0	0	2	2	0	0	1	1
***	Open Elective – II	3	0	0	3	3	0	0	3
EEPC603	Simulation	0	0	4	4	0	0	2	2
EESL604	Seminar	0	0	2	2	0	0	1	1
EEMP605	Major Project	0	0	16	16	0	0	8	8
		09	0	26	35*	09	0	13	22

***: The Extra Classes shall be managed during project hours/supplementary classes.**

***: The Students have to choose Elective-IV from the common pool of program electives given at the end of the curriculum for Electrical Engineering and Open-Elective-II from the common pool of open electives given at the end of the curriculum for Electrical Engineering**. Furthermore for the lab courses of program electives, it is mandatory that the lab course chosen is the corresponding lab course of the chosen program elective only i.e if a student opts Indutrial Drives as Program Elective , then he/she has to also chose Industrial Drives Lab course as well.*

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPC601	Course Title: POWER SYSTEM PROTECTION
Semester: 6th	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identified competency through various teaching-learning experiences. Maintain switchgear and protection schemes used in electrical power systems.

COURSE CONTENT

1. Basics of Protection

1.1. Necessity functions of the protective system.
1.2. Normal and abnormal conditions.
1.3. Types of faults and their causes.
1.4. Protection zones and backup protection
1.5. Short circuit fault calculations in lines fed by generators through transformers
1.6. Need of current limiting reactors and their arrangements.

2. Circuit Interruption Devices

2.1. Isolators- Vertical break, Horizontal break, and Pantograph type.
2.2. Arc formation process, methods of arc extinction (High resistance and Low resistance), Arc voltage, Recovery voltage, Re-striking voltage, RRRV.
2.3. HT circuit breakers (Sulphur-hexa Fluoride (SF6), Vacuum circuit breaker) – Working, construction, specifications, and applications.
2.4. L.T. circuit breakers (Air circuit breakers (ACB)), Miniature circuit breakers (MCB), Moulded case circuit breakers (MCCB), and Earth leakage circuit breakers (ELCB)) Working and applications.
2.5. Selection of LT and HT circuit breakers (ratings).

3. Protective Relays

3.1. Fundamental quality requirements: Selectivity, Speed, Sensitivity, Reliability, Simplicity, Economy.
3.2. Basic relay terminology- Protective relay, Relay time, Pick up, Reset current, current setting, Plug setting multiplier, Time setting multiplier.
3.3. Protective relays: Classification, working principle, construction, and Operationof – Electromagnetic (Attracted armature type, Solenoid type, Watt-hour meter type) relay, Thermal relay.
3.4. Block diagram and working of Static relay (Introduction Only)
3.5. Overcurrent relay-Time current characteristics.
3.6. Distance relaying- Principle, operation of Definite distance relays.

3.7. Directional relay: Need and operation.
3.8. Operation of current and voltage differential relay.

4. Protection of Alternator and Transformer

4.1 Alternator Protection: Faults, Differential protection over current, earthfault, overheating, and field failure protection.
4.2 Reverse power protection.
4.3 Transformer Protection: Faults, Differential, over current, earth fault, overheating protection, Limitations of differential protection.
4.4 Buchholz relay: Construction, operation, merits and demerits.

5. Protection of Bus-bars and Transmission Lines

5.1 Over Voltages: Causes of Overvoltages
5.2 Protection against Overvoltages. Lightening arresters(Rod Gap, Horn Gap,Thyrite Type) and Overhead Ground Wires.
5.3 Bus bar protection: Differential and Fault bus protection.
5.4 Transmission line: Over current, Distance, and Pilot wire protection (Brief Idea)

COURSE OUTCOME:

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

- Identify various types of faults in the power system.
- Select suitable switchgear for different applications.
- Test the performance of different protective relays.
- Maintain protection systems of alternators and transformers.
- Maintain protection schemes for motors and transmission lines.
- Maintain protection schemes for the power system against over-voltages.

RECOMMENDED BOOK:

1. Principles of Power System, Mehta V. K; Rohit Mehta, S . Chand and Co., NewDelhi. ISBN: 978-81-2192-496-2.
2. Switchgear and Protection Rao, Sunil S., Khanna Publishers, New Delhi, ISBN: 978-81-7409- 232-3.
3. Switchgear and Power System Protection Singh, R. P., PHI Learning, New Delhi, ISBN: 978-81-203-3660-5.
4. Switchgear and Protection, Gupta. J. B.., S. K. Kataria and Sons, New Delhi, ISBN: 978-93-5014- 372-8.
5. Switchgear and Protection, Veerapan, N., Krishnamurthy, S. R., S . Chand and Co.,New Delhi. ISBN: 978-81-2193-212-7.
6. D. N., Power System Protection and Switchgear, Ram, Badri; Vishwakarma, McGraw-Hill, New Delhi. ISBN : 978-07-107774-X

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (hrs)	Marks Allotted (%)
1.	7	15
2.	10	20
3.	10	20
4.	9	20
5.	12	25
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPC602	Course Title : POWER SYSTEM PROTECTION LABORATORY
Semester: 6th	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identified competency through various teaching-learning experiences. Maintain switchgear and protection schemes used in electrical power systems.

COURSE CONTENT

1. Identify various switchgears in the laboratory and write their specifications.
2. Test HRC fuse and MCB by performing the load test.
3. Dismantle MCCB/ELCB / ACB/VCB and identify various parts
4. Set the plug and time (with PSM, TSM) of induction type electromagnetic relay.
5. Test electromagnetic over-current relay by performing load test.
6. Simulate differential protection scheme for transformer with power system simulation kit.
7. Simulate transmission line protection using the impedance relay/over current relay for various faults. (On transmission line protection simulation Kit).
8. Dismantle Thyrite type arrester and identify different parts.
9. Perform neutral earthing at different substations/locations.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICALENGINEERING	
Course code: EEPC603	Course Title: SIMULATION
Semester: 6th	Credits: 2
Hours per week: 4 (L:0 T:0 P:4)	

Software Applications in Electrical Engg.

1. PSPICE
2. PSIM
3. Matlab
4. Kiel

LIST OF PRACTICALS:

1. Introduction to Simulation and Matlab Programming.
2. Simulation of diode characteristics
3. Simulation of Zener Diode Characteristics
4. Simulation of half-wave rectifier
5. Simulation of full wave Rectifier.
6. Simulation of Transistor Characteristics

RECOMMENDED BOOKS:

1. E. Balaguruswamy, "Object Oriented Programming with C++," Tata McGraw Hill, New Delhi.
2. Marc E. Herinter, "Programming in MATLAB," Thomson Learning.
3. David Kuncicky, "MATLAB Programming", Pearson Education, New Delhi.
4. R K Bansal, "MATLAB and Its Application in Engineering," Pearson Education, New

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EESL604	Course Title: Seminar
Semester: 6th	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

Students will have the opportunity to deliver one or two seminars aimed at enhancing their presentation skills, deepening their understanding of specific topics, and fostering collaboration between academia and industry. These seminars will provide a platform for students to showcase their knowledge, research abilities, and innovative thinking to industry professionals and fellow students. The seminars will be structured as follows:

1. Seminar Topic Selection:

- Students will choose topics relevant to current trends, emerging technologies, or challenges in the field of computer engineering.
- Topics may include artificial intelligence, cybersecurity, data science, Internet of Things (IoT), cloud computing, or any other area of interest within the domain of computer engineering.

2. Preparation Phase:

- Students will conduct in-depth research on their chosen topic, gathering information from academic journals, industry reports, and reputable online sources.
- They will create comprehensive presentation materials, including slides, diagrams, and multimedia content to support their seminar.

3. Practice Sessions:

- Prior to the seminar, students will participate in practice sessions to refine their presentation skills, receive feedback from peers and instructors, and ensure clarity and coherence in their delivery.

4. Seminar Delivery:

- On the designated day, students will deliver their seminars in front of an audience comprising industry professionals, faculty members, and fellow students.
- Each seminar will typically last 20-30 minutes, followed by a question-and-answer session to facilitate discussion and exchange of ideas.

5. Feedback and Evaluation:

- Following each seminar, participants will provide constructive feedback to the presenter, highlighting strengths and areas for improvement.
- Faculty members and industry experts will evaluate the content, delivery, and overall effectiveness of the seminar, providing valuable insights for student development.

6. Reflection and Learning:

After completing their seminars, students will reflect on their experiences, identifying lessons learned, challenges overcome, and areas for future growth. They will document their reflections in their industrial training reports, integrating insights gained from the seminar experience into their overall learning journey.

By participating in these seminars, students will not only enhance their communication and presentation skills but also deepen their understanding of key concepts and issues in electrical engineering. Moreover, the interaction with industry professionals will provide valuable networking opportunities and industry insights, enriching their overall educational experience.

COURSE EVALUATION:

Evaluation of students' performance during the seminar presentations will be conducted by industry experts(if available) and faculty members. The assessment criteria will focus on various aspects of the seminar, including content, delivery, engagement, and overall effectiveness. Here's a draft of how students' performance will be evaluated:

1. **Content (40% of total evaluation):**
   - Relevance: The extent to which the seminar topic is pertinent to the field of computer engineering.
   - Depth of Research: The thoroughness and depth of the student's research on the chosen topic.
   - Clarity of Concepts: The ability to explain complex concepts clearly and concisely.
   - Originality and Innovation: The presentation of fresh insights or innovative perspectives on the topic.
2. **Delivery (30% of total evaluation):**
   - Organization: The logical structure and flow of the presentation, including introduction, main points, and conclusion.
   - Visual Aids: The effectiveness of visual aids (e.g., slides, diagrams) in enhancing understanding and engagement.
   - Verbal Communication: The clarity, articulation, and pace of the student's speech.
   - Body Language: The use of appropriate gestures, eye contact, and overall confidence during the presentation.
3. **Engagement (20% of total evaluation):**
   - Audience Interaction: The student's ability to engage the audience through questions, anecdotes, or interactive elements.
   - Interest Generation: The degree to which the presentation captures and maintains the audience's interest throughout.
   - Relevance to Audience: The alignment of the content with the audience's background and interests.
4. **Overall Effectiveness (10% of total evaluation):**
   - Impact: The overall impact of the seminar in terms of stimulating discussion, raising awareness, or inspiring further inquiry.
   - Time Management: The ability to manage time effectively and cover the key points within the allotted time frame.

Each evaluator will assign scores based on these criteria, and the final evaluation will be a weighted average of the scores given by all evaluators and will necessarily give each evaluated student the feedback on his/her performance, highlighting strengths and areas for improvement.

A complete compiled report for the same is to be submitted by the concerned evaluator to the concerned HOD/Principal for record and reference.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEMP605	Course Title: Major Project
Semester: 6th	Credits: 8
Hours per week:1 6 (L:0 T:0 P:16)	

Project work aims at developing skills in the students whereby they apply the knowledge and skills gained through the course to solve a practical problem undertaken as a project work. The students have different aptitudes and strengths.Project work, therefore, should match the strengths of students. For this purpose, studentsshould be asked to identify the type of project work they would like to execute. It is also essential that the faculty of the respective departments have a brainstorming session to identify suitable project assignments. The project assignment can be an individual assignment or a group assignment. There should not be more than three students if the project work is given to a group. The students should identify themselves or be given project assignments at least two to three months in advance. The project work identified in collaboration with industry/field organizations should be preferred.

Each teacher is expected to guide the project work of 5-6 students at a time. The project assignments may consist of the following:

a) Projects related to the repair and maintenance of machine parts
b) Estimating and costing projects
c) Design of components/ parts/jigs/fixtures
d) Projects related to quality control
e) Project work related to increasing productivity
f) The project connected with work-study
g) Projects relating to the erection, installation, calibration, and testing
h) Projects related to wastage reduction
i) Projects related to energy audit

For Students of Electrical Engineering Diploma Programme the project work can begrouped under the following four groups. Several projects have been mentioned under each section. A student should take at least two projects, which should notbe from the same group.

Report for all the four projects should be prepared and will give a seminar. The same will be assessed for internal and external assessment.

NOTE: Anyone from each section:

SECTION A

Electrical Machines and Equipment:

- Design and Construction of a small transformer (100 VA to 1 kVA)
- Construction of hot air blower
- Design and Fabrication of Automatic curtain operator
- Fabrication of Automatic Star-Delta starter
- Construction of Automatic Water level controller
- Construction of Choke for fluorescent tubes
- Design and construction of fan regulators (inductance type)
- Design and construction of fan regulators (Resistance type)
- Design and construction of loading rheostats
- Design and construction of Desert coolers/room coolers
- Rewinding of single-phase Electric Motor up to 1 HP
- Rewinding of motors of 3 phases up to 5 HP
- Design and construction of Geyser
- Rewinding of motors of small domestic appliances(exhaust fan/ceiling fan)
- Erection/installation and commissioning of rotating electrical machine
- Fault detection and repair of electrical/electronic instruments
- Design and assembly of contactor control circuits for various applications

SECTION B

Electrical Power:

- Drawing, estimating and costing of electrical installation of the institution from supplier's pole to the institution distribution board.
- Drawing, estimating, and costing of electrical installation of a workshopwith several electrically operated appliances/machines.
- To study the laying of underground distribution cable for a small colony starting from the main distribution pole
- To study the erection of a five pole span overhead line for a small distance for the distribution of electrical energy. To energize it and prepare a list of material and cost estimates.
- Energy audit for the workshop of your institution and to suggest remedies to have low Electricity Bill
- To provide a service connection to a consumer's premises for domestic purposes
- To survey the load of a given area in a small village colony, calculate the effective load, and determine the cables/conductors sizes for the proposed distribution system.
- Designing of light and fan scheme for an institutional or commercial building

- To study the augmentation of a nearby pole-mounted substation
- To prepare a proposal for the substation of your institution, calculating thetotal load (estimating and costing)

SECTION C

Electronics Based Projects:

Fabrication of:

- Voltage Stabilizer for refrigerator, air-conditioner
- Emergency light using SCR
- Power amplifier
- Low-cost intercom for home
- Analog computer
- Regulated power supply (+ 12V and + 6V) using 7812, 7912 and 7806, 7906
- Automatic battery charger using SCR
- Digital Clock
- FM Radio Receiver
    - Burglar Alarm
- Fabrication of UPS
- Automatic street light/dressing table light
- Mosquito Repeller
- Inverter circuit 500 watt/1 KVA.
- Solid State Control of Traffic Lights

SECTION D

Fabrication and Testing of:

- Inverter/Emergency light circuit using power transistors
- SCR-based automatic battery charger
- SCR-operated illumination controller
- SCR-operated automatic water level controller
- SCR-based speed controller for DC shunt motor
- Three-phase full wave rectifier using power diodes
- Timer circuit using 555-IC
- SCR-controlled rectifier circuit
- The speed control circuit of the DC shunt motor using SCR
- Inverting and non-inverting amplifiers using OP AMP(741)
- Comparator circuits using OP AMP (741)
- Project using PLC
- Project relating to Microprocessor
- Project relating to Microcontroller

Note: The quality of the end product and process adopted by the students in its execution should be considered along with other parameters while evaluating the students.

Important Notes

1. The general guidelines given in the curriculum of evaluation of Major Project should be followed for evaluation purpose.
2. It is also proposed that two students or two projects, which are rated best be given merit certificates at the time of the annual day of the institute. It would be better ifspecific nearby industries were approached for instituting such awards.

It is suggested that the institute organize an annual exhibition of the project items prepared by the students and invite leading Industrial organizations to such an exhibition. It is also suggested that two students or two projects, which are rated best be given merit certificates at the time of the annual day of the institute and if possible specific industries be approached for instituting such awards.

CURRICULUM
OF
CORE/PROGRAM ELECTIVE SUBJECTS
AND
OPEN ELECTIVES
FOR
THREE-YEAR DIPLOMA COURSE
IN
ELECTRICAL ENGINEERING

The student has to choose amongst the following list of electives for the core/program elective subjects and open electives to be chosen in 5th and 6th Semester. Furthermore for the lab courses of program electives, it is mandatory that the lab course chosen is the corresponding lab course of the chosen program elective only i.e. if a student opts Industrial Drives as Program Elective, then he/she has to also choose Industrial Drives Lab course as well.

LIST OF CORE/PROGRAM ELECTIVE SUBJECTS TO BE OFFERED IN 5TH AND 6TH SEMESTER FOR ELECTRICAL ENGINEERING				
S.NO.	**Course Code**	**Subject Name**	**Corresponding Elective Course-Code**	**Corresponding Elective Subject Name**
1	**EEPE01**	Industrial Drives	**EEPE02**	Industrial Drives Lab
2	**EEPE03**	Communication Technologies	**EEPE04**	Communication Technologies Lab
3	**EEPE05**	Electrical Vehicles	**EEPE06**	Electrical Vehicles Lab
4	**EEPE07**	Illumination Practices	**EEPE08**	Illumination Practices Lab
5	**EEPE09**	Control Systems	**EEPE10**	Control Systems Lab
6	**EEPE11**	Building Electrification	**EEPE12**	Building Electrification Lab
7	**EEPE13**	Solar Power Technologies	**EEPE14**	Solar Power Technologies Lab
8	**EEPE15**	Wind Power Technologies	**EEPE16**	Wind Power Technologies Lab
9	**EEPE17**	Bio Mass and Micro-Hydro Power Plants	**EEPE18**	Bio Mass and Micro-Hydro Power Plants Lab
10	**EEPE19**	Electric Traction	**EEPE20**	Electric Traction Lab

LIST OF OPEN ELECTIVE SUBJECTS TO BE OFFERED IN 5TH AND 6TH SEMESTER FOR ELECTRICAL ENGINEERING		
S.No.	**Course Code**	**Subject Name**
1	**EEOE01**	**Generic Skills and Entrepreneurship Development**
2	**EEOE02**	**Disaster Management**
3	**EEOE03**	**Project Management**
4	**EEOE04**	**Internet of Things**
5	**EEOE05**	**Economic Policies in India**
6	**EEOE06**	**E-Commerce**
7	**EEOE07**	**Basics of Management**
8	**EEOE08**	**Cyber Crimes and Laws**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE01	Course Title: INDUSTRIAL DRIVES
Program-Elective	Credits: 3
Hours per week: 3 (L: 3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry- identified competency through various teaching-learning experiences:

- Maintain electric AC and DC Drives.

COURSE CONTENT

1. Electric Drives

1.1 Need of Electric Drives,
1.2 Functional Block diagrams of an electric drive.
1.3 DC Motors (Brief Review of the following)
  a. Series, Shunt, and compound DC motors.
  b. Universal motor
  c. Permanent magnet motor
  d. DC servo motor
  e. Moving coil motor
  f. Torque motor.
1.4 Starting and Braking of DC Motors

2. AC Motors (Brief Review of the following)

2.1 Single-phase AC Motors
  i. Resistance split-phase motors
  ii. Capacitor run motors
  iii. Capacitor start motors
  iv. Shaded pole motors
2.2 Three-phase Induction Motors
  i. Squirrel cage Induction motor
  ii. Slip ring Induction Motor
  iii. Starting methods of Induction Motor
  iv. Braking methods of Induction Motor

3. DC Drives

3.1 Single-phase SCR Drives
  a) Half wave converter
  b) Full wave converter
  c) Semi converter
  d) Dual converter
3.2 Three-Phase SCR Drives

a) Half wave converter
b) Full wave converter
c) Semi converter
d) Dual converter

3.3 Speed control methods of DC series Motor
3.4 Chopper Controlled DC Drives
3.5 Maintenance procedure.
3.6 Reversible SCR Drives.

4. AC Drives

4.1 Stator voltage control
4.2 Variable Frequency Control
4.3 Voltage Source Inverter Control
4.4 Current Source Inverter Control
4.5 Rotor Resistance Control
4.6 The maintenance procedure for AC drives
4.7 Sequences of stages & drives required in each stage for the following applications: a) Textile mills, b) Steel rolling mills, c) Paper mills, d) Sugar mills

COURSE OUTCOMES

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

- Select relevant DC motors for various electric drive applications.
- Select relevant AC motors for various electric drive applications.
- Maintain DC Drives.
- Maintain AC Drives.

RECOMMENDED BOOKS:

1. Electric Machines, P.S. Bimbhra, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-86173- 294)
2. Fundamentals of Electrical Engineering by Saxena, S.B Lal; Dasgupta, K.,Cambridge University Press Pvt. Ltd., New Delhi, ISBN: 9781107464353
3. A Text Book of Electrical Technology Vol-II, by Theraja, B. L.; Theraja, A. K., S. Chand and Co. Ramnagar, New Delhi, ISBN:9788121924405
4. Basic Electrical Engineering by Mittle, V.N.; Mittle, Arvind, McGraw Hill Education,Noida, ISBN: 9780070593572
5. Power Electronics, Sen P.C., Mcgraw-Hill Publishing CompanyLimited, New Delhi. ISBN:9780074624005
6. Fundamentals of Electrical Drives, Dubey Gopal K., Second Edition, Narosa Publishing House, New Delhi.ISBN:9788173194283
7. Electrical Drives Concepts and Applications, Subrahmanyam, Vedam, Mcgraw-Hill Publishing CompanyLimited, New Delhi.ISBN:9780070701991
8. Power Electronic Systems Theory and Design, by Agrawal, Jai P., Pearson Education, Inc. ISBN 9788177588859.
9. Design and Testing of Electrical Machines, Deshpande M.V., PHI Publication, ISBN: 9788120336452 10. Pillai, S.K., A first course on Electrical Drives, Wiley Eastern Ltd. New Delhi, ISBN :13: 978- 0470213995

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	9	20
2.	9	20
3.	15	30
4.	15	30
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE02	Course Title: INDUSTRIAL DRIVES LABORATORY
Program Elective	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry- identifiedcompetency through various teaching-learning experiences:

- Maintain electric AC and DC Drives.

LIST OF PRACTICALS:

1. Dismantle the given DC / AC motor and identify its different parts
2. Control the speed of the DC Motor using armature voltage control and field current control method
3. Measure the output voltage of the chopper for resistive load by varying the frequency and
   /or duty cycle of a chopper.
4. Control the speed of the three-phase squirrel cage induction motor using the stator voltage control method.
5. Observe the effect on the speed of the given D.C. separately excited motor by varyingvoltage using a step-down chopper.
6. Control the speed of the given separately excited motor by changing the firing angle of SCR using single phase semi converter and single phase full converter. Also, measure the speed.
7. Control the speed of the given three-phase induction motor by varying frequency and plot the graph between speed and frequency
8. Demonstrate High power SCR/power device and Heat sink and write their specifications and rating.
   a. Control the speed of single-phase capacitor split-phase induction motor using DIAC –TRIAC circuit.
   b. Identify different parts and assemble the given DC motor.
   c. Identify different parts and assemble the given AC motor.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE03	Course Title: COMMUNICATION TECHNOLOGIES
Program Elective	Credits: 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry-identifiedcompetency through various teaching-learning experiences:

- Use relevant data communication techniques.

COURSE CONTENT

1. Data Communication and Modulation

1.1 Block diagram of communication system
1.2 Types of communication systems: synchronous and asynchronous, simplex,half-duplex, Full duplex, serial and parallel communication
1.3 Classification of communication technique: AM, FM, & PM based ondefinition, waveform, bandwidth, modulation index
1.4 Modulation and demodulation: Block diagram of AM, FM, and PM
1.5 Pulse Modulation: Block diagram for waveform generation of PAM, PWM& PPM, working principle, advantages, disadvantages, and applications.
1.6 Advantages of pulse modulation over AM and FM.

2. Digital Modulation Techniques

2.1 Digital Communication: Block diagram and working principle, waveforms, strength, and limitations
2.2 Sampling process Nyquist sampling theorem, quantization process, quantization error, quantization noise
2.3 PCM: Block diagram, working principle, waveforms, advantages, disadvantages, application of PCM.
2.4 Principle of ASK, PSK, FSK. Application of ASK, PSK, FSK

3. Data Communication Media

3.1 Baud rate, Bit rate, types of errors in data communication, and error correction techniques.
3.2 Types of communication media and frequency band of operation
3.3 Guided media: Cable-twisted pair cable, co-axial cable, fiber opticcable.
3.4 Unguided media: Microwave communication, Infrared communication.

4. Fibre Optics

4.1 Introduction to Fiber-optic communication. Strength and limitations of fiber optic system
4.2 Light propagation through cable: Mode of propagation, index profile
4.3 Fibre optic cables: cable construction, fiber optics cable modes, single mode,

step-index fiber, multimode index fiber, multimode graded index fiber, fiber cable losses.

4.4 Light source and Detector: Light emitting diode (LED), Photo Transistor, Laser diode, optocoupler.

5. Data Communication Protocols and Interfacing Standard

5.1 OSI (Open Systems Interconnection) Reference model
5.2 Introduction to protocol, FTP, SMTP, TCP/IP, UDP
5.3 LAN standards. Introduction to IEEE Standards for LAN and GPIB
5.4 RS-232 standard: Introduction and working principle
5.5 Network topologies, introduction star, ring, tree, bus, mesh, hybrid
5.6 Basic functions of networking devices: modem, switches, routers, repeaters, hubs, bridges, gateway.

6. Advanced-Data Communication

6.1 Introduction to Wi-Fi and Wi-Max
6.2 Bluetooth architecture and its layers,
6.3 Universal serial bus (USB) architecture.
6.4 Bluetooth and USB

COURSE OUTCOMES

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

- Identify the different types of data communication equipment and techniques.
- Use relevant digital modulation techniques.
- Interpret the specifications of the data communication media.
- Maintain the fiber optics networks for data communication.
- Use the OSI model and relevant data communication protocols.
- Maintain a wireless network environment.

RECOMMENDED BOOKS:

1. Electronic Communication System, Wayne Tomasi, Prentice Hall of India, ISBN 13:9780130494924
2. Practical Industrial Data Communications, Reynders D., Steve Macky, Wright Edvin, Newnes publication, ISBN 10:07506639523
3. Electronic Communication System, George F. Kennedy, Barnard Davis, Tata McGraw Hill, ISBN 13:9780074636824 Electrical Engineering Curriculum Structure 186
4. Data Communication & Networking, Forouzan B.A., McGraw Hill Education; 5 edition ISBN13: 0073376226-978
5. Principles of Digital communication systems and computer networks. Prasad K.V.K.K., , Dreamtech press, New Delhi, ISBN 13:9788177223620
6. Computer Networks Tanenbaum, Andrew S.David J. Wetherall, Pearson; edition ISBN 13:9788121924252
7. Text Book of Communication Engineering, Kumar A., Umesh Publication, ISBN 13:978818114160 8. A. Kumar, D. Manjunath, Joy Kuri, Communication Networking, Academic Press Publication ISBN 13:9780124287518
8. Electronic Communication & Data Communication, Hemant Kumar Garg, Soni

Manish, University Book House Private Ltd., ISBN 13:9788181980717
9. Optical Fiber Systems: Technology, Design, and Applications Kao, Charles K., Published by McGraw-Hill Inc., US ISBN 13: 9780070332775.
10. Fiber Optic Communication System by Agrawal, Govind P., Wiley; 4 edition ISBN :13 9780470505113
11. Optical communications essentials. Keiser, Gerd, McGraw-Hill, New Delhi- 2003, ISBN13:9780071412049

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allot-ted (Hrs)	Marks Allot-ted(%)
1.	9	20
2.	9	20
3.	6	10
4.	9	20
5.	6	10
6.	9	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE04	Course Title:COMMUNICATION TECHNOLOGIES LAB
PROGRAM ELECTIVE	Credits: 1
Hours per week: 2 (L: 1 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry-identifiedcompetency through various teaching-learning experiences:

- Use relevant data communication techniques.

LIST OF PRACTICALS:

1. Measure the modulation index of amplitude- modulated and frequency-modulated waves and observe the effect of modulating signals.
2. Test Pulse Amplitude Modulation (PAM), Pulse Width Modulation, PulsePosition,and Pulse Code Modulation signals
3. Test Amplitude, Frequency, and Phase Shift Keying Signals
4. Plot the V-I Characteristics of a given Infra-Red Light Source(IR-LED)
5. Test UTP/STP cable in straight and crossover mode and by line tester.
6. Plot the V-I Characteristics of the given Light Source(LED) and detector(photo transistor)
7. Use OFT trainer Kit given 1mm. Diameter Plastic optical fiber at 650 nm todetermine the
8. Numerical Aperture (NA).
9. Install and configure TCP/IP protocol.
10. Perform the transfer of files from PC to PC using Windows
11. Perform the transfer of a file from one PC to another PC using Serial port RS-232
12. Establish Wireless Communication between five computers using wireless LAN.
13. Establish Bluetooth communication using 4G mobile and laptop.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE05	Course Title: ELECTRIC VEHICLES
PROGRAM ELECTIVE	Credits: 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry-identified competencythrough various teaching-learning experiences:

- Maintain electric vehicles

COURSE CONTENT

1. Introduction to Hybrid Electric Vehicles

1.1 Evolution of Electric vehicles
1.2 Advanced Electric drive vehicle technology Vehicles-Electric vehicles (EV),Hybrid Electric drive (HEV), Plug-in Electric vehicle (PIEV),
1.3 Components used Hybrid Electric Vehicle
1.4 Economic and Environmental Impacts of Electric Hybrid Vehicles
1.5 Parameters affecting Environmental and economic analysis
1.6 Comparative study of vehicles for economic environmental aspects

2. Dynamics of hybrid and Electric vehicles

2.1 General description of vehicle movement
2.2 Factors affecting vehicle motion- Vehicle resistance, tire ground adhesion, rolling resistance, aerodynamic drag, equation of grading resistance, dynamic equation
2.3 Drive train configuration, Automobile power train, classification of vehicle power plant
2.4 Performance characteristics of IC engine, electric motor, need of gear box
2.5 Classification of motors used in Electric vehicles
2.6 Basic architecture of hybrid drive trains, types of HEVs
2.7 Energy saving potential of hybrid drive trains
2.8 HEV Configurations-Series, parallel, Series-parallel, complex.

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 Principle of step-down operation Boost and Buck-Boost converters
3.4 Principle of Step-Up operation Two quadrant converters; multi quadrant converters

4. DC-AC Inverter & Motors for EV and HEVs

4.1 DC-AC Converters
4.2 Principle of operation of half-bridge DC-AC inverter (R load, R-L load)
4.3 Single phase Bridge DC-AC inverter with R load, R-L load
4.4 Electric Machines used in EVs and HEVs, principle of operation, working &control

5. Batteries

5.1 Overview of batteries
5.2 Battery Parameters, Advantages, Applications and Charging Method of Lithium Ion Batteries
5.3 Control system for EVs and HEVs, overview, electronic control unit ECU
5.4 Regenerative braking in EVs

COURSE OUTCOMES

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

- Interpret the salient features of Hybrid electric vehicles.
- Interpret the Dynamics of hybrid and Electric vehicles
- Maintain the DC-DC converters in EV applications.
- Maintain the DC-AC converters in EV applications
- Select the batteries for EV applications.

RECOMMENDED BOOKS:

1. Electric & Hybrid Vehicles A.K. Babu, Khanna Publishing House, New Delhi(Ed.2018)
2 Hybrid Vehicles and the Future of Personal Transportation. Fuhs, A. E., CRC Press,
2. Electric and Hybrid Vehicles: Power Sources, Models, Sustainability,Infrastructure And The Market, Gianfranco, Pistoia Consultant, Rome, Italy,
3. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, Ehsani, M. CRC Press
4. Electric and Hybrid Electric Vehicles Husain, I., CRC Press
5. Modern Electric Vehicle Technology, Chan C. C. and K. T. Chau, Oxford SciencePublication,
6. Automotive Transmissions: Fundamentals, Selection, Design and Application,Lechner G. and H. Naunheimer, Springer
7. Power Electronics: Circuits, Devices and Applications Rashid, M. H., 3rd edition,Pearson,
8. Power Electronics: Devices, Circuits and Industrial Applications, Moorthi, V. R.Oxford University Press
9. Electric motor drives: modeling, analysis, and control, Krishnan, R. Prentice Hall
10. Analysis of electric machinery. Krause, O. P.; C. Wasynczuk, S. D. Sudhoff, IEEE Press

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	9	20
2.	15	30
3.	6	10

4.	9	20
5.	9	20
To-tal	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE06	Course Title: ELECTRIC VEHICLES LABORATORY
Program Elective	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry- identifiedcompetency through various teaching-learning experiences:

- Maintain electric vehicles

LIST OF PRACTICALS:

1. Develop a block diagram of the Electric vehicle and identify parts
2. Case study- Compare a minimum of four vehicles for economic and environmentalanalysis
3. Develop a schematic diagram of a hybrid electric vehicle and identify the components fluorescent lamp.
4. Prepare a report on Plug-in Electric vehicles by visiting a charging station
5. Collect specifications of converters and inverters used for Electric vehicles, asingle lamp controlled by two switches
6. Diagnose, repair, and maintain battery used in electric vehicle
7. Prepare test procedure for equipment used in Electric vehicle
8. List safety procedures and schedule for handling HEVs and EVs.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE07	Course Title: ILLUMINATION PRACTICES
Program Elective	Credits: 3
Hours per week: 3 (L:3 T:0	P:0)

COURSE OBJECTIVE:

This course aims to help the student attain the following industry-identifiedcompetency through various teaching-learning experiences:

- Design illumination schemes and associated electrification of buildings.

COURSE CONTENT

1. Fundamentals of illumination
- 1.1 Basic illumination, Terminology, Laws of illumination
- 1.2 Polar curves, polar curve: its meaning and applications for designing thelamp.
- 1.3 Concept of Photometry, Measurement of illumination
- 1.4 Lighting calculation method, Lumens or light flux method,

2. Types of lamps
- 2.1 Incandescent lamps, ARC lamps – AC and DC arc lamps, Fluorescent lamp
- 2.2 Types of other lamps: Mercury vapor lamp, Sodium vapour lamp, Halogen Lamps, Neon Lamps. Neon Sign Tubes.
- 2.3 LED lamps, CFL, Lasers
- 2.4 Selection Criteria for lamps

3. Illumination Control and Control Circuits
- 3.1 Purpose of lighting control and Dimmer,
- 3.2 Working principle and operation of Dimmer
- 3.3 Electronic Dimmer: working principle and operation
  - a. Thyristor operated dimmer
  - b. Triac operated dimmer
- 3.4 Methods used for light control Control circuits: a single lamp controlled by a switch or two switches.
- 3.5 Single Lamp control by two-point method,

4. Illumination for Interior Applications
- 4.1 The standard for various locations of Interior Illumination
- 4.2 Design considerations for Interior location of residences (2 BHK),
- 4.3 Illumination scheme for different Interior locations of Residential unit

5. Illumination for Interior Applications
- 5.1 Street Lighting (Latest Technology),
- 5.2 Railway Lighting

COURSE OUTCOMES

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

- Select relevant lamps for various applications considering illumination levels
- Select the lighting accessories required for the selected wiring scheme.
- Design relevant illumination schemes for interior applications.

- Design Illumination schemes for various applications
- Design Illumination schemes for various outdoor applications.

RECOMMENDED BOOKS:

1. Applied Illumination Engineering, Lindsey, Jack L., The Fairmont Press Inc.
2. Lighting Engineering: Applied Calculations Simons, R. H., Bean, Robert;Architectural Press ISBN: 0750650516.
3. Handbook of Applied Photometry by Casimer M Decusatis, Springer, ISBN 1563964163.
4. Handbook of Industrial Lighting, Butterworths, Lyons Stanley, Butterworths
5. Lighting Control Technology and Applications Simpson Robert S, Focal Press
6. Energy Management in Illuminating Systems Kao Chen, CRC Press

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	10	20
2.	15	30
3.	10	20
4.	8	20
5.	5	10
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE08	Course Title: ILLUMINATION PRACTICES LABORATORY
Program Elective	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry-identifiedcompetency through various teaching-learning experiences:

- Design illumination schemes and associated electrification of buildings.

LIST OF PRACTICALS:

1. Conduct illumination level assessment in the workplace using a lux meter.
2. Fit the given lamp in the selected mounting.
3. Interpret the polar curves of the given type of lamp and verify it using the lux meter.
4. Measure the illumination output of different lamps (Incandescent, Fluorescent, CFL, LED) and compare it with their wattage.
5. Build an electronic dimmer – Part I
6. Build another type of electronic dimmer – Part II
7. Build a single lamp control circuit for a two-point method

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE09	Course Title: Control system
Program Elective	Credits: 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course has been designed so that students may learn to Build and test the different types of Control Systems for Process Applications.

COURSE CONTENT

1. Basics of Control System:

1.1 Introduction, Definitions. Classification of Control Systems with examples. Open loop systems, Closed loop systems: Comparison of open and closed loop control systems.
1.2 Concept of feedback in control system
1.3 Time lag, dead time, Hysteresis
1.4 Block Diagrams
1.5 Introduction to Block Diagram representation, properties, Advantages and disadvantages of Block Diagram,
1.6 Block diagrams for open loop and closed loop control system
1.7 Simple or canonical Form of Closed Loop System,
1.8 Rules for Block Diagram Reduction (simple), Procedure to solve block diagramreduction problems

2. Laplace transform and Transfer function:

2.1 Laplace transform definition, procedure to find Laplace transform, properties, Inverse Laplace transform, importance and applications
2.2 Definition Advantages and disadvantages of the transfer function, Procedures to determine the transfer function of a control system, Impulse Response, Poles and zeros of transfer Function, Characteristics equation of transfer function

3. Signal flow graph representation:

3.1 Introduction of Signal Flow Graph, Properties of Signal Flow Graph,Terminology used in Signal Flow Graph,
3.2 Methods to obtain Signal Flow Graph from system equations & BlockDiagram, Masons Gain Formula (brief idea)

4. Time response analysis of the control system

4.1 Definition of type and Order of System
4.2 Standard test inputs,
4.3 Steady State Analysis, Steady-state errors, and error constants, Derivation of Steady State Error, Time Response of the first-order system to step input, Time Response of the second-order system to step input

5. Stability Analysis by Routh- Hurwitz Criteria

4.4 Characteristic equation
4.5 Stability of control system
4.6 Necessary Conditions
4.7 Routh-Hurwitz Criteria for Stability.

COURSE OUTCOMES

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

- Learn the basics of control systems, including open/closed loop systems, feedback, and time-related factors.
- Cover Laplace transform, transfer functions, signal flow graphs, and time response analysis.
- Provide knowledge on stability analysis using Routh-Hurwitz criteria.
- Develop skills in block diagram reduction, system type/order analysis, and steady-state error determination.

RECOMMENDED BOOKS:

1. Control System Engg by I.J.Nagrath and M.Gopal, TMH
2. Control Systems: Principles and Design by M.Gopal, TMH
3. Control System Engg by Ogata, PHI
4. Automatic Control System by BC Kuo, Prentice Ha
5. Linear Control System by B.S.Manke, Khanna publication
6. Feed back Control Systems by Dr. S D. Bhide & Barapte, Tech maxPublication.
7. Control Systems Engineering by S.K. Bhattacharya, Pearson Education.
8. Automatic Control system by Syed Hasan Saeed, S.K. Kataria &Sons.

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	4	10
2.	10	20
3.	12	20
4.	6	15
5.	10	20
6.	6	15
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE10	Course Title: Control System LAB
Program Elective	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course has been designed so that students may learn to Build and test the differenttypes of Control Systems for Process Applications.

LIST OF PRACTICALS:

1 Identify various blocks of a given open loop system.
2 Identify various blocks of a given closed-loop system
3 Convert an open loop system into a closed loop and observe the difference in outputusing a control simulator.
4 To study the torque-speed characteristics of an AC servo motor, determine its parameters, and evaluate its transfer function.
5 To study the open and closed- loop step response of first order simulated linear systems.

INSTRUCTIONAL STRATEGY

1. Visit to Industries.
2. Use Free Simulators Software for teaching / learning activities.
3. Show Video/Animation Films relevant to Automation & Control Systems.

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE511	**Course Title : BUILDING ELECTRIFICATION**
Program Elective	**Credits: 3**
Hours per week: 3 (L:3 T:0 P:0)	

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 electrical installation systems in building complexes.

Course contents:

1. Wiring Tools and Accessories

1.1 Various tools required for wiring- screwdrivers, pliers, Try square, saws, hacksaw, chisel, hammers, mallet, rawl punch, hand drill machine, portable drilling machine, files, plumb bob, line thread, electricians knife, test lamp, tester and their BIS specifications, Application, care & maintenance of tools

1.2 Classification of electrical accessories- controlling, holding, safety, outlets

1.3 BIS symbols of following electrical accessories.

Switch – Their types according to construction such as surface switch, flush switch, and pull switch, rotary switch, knife switch, pendent switch, Main-switch (ICDP, ICTP). Their types according to working such as single pole, double pole, two-way, two-way centre off, interme- diate, series parallel switch

Holders- Their types such as bayonet cap lamp holder, pendent holder, batten lamp holder, angle holder, bracket holder, tube light holder, screw type Edison and goliath Edison lamp holder, swivel lamp holder.

Socket outlets and plugs- two pin, three-pin, multi pin sockets, two-pin and three-pin plug.

Others- Iron connector, adaptor, and ceiling rose, distribution box, neutral link, bus-bar chamber. Wooden/ mica boards, Moulded/ MS Concealed boxes of different sizes. Modular accessories.

2.Electrical Wires and Underground Cables

2.1 Conductors: - wire, bus bar, stranded conductor, cable, armoured cable, flexible cable, solid conductor, PVC wires, CTS wire, LC wire, FR (Fire retardant) wire, Size of wire according to BIS.

2.2 Tools used for measurement of wire size, Wire jointing methods.

2.3 Classification of cables: low tension, high tension, and extra high tension cables.

2.4 Selection of suitable cable size and type from standard data.

3. **Wiring Methods and wiring layout**

3.1 Factors determining the selection of wiring methods.

3.2 Classification of wiring methods.

PVC casing-capping wiring- wiring rules according to IS: 732-1983

Conduit wiring- Types of conduit, comparison between Metal and PVC conduit, types of conduit wiring (Surface/Concealed). Conduit wiring accessories, BIS rules for Metal and PVC conduit wiring.

3.3 Comparison of various wiring systems.

3.4 General BIS rules for domestic installations.

3.5 Design, working and drawing of following electrical circuits:

Simple light and fan circuits, Stair case wiring, Go-down wiring circuit,

Bedroom lighting circuit, Corridor lighting circuit,

4. **Residential Building Electrification**

4.1 Interpretation of electrical installation plan and electrical diagrams, electrical symbols.

4.2 Load assessment: Selection of size of conductor, Selection of rating of main switch and protective switch gear.

4.3 Design and drawing, estimation and costing of a residential installation having maximum 5 KW load; Sequence to be followed for preparing estimate; Calculation of length of wire and other materials, labour cost

4.4 Residential building Service Connection- types Underground and overhead.

4.5 Calculation of Material required for overhead service connection

5.Protection of Electrical Installation

5.1 Fuse in electric circuit: fuse element, current rating, minimum fusing current, fusing factor, Fuse material, Types of fuses –Re-wirable, cartridge fuses (HRC and LRC),

5.2 Miniature circuit Breaker (MCB)- Principle, rating and uses

5.3 Earth Leakage Circuit Breaker (ELCB)- Principle, rating and uses.

5.4 Brief idea about System and equipment earthing and its requirements,

6. Illumination in Residential Installation

6.1 Concept of Luminous flux, Luminous intensity, Lumen, Illumination or illuminance, Lux, Space-height ratio, utilization factor, depreciation factor, luminous efficiencies

6.2 Laws of Illumination-Inverse Square Law, Cosine Law

6.3 Factors affecting the illumination.

Course outcomes:

After the completion of the course, the student will be able to

a) Select accessories, wires, cables and wiring systems for electrification.
b) Design electrical wiring installation system for residential unit.
c) Design proper illumination scheme for residential unit.
d) Prepare wiring layouts on wiring board.
e) Locate and diagnose faults in electrical wiring installation.
f) Do proper earthing for building electrification

References:

1. Raina, K.B. and S.K.Bhattacharya, Electrical Design Estimating and Costing, New Age Interna- tional Ltd., New Delhi, ISBN 978-81-224-0363-3
2. Allagappan,N. S.Ekambarram, Electrical Estimating and Costing, New Delhi, ISBN-13: 9780074624784
3. Singh, Surjit, Electrical Estimating and Costing, Dhanpat Rai and Co. New Delhi, ISBN: 1234567150995
4. Gupta, J B: A Course in Electrical Installation Estimating and Costing, S K Kataria and Sons,New Delhi, ISBN:978-93-5014-279-0
5. Bureau of Indian Standard, IS: 732-1989, Code of practice for electrical wiring installation
6. Bureau of Indian Standard, SP 30 National Electrical Code 2010
7. Bureau of Indian Standard, SP 72 National Lighting Codes 2010
8. E-REFERENCES:-
   - http://nptel.ac.in/courses/108108076/1 , assessed on 18th January 2016
   - http://www.electrical4u.com, assessed on 18th January 2016
   - https://www.youtube.com/watch?v=A9KSGAnjo2U, assessed on 18th January 2016
   - http://www.electricaltechnology.org/2015/09, assesed on 30 Jan 2016
   - www.slideshare.net/bawaparam/made-by-paramassesed on 30 Jan2016
   - www.electricaltechnology.org/2013/09/electrical-wiring.html assessed on 16 March 2016.

UNIT WISE MARKS AND TIME DISTRIBUTION

UNIT	Time Allotted (hrs)	Marks Allocation (%)
1.	7	15
2.	5	15
3.	10	20
4.	12	20
5.	6	15
6.	8	15
	48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE512	**Course Title : BUILDING ELECTRIFICATION LABORATORY**
Program Elective	**Credits: 1**
Hours per week: 2 (L:0 T:0 P:2)	

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 electrical installation systems in building complexes.

LIST OF PRACTICALS

1. Prepare series testing board.
2. Select the electric wire using measuring and testing instruments for particular applications.
3. Identify cables of different current ratings.
4. Prepare wiring installation on a board showing control of one lamp, one fan and one socket from one switch board in PVC surface conduit wiring system.
5. Prepare wiring installation on a board.
6. Control one lamp from two different places using PVC surface conduit wiring system.
7. Prepare wiring installation on a board. Control one lamp from three different places using PVC surface conduit wiring system.
8. Prepare wiring installation on a board.
9. Perform go-down wiring for three blocks using PVC casing capping.
10. Design 2 BHK residential installation scheme and estimate the material required. And draw the details required for installation on A4 size sheet.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE13	Course Title: SOLAR POWER TECHNOLOGIES
Program Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identifiedcompetency through various teaching-learning experiences. Maintain the efficient operation of various types of solar power technologies.

COURSE CONTENT

1. Solar Energy

1.1 Solar Map of India: Global solar power radiation
1.2 Different types of Solar water heaters: Construction, working, specifications,and installation of Solar Heating systems
1.3 Solar drying and different types of Solar cookers
1.4 Solar lighting.
1.5 Preventive maintenance of all of the above.

2. Concentrated Solar Power (CSP)

2.1 Concentrated Solar Power (CSP) plants or solar thermal electric systems
2.2 Parabolic Trough: Construction, working and specifications
2.3 Parabolic Dish: Construction, working and specifications
2.4 Preventive maintenance of all of the above

3. Solar PV Systems

3.1 Solar PV cell: Types of construction, working, Typical specifications of solar cells
3.2 Solar PV working principle: Series and parallel connections of solar modules
3.3 Solar Photovoltaic (PV) system: components layout and working.
3.4 Roof top and streetlight solar PV systems and typical specifications Maintenance of these systems

4. Solar PV Electronics

4.1 Solar Charge controllers: working and specifications,

4.2 Solar Inverters: working and specifications
4.3 Solar Power tracking: construction, working, tilt angle, solar radiation, I-V, P-V characteristics, maximum power point tracking (MPPT)

5. Solar PV Off-grid and Grid-Tied Systems

5.1 Solar off-grid systems: layout and specifications
5.2 Solar Grid-tied (on grid) systems: Working principle of grid-tied dc-acin-verter, grid synchronization, and active power export
5.3 Net metering: main features and working

COURSE OUTCOME

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

- Maintain the solar non-electric equipment.
- Maintain CSP plants
- Maintain solar PV systems.
- Maintain solar PV electronics and MPPT systems
- Maintain off-grid and on-grid solar power plants

RECOMMENDED BOOKS:

1. Solanki, Chetan Singh, - Solar Photovoltaics: Fundamentals, Technologies and Applications, PHI Learning, New Delhi, ISBN: 9788120351110
2. Solanki, Chetan Singh, - Solar Photovoltaic Technology and Systems - A Manual For Technicians, Trainers and Engineers, PHI Learning, New Delhi, ISBN: 9788120347113
3. Kothari, D.P. et aL. Renewable Energy Sources and Emerging Technologies, PHI
4. David M. Buchla, Thomas E. Kissell, Thomas L. Floyd, - Renewable Energy Systems, Pearson Education New Delhi, ISBN: 9789332586826
5. Rachel, Sthuthi, Earnest, Joshua; -Wind Power Technologies, PHI Learning 5. O.P. Gupta, Energy Technology, Khanna Publishing House, ISBN: 978-93-86173- 683

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (hrs)	Marks Allotted (%)
1.	9	20
2.	9	20
3.	10	20
4.	10	20
5.	10	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE14	Course Title : SOLAR POWER TECHNOLOGIES LABORATO-RY
Program Elective	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identifiedcompetency through various teaching-learning experiences. Maintain the efficient operation of various types of solar power technologies.

LIST OF PRACTICALS:

1. Dismantle and Assemble solar power heaters
2. Dismantle and Assemble the parabolic dish CSP plant.
3. Dismantle, Assemble, and Troubleshoot the solar PV system
4. Troubleshoot solar PV panels and arrays
5. Troubleshoot solar inverters
6. Troubleshoot solar off-grid systems
7. Troubleshoot solar net metering systems

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE15	Course Title: WIND POW-ERTECHNOLOGIES
Program Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identified competency through various teaching-learning experiences. Maintain large wind power plants and small wind turbines.

COURSE CONTENT

1. Wind Energy and Wind Power Plants

1.1 Wind power scenario in the world and India
1.2 Characteristics of Wind Energy: Wind movement, wind profile, roughness,effects of obstacles in wind path.
1.3 Types of Wind Power Plants (WPPs): Small and large wind turbines;
1.4 Horizontal and Vertical axis; Upwind and Downwind, One, Two, and Three blades; constant and variable Speed; Geared, Direct-Drive and Semi-Geared (Hybrid) WPPs; WECS, WEGs, WTs, WPPs,
1.5 WPP Tower Types: Lattice tubular steel, concrete, hybrid, ladders, cables.
1.6 WPP substation: Switchgear, transformers, inside layouts of Electricelectronic panels at the block level.

2. Construction and Working of Large Wind Power Plants

2.1 Wind Turbine Terminologies: Cut-in, cut-out, and survival wind speeds, Threshold wind speeds, rated power, nominal power, Wind Power Curve
2.2 Major parts and Functions of WPP: Rotor blades, hub, nacelle, tower, electric sub-station, nacelle layouts of Geared, Direct-Drive, and Semi-Geared WPPs, Main shaft, gearbox, electric generator, electronic control panels
2.3 Rotation principles: Drag and Lift principle, thrust, and torque of wind turbinerotor.
2.4 Different types of Sensors: Anemometer, wind vane, rpm sensors of main shaft and generator, temperature sensors of nacelle, gearbox, and generator; cable untwisting and vibration sensors.
2.5 Different types of Actuators: Electric and hydraulic pitching and yawingmechanisms, cable untwisting and braking mechanisms

3. Aerodynamic Control, Electric Generators and Grid Connection

3.1 Aerodynamic Control of WPPs: Stall Pitch and Active Stall.
3.2 Braking mechanisms of large WPPs.
3.3 Electric Generator Types: Working of Squirrel-Cage rotor Induction Generator(SCIG), Wound-Rotor Induction Generator (WRIG), Doubly-Fed Induction Generator (DFIG), wound rotor and permanent magnet synchronous generators.
3.4 Electric grid connection of WPPs: Local Impacts and system-wide impact

4. Construction and Working Small Wind Turbines

4.1 Types and working of different types of small wind turbines (SWT): Classification: Horizontal and Vertical axis, Upwind and Downwind, One, Two, and Three blades; Constant and Variable Speed; Direct-Drive and Geared; braking of SWTs
4.2 Parts of SWTs: Rotor, generator, gearbox, tower, electric control panel, tale vane, anemometer, wind vane, temperature, and rpm sensors.
4.3 Working SWTs: Direct-drive and Geared.
4.4 Electrical generators in SWTs: permanent magnet synchronous generators, induction generators
4.5 SWT towers: Lattice tubular type, hydraulic towers, ladders, cables,

5. Maintenance of Small Wind Turbines

5.1 Small wind turbine assembly.
5.2 Installation of different types of small wind turbines (SWT): tubular and lattice types.
5.3 SWT Routine maintenance: Tips; Preventive maintenance schedule of braking mechanisms, sensors; oiling and greasing related;
5.4 Common electrical and mechanical faults in SWTs

COURSE OUTCOME

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

- Identify the various types of wind power plants and their auxiliaries.
- Maintain the normal working of large wind turbines.
- Optimize the aerodynamic and electric control of large wind power plants.
- Troubleshoot the common faults of large wind power plants.
- Maintain the normal working of small wind turbines.
- Troubleshoot small wind turbines.

RECOMMENDED BOOKS:

1. Hau, Erich: Wind Turbines Springer-Verlag, Berlin Heidelberg, Germany, ISBN:978-3-642- 27150-2
2. Rachel, Sthuthi, Earnest, Joshua; -Wind Power Technologies, PHI Learning, NewDelhi, ISBN: 978-93-88028-49- E-book 978-93-88028-50-9
3. Gipe, Paul: Wind Energy Basics, Chelsea Green Publishing Co; ISBN: 978-1603580304
4. Wizelius, Tore, Earnest, Joshua - Wind Power Plants and Project Development, PHILearning, New Delhi, ISBN:978-8120351660
5. Bhadra, S.N., Kastha, D., Banerjee, S, Wind Electrical Systems installation; Ox-fordUniversity Press, New Delhi, ISBN: 9780195670936
6. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi (ISBN:978-93-86173- 683)

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allot-ted(hrs)	Marks Allotted (%)
1.	10	20
2.	10	20
3.	10	20
4.	9	20
5.	9	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICALENGINEERING	
Course code: EEPE16	Course Title: WIND POWER TECHNOLOGIES LABORATORY
Program Elective	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identifiedcompetency through various teaching-learning experiences. Maintain large wind power plants and small wind turbines.

LIST OF PRACTICALS (ANY TEN)

1. Identify the specified items of a wind farm after watching the video clip.
2. After watching the video clips, identify the specified parts inside the nacelle of a large wind power plant.
3. Check the performance of the temperature and vibration sensor used in 125/150 kW WPPs.
4. Check the performance of the SCIG.
5. Check the performance of the PMSG.
6. Check the performance of the hydraulic and electric pitch actuator and yaw actuator used in 125/150 kW WPPs.
7. Check the performance of the contactless RPM sensors used in WPPs
8. Troubleshoot the anemometer and wind vane
9. Check the generator performance of SWTs.
10. Identify the parts of a direct-drive SWT
11. Identify the parts of a geared SWT
12. Assemble/Dismantle a direct-drive SWT
13. Assemble/Dismantle a geared SWT
14. Check the performance of direct-drive SWT
15. Check the performance of geared SWT
16. Simulate faults in the small wind turbine trainer
17. Troubleshoot direct-drive SWT
18. Troubleshoot geared SWT

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE17	Course Title: BIOMASS AND MICRO-HYDROPOWER PLANTS
Program Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identifiedcompetency through various teaching-learning experiences. Maintain the efficient operation of various types of Biomass and Micro hydropower plants.

COURSE CONTENT

1 Basics of Biomass-based Power Plants

1.1 Properties of solid fuel for biomass power plants: bagasse, wood chips, rice husk, municipal waste
1.2 Properties of liquid and gaseous fuel for biomass power plants: Jatropha, bio-diesel gobar gas
1.3 Layout of a Bio-chemical based (e.g., biogas) power plant
1.4 Layout of a Thermo-chemical-based (e.g., Municipal waste) power plant
1.5 Layout of an Agro-chemical (e.g. bio-diesel) power plant
1.6 Selection of biomass power plants

2 Biomass Gasification Power Plants

2.1 The basic principle to convert Agriculture and forestry products and wood processing remains (including rice husks, wood powder, branches, offcuts, corn straws, rice straws, wheat straws, cotton straws, fruit shells, coconut shells, palm shells, bagasse, corncobs) into combustible gas.
2.2 General Construction and working of a typical gasifier
2.3 Power generating in gas engine
2.4 Strengths and limitations of Agriculture and forestry products gasifier
2.5 Preventive maintenance steps for different types of biomass gasifiers.

3. Different Types of Gasifiers

3.1 Construction and working of the following types of gasifiers
3.2 Rice Husk Gasification Power Plant and their specifications
3.3 Straw Gasification Power Plant and their specifications
3.4 Bamboo Waste, Bamboo Chips Gasification Power Plant and their specifications
3.5 Coconut shell, coconut peat, coconut husk, Gasification Power Plant and their specifications

3.6 Bagasse/Sugar Cane Trash Gasification Power Plant and their specifications

3.7 Gobar gas plant and its specifications. Breakdown maintenance of biomass power plant at the module level.

4. Micro-hydro Power Plants

4.1 Locations of micro-hydro power plant
4.2 The energy conversion process of the hydropower plant.
4.3 Classification of hydro power plant: High, medium, and low head.
4.4 General Layouts of typical micro-hydro power plant.
4.5 Strengths and limitations of micro-hydro power plants

5. Different types of Micro-hydro power plants

5.1 Construction and working of High head – Pelton turbine and their specifications
5.2 Construction and working of Medium head – Francis turbine and theirspecifications
5.3 Construction and working of Low head – Kaplan turbine and theirspecifications
5.4 Preventive and breakdown maintenance of micro-hydro power plants Safe Practices for micro-hydro power plants

COURSE OUTCOME

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

- Select the relevant biomass power plant
- Undertake the preventive maintenance of different types of biomass gasifiers
- Undertake the breakdown maintenance of different types of biomass gasifiers
- Maintain the optimized working of large wind power plants
- Maintain the optimized working of small wind turbines.
- Maintain the optimized working of micro hydro power plants.

RECOMMENDED BOOKS:

1. Khoiyangbam, R S Navindu; Gupta and Sushil Kumar; Biogas Technology Towards Sustainable Development; TERI, New Delhi; ISBN: 9788179934043
2. David M. Buchla; Thomas E. Kissell; Thomas L. Floyd - Renewable Energy Systems, Pearson Education New Delhi, ISBN: 9789332586826,
3. Kothari, D.P. et al.: Renewable Energy Sources and Emerging Technologies, PHI
4. Rachel, Sthuthi, Earnest, Joshua; -Wind Power Technologies, PHI Learning
5. O.P. Gupta, Energy Technology, Khanna Publishing House, ISBN: 978-93-86173-683

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allot-ted(hrs)	Marks Allot-ted(%)
1.	10	20
2.	10	20
3.	10	20
4.	10	20
5.	8	20
To-tal	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code:EEPE18	Course Title: BIOMASS AND MICRO-HYDROPOW-ERPLANTS LABORATORY
Program Elective	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identified competency through various teaching-learning experiences. Maintain the efficient operation of various types of Biomass and Micro-hydro powerplants.

LIST OF PRACTICALS:

1. Identify different components of a typical Biomass power plant.
2. Identify different biomass resources and evaluate their energy potential.
3. Determine the carbon content of solid biomass.
4. Dismantle / Assemble the Biogas power plant.
5. Identify the components of the high head / medium head/ low head micro hydro power plant.
6. Assemble a high head/ medium head/ low head micro hydro power plant.
7. Undertake preventive maintenance of the high head /medium head / low head micro hydro power plant.
8. Check the performance of the Pelton wheel micro hydro power plant.

PROGRAM: THREE YEARS DIPLOMA PROGRAMS IN ELECTRICAL ENGINEERING	
Course code: EEPE19	Course Title: ELECTRIC TRACTION
Program Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identifiedcompetency through various teaching-learning experiences. Maintain electric traction systems.

COURSE CONTENT

1. Basics of Traction

1.1 General description of Electrical Traction system in India.
1.2 Advantages and Disadvantages of Electric Drive, Diesel Electric Drive, BateryDrive
1.3 Problems associated with AC traction Systems and remedies for it.
1.4 Voltage balance, current balance, production of harmonics, induction effects.
1.5 Metro rail system features

2. Power Supply Arrangements

2.1 Constituents of supply system: -
2.2 Substation: layout, list of equipment and their functions; feeding post: list of equipment and their functions; Feeding and sectioning Arrangements
2.3 Sectioning and paralleling post-sub-sectioning and Paralleling post-sub-sectioning post
2.4 Elementary section
2.5 Major equipment at the substation
2.6 Miscellaneous equipment at the control post or Switching station

3 Overhead Equipment

3.1 Different types of overhead equipment
3.2 Pentagonal OHE Catenary Construction
3.3 Different Types of Catenaries according to Speed Limit
3.4 OHE Supporting Structure, Cantilever assembly diagram
3.5 Overhead system- Trolley collector, Bow collector, Pantograph Collector
3.6 Types and construction of pantograph

4 Electric Locomotive

4.1 Classification and Nomenclature of Electric Locomotive
4.2 Block diagram of AC locomotive
4.3 Power Circuit of AC Locomotive

4.4 Equipment (List and Function only) used in the auxiliary circuit of AC Locomotive
4.5 Loco bogie classification according to wheel arrangements

5 Traction Motors and Train Lighting

5.1 Desirable characteristics of traction motor.
5.2 Types of motors used for traction with their characteristics and features
5.3 Control of motors used for traction and methods to control
5.4 Requirements of braking, types of braking: Electric braking, Regenerative braking
5.5 Systems of train lighting, Single battery, double battery parallel block system

6 Signaling and Supervisory Control (Introduction Only)

6.1 Requirements of signalling systems
6.2 Types of signals, track circuits
6.3 Advantages of remote control
6.4 Systems of remote control

COURSE OUTCOME:

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

- Interpret the traction layout and its systems
- Maintain the power supply arrangements.
- Maintain the function of the overhead equipment for electric traction
- Maintain the different components of the electric locomotive.
- Maintain the traction motor and train lighting system
- Maintain the signalling and supervisory control systems

RECOMMENDED BOOKS:

1. Utilization of Electric Power & Electric Traction G.C. Garg, Khanna BookPublishing Co., New Delhi (ISBN: 978-93-86173-355) Revised Ed. 2018
2. Utilization of Electric power and traction Gupta J.B., S.K.Kataria and Son,
3. Art and Science of Utilization of Electrical Energy Partab H., Dhanpat Rai and Co,'
4. Modern Electric Traction, Partab H., Dhanpat Rai and Co,
5. Suryanarayana N.V., New Age International Publishers, Reprint 2010
6. Utilization of electrical energy Open Shaw Taylor, Orient Longman Ltd.

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (hrs)	Marks Allotted (%)
1.	8	20
2.	10	20
3.	9	20
4.	9	20
5.	9	15
6.	3	5
To-tal	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING		
Course code: EEPE20	Course Title :	ELECTRIC TRACTION LABORATORY
Program Elective	Credits: 1	
Hours per week: 2 (L:0 T:0 P:2)		

COURSE OBJECTIVE:

This course aims to help students attain industry-identifiedcompetency through various teaching-learning experiences. Maintain electric traction systems.

LIST OF PRACTICALS:

1. Dismantle a traction motor
2. Assemble a traction motor
3. Troubleshoot a traction motor
4. Visit the installation of the electric-traction train lighting system, identifysystem components, and prepare a report.
5. Visit the electric-traction loco shed, investigate the working of each section& prepare a report.
6. Visit the Traction Substation or feeding post (for layout and OHE)and write a report.
7. Visit the Railway Station (for signalling and train lighting) and write areport on the visit.
8. Draw the traction substation Layout on the drawing sheet and prepare a report.
9. Draw the Pentagonal OHE Catenary, different Catenaries according to the speed limit, OHE supporting structure on the drawing sheet, and prepare a report.
10. Draw the Power Circuit of AC Locomotive on the drawing sheet and prepare a report.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEOE01	Course Title: GENERIC SKILLS AND ENTREPRENEURSHIP DEVELOPMENT
Open Elective	Credits: 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

Generic Skills and Entrepreneurship Development is one of the courses from the "Human Science" subject area. Generic skills have emerged as an important component of employability skills, enabling an individual to become and remain employable over a lifetime and lead a happy and prosperous life. Entrepreneurship development aims at developing a conceptual understanding for setting-up one's business venture/enterprise. This aspect of Human Resource Development has become equally important when wage employment prospects have become meager.

Both the subject areas are supplementary to each other, and soft skills are required to be developed in diploma pass outs for enhancing their employability and self-confidence.

COURSE CONTENT

1. Introduction to Generic Skills

1.1 Importance of Generic Skill Development (GSD)
1.2 Global and Local Scenario of GSD
1.3 Life Long Learning (LLL) and associated importance of GSD.

2. Managing Self

2.1 Knowing Self for Self Development
Self-concept, personality traits, multiple intelligences such as language, numerical, psychological, etc.

2.2 Managing Self - Physical
Personal grooming, Health, Hygiene, Time Management

2.3 Managing Self – Intellectual development
- Information Search: Sources of information
- Listening: Effective Listening
- Speaking: Effective Oral Communication
- Reading: Purpose of reading, different styles of reading, techniques ofsystematic reading;
- Note Taking: Importance and techniques of note-taking
- Writing: Correspondence - personal and business

2.4 Managing Self – Psychological
- Stress, Emotions, Anxiety-concepts, and significance (Exercises related to stress management)
- Techniques to manage the above

3. Managing in Team

3.1 Team - definition, hierarchy, team dynamics
3.2 Team- related skills- sympathy, empathy, co-operation, concern, leading andnegotiating, working well with people from culturally diverse backgrounds
3.3 Communication in the group - conversation and listening skills

4 Task Management

4.1 Task Initiation, Task Planning, Task execution, Task close out

5. Problem-Solving

5.1 Prerequisites of problem-solving meaningful learning, ability to apply knowledge in problem solving.

5.2 Different approaches for problem solving.

6. Entrepreneurship

6.1 Introduction

- Concept/Meaning and its need
- Competencies/qualities of an entrepreneur
- Entrepreneurial Support System, e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level.

6.2 Market Survey and Opportunity Identification (Business Planning)

- How to start a small-scale industry
- Procedures for registration of small-scale industry
- List of items reserved for exclusive manufacture in small-scale industry
- Assessment of demand and supply in potential areas of growth.
- Understanding business opportunity
- Considerations in product selection
- Data collection for setting up small ventures.

6.3 Project Report Preparation

- Preliminary Project Report
- Techno-Economic Feasibility Report
- Exercises on Preparation of Project Report in a group of 3-4 students

INSTRUCTIONAL STRATEGY:

This subject will require a blend of teaching and learning methods, beginning with the lecture method. Some topics may be taught using question answers, assignments, case studies, or seminars. In addition, expert lectures may be arranged from within the institution or management organizations. Conceptual understanding of Entrepreneurship inputs by teachers and outside experts will expose the students to facilitate in starting one's business venture/enterprise. The teacher will discuss success stories and case studies with students, which will develop managerial qualities in the students. There may also be guest lectures by successful diploma-holding entrepreneurs and field visits. The students may also be provided with relevant text material and handouts.

RECOMMENDED BOOKS:

1. Generic skill Development Manual, MSBTE, Mumbai.
2. Lifelong learning, Policy Brief (www.oecd.org)
3. Lifelong learning in Global Knowledge Economy, Challenge for Developing Countries – World Bank Publication
4. Towards Knowledge Societies, UNESCO Paris Publication
5. Your Personal Pinnacle of Success by DD Sharma, Sultan Chand and Sons, New Delhi
6. Human Learning, Ormrod

7. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
8. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand andSons, New Delhi
9. Handbook of Small Scale Industry by PM Bhandari
10. Generic Skills and Entrepreneurship Development by Ishan Publishers(Ambala)
11. Generic Skills and Entrepreneurship Development by Poonam Goyal (GBD)-Punjab

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allot-ted(Hrs)	Marks Allotted (%)
1.	3	5
2.	10	20
3.	8	15
4.	5	10
5.	5	10
6.	17	40
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEOE 02	Course Title: Disaster Management
Open Elective	Credits: 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

The 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 organizations in disaster management in India.
- To get exposed to technological tools and their role in disaster management.

COURSE CONTENT

1. Understanding Disaster

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

2. 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) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters

3. 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, and Awareness. During Disaster – Evacuation – Disaster Communication – Search and Rescue

– Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, HyogoFramework of Action.

4. Disaster Management in India

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

5. Applications of Science and Technology for Disaster Management

Geo-informatics in Disaster Management (RS, GIS, GPS, and RS). 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, students will be:

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

RECOMMENDED BOOKS:

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 theirreduction, CSIR, New Delhi
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters indeveloping 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.

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	5	10
2.	15	30
3.	10	20
4.	9	20
5.	9	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEOE03	Course Title: PROJECT MANAGEMENT
Open Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

- To develop the idea of the project plan, from defining and confirming the project goals and objectives to identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

COURSE CONTENT

1. Concept of a project:

1.1 Classification of projects
1.2 Importance of project management
1.3 The project life cycle
1.4 Establishing project priorities (scope-cost-time)
1.5 Project priority matrix
1.6 Work breakdown structure.

2. Capital budgeting process:

2.1 Planning, Analysis, Selection, Financing, Implementation, Review. Generation and screening of project ideas, market and demand analysis, and Demand forecasting techniques. Market planning and marketing research process-Technical analysis

3. M Financial estimates and projections:

3.1 Cost of projects, means of financing, estimates of sales and production, cost of production, working capital requirement, and its financing-profitability projected cash flow statement and balance sheet. Break-even analysis.

4. Basic techniques in capital budgeting:

4.1 Non-discounting and discounting methods: payback period, accounting rate of return, net present value, Benefit cost ratio, internal rate of return. Project risk. Social cost-benefit analysis and economic rate of return. Non-financial justification of projects.

5. Project administration:

5.1 Progress payments, expenditure planning, project scheduling, network planning, use of Critical Path Method (CPM), schedule of payments and physical progress, time-cost trade-off. Concepts and uses of PERT cost as a

Function of time, Project Evaluation, and Review Techniques/cost mechanisms. Determination of least cost duration. Post-project evaluation. Introduction to various Project management softwares.

COURSE OUTCOME:

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

- Understand the importance of projects and their phases.
- Analyze projects from marketing, operational, and financial perspectives.
- Evaluate projects based on discount and non-discount methods.
- Develop network diagrams for the planning and execution of a given project.
- Apply crashing procedures for time and cost optimization.

RECOMMENDED BOOKS:

1. Project planning,analysis, selection, implementation, and review – Prasanna Chandra – Tata McGraw Hill
2. Project Management – The Managerial Process – Clifford F. Gray & Erik W.Larson- McGraw Hill
3. Project management – David I Cleland - McGraw Hill International Edition, 1999.
4. Project Management – Gopala Krishnan – McMillan India Ltd.
5. Project Management – Harry-Maylor-Pearson Publication

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted(hrs)	Marks Allotted(%)
1.	08	15
2.	08	20
3.	08	20
4.	08	15
5.	16	30
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEOE04	Course Title: Internet of Things
Open Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry-identifiedcompetency through various teaching-learning experiences:

COURSE CONTENT

1. Introduction to the Internet of Things

1.1. Define the term "Internet of Things."
1.2. State the technological trends that have led to IoT
1.3. Describe the impact of IoT on society.

2. Design Consideration of IoT

2.1 Enumerate and describe the components of an embedded system.
2.2 Describe the interactions of embedded systems with the physical world.
2.3 Name the core hardware components most commonly used in IoT devices.

3. Interfacing by IoT devices

3.1 Describe the interaction between software and hardware in an IoT device.
3.2 Explain the use of networking and basic networking hardware.
3.3 Describe the structure of the Internet.

COURSE OUTCOME:

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

- Understand the concept of the Internet of Things (IoT) and its impact on society.
- Analyze the design considerations of IoT systems, including embedded system components and hardware.
- Demonstrate knowledge of interfacing IoT devices, including software-hardware interactions, networking principles, and Internet structure.

RECOMMENDED BOOKS:

1. Internet of Things: Raj Kamal McGraw Hill Education; First edition (10 March 2017) ISBN: 978-9352605224

2. Internet of Things: A Hands-On Approach Arsheep Bahge and Vijay Madisetti Orient Blackswan Private Limited - New Delhi; First edition (2015) ISBN: 978-8173719547

SUGGESTED SOFTWARE/LEARNING WEBSITES:

1. https://www.raspberrypi.org/blog/getting-started-with-iot/
2. https://www.arduino.cc/en/IoT/HomePage
3. https://www.microchip.com/design-centers/internet-of-things
4. https://learn.adafruit.com/category/internet-of-things-iot
5. http://esp32.net/

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (hrs)	Marks Allotted (%)
1.	10	20
2.	18	40
3.	20	40
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEOE05	Course Title: ECONOMIC POLICIES IN INDIA
Open Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to familiarize the students of different streams withthe basic concepts, structure, problems, and issues concerning the Indian economy.

COURSE CONTENT

1 **Basic features and problems of the Indian Economy**:

1.1. Economic History of India; Nature of Indian Economy, Demographic Features and Human Development Index.
1.2. Problems of Poverty, Unemployment, Inflation, income inequality, Black money in India.

2 **Sectoral Composition of Indian Economy**:

2.1 Issues in the Agriculture sector in India
2.2 Land reforms
2.3 Green Revolution and agriculture policies of India

3 **Industrial development**,

3.1 Small-scale and cottage industries
3.2 Industrial Policy, Public Sector in India
3.3 Service sector in India.

4 **Economic Policies**:

4.1 Economic Planning in India, Planning commission v/s NITI Aayog
4.2 Five-Year Plans, Monetary Policy in India, Fiscal Policy in India
4.3 Center-state Finance Relations
4.4 Finance commission in India. LPG policy in India

5 External sector in India: -

5.1 India's foreign trade value, composition and direction
5.2 India's Balance of payment since 1991, FDI in India
5.3 Impact of Globalization on Indian Economy, WTO and India.

COURSE OUTCOME:

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

- Understand Indian economics policy, planning strategies

- It will enable students to comprehend theoretical and empirical development across countries and regions for policy purposes

RECOMMENDED BOOKS:

1. Indian Economy by Dutt Rudder and K.P.M Sundaram (2017), S Chand &Co. Ltd. New Delhi.
2. Indian Economy and –Its Development Experience. Mishra S.K & V.K Puri (2017).Himalaya Publishing House.
3. Indian Economy, Singh, Ramesh, (2016): Tata-McGraw Hill Publications, New Delhi.
4. March of the Indian Economy, Dhingra, I.C., (2017): Heed Publications Pvt. Ltd.
5. Evolution of the Indian Economy Karam Singh Gill, (1978): Evolution of the Indi-anEconomy, NCERT, New Delhi
6. Kaushik Basu (2007): Oxford University Press.

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (hrs)	Marks Allot-ted (%)
1.	08	15
2.	10	20
3.	10	20
4.	10	25
5.	10	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICALENGINEERING	
Course code: EEOE06	Course Title: E-Commerce
Open Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to familiarize the students of different streams with thebasic concepts, structure, problems, and issues related to E-Commerce.

COURSE CONTENT

1. Electronic Commerce

1.1 Overview, Definitions, Advantages And Disadvantages of E-commerce,
1.2 Threats of E-commerce, Managerial Prospective,
1.3 Rules and Regulations for controlling E-commerce,
1.4 Cyber Laws.

2. Technology

2.1 Relationship Between E-Commerce and Networking,
2.2 Different Types of Networking for E-commerce, Internet, Internet and Extranet, EDI System Wireless
2.3 Application Protocol: Definition, Hand Held Devices, Mobility and Commerce, Mobile computing, Wireless Web, Web Security, Infrastructure Requirement for E-Commerce.

3. Business Models of E-Commerce and E-Strategy

3.1 Overview, Strategic Methods for developing E-commerce, Business - to - Business (B2B), Business - to - Consumer (B2C), Consumer - to - Consumer (C2C), Consumer - to - Business (C2B), Business - to - Government (B2G)
3.2 Government - to - Business (G2B), Government - to - Citizen (G2C)
3.3 Four C's (Convergence, Collaborative Computing, Content Management and Call Center), Payment through card system,
3.4 E-Cheque, E-Cash, E-Payment Threats and protections.

4. E-Marketing, Scam and Risk of E-Commerce

4.1 Overview, Security for E-commerce, Security Standards, Fire-

wall,Cryptography, Key Management, Password system,

4.2 Digital certificates, Digital signatures, Home-Shopping, E-Marketing, Tele- Marketing.

COURSE OUTCOME

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

- Distinguish between E-commerce and Commerce
- Know the rules of E-commerce
- Know the relationship between E-commerce and the Internet
- Know the modes of E-commerce

RECOMMENDED BOOKS:

1. E-Commerce – M. M. Oka- EPH
2. Electronic Bharat – TMH Commerce- Technologies & Application – Bhaskar
3. E-Commerce, McGraw Hill: Strategy Technologies and Applications – Tata

.

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (hrs)	Marks Allotted (%)
1.	12	25
2.	12	25
3.	12	25
4.	12	25
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICALENGINEERING	
Course code: EEOE07	Course Title: BASICS OF MANAGEMENT
Open Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry-identified competency through various teaching-learning experiences:

The diploma holders are generally expected to take up middle-level managerial positions; their exposure to basic management principles is essential. Topics like Structure of Organization, Leadership, Motivation, Ethics, and Values, Customer Relationship Management (CRM), Legal Aspects of Business, Total Quality Management (TQM), and Intellectual Property Rights (IPR) etc. have been included in the subject to provide elementary knowledge about these management areas.

COURSE CONTENT

1. Principles of Management

1.1 Introduction, definition, and importance of management.
1.2 Functions of Management
1.3 Concept and Structure of an organization,
1.4 Hierarchical Management Structure

2. Work Culture

2.1 Introduction and importance of Healthy Work Culture in an organization
2.2 Components of Culture
2.3 Importance of attitude, values, and behavior Science – Individual and group behavior
2.4 Professional ethics – Concept and need of Professional Ethics

3. Leadership and Motivation

3.1 Leadership
- Definition and Need of Leadership
- Qualities of a good leader
- Manager vs. leader

3.2 Motivation
- Definition and characteristics of motivation
- Factors affecting motivation
- Maslow's Need Hierarchy Theory of Motivation

3.3 Job Satisfaction

4. Legal Aspects of Business

4.1 Introduction and Need Labour Welfare Schemes
4.2 Wage payment: Definition and types
4.3 Incentives: Definition, need, and types
4.4 Minimum Wages Act 1948

5. Management Scope in Different Areas

5.1 Human Resource Development
- Introduction and objective
- Manpower Planning, recruitment, and selection
- Performance appraisal methods

5.2 Material and Store Management
- Introduction, functions, and objectives of material management
- Purchasing: definition and procedure
- Just in time (JIT)

5.3 Financial Management – Introduction
- Elementary knowledge of Income Tax, Sale Tax, Excise duty, Custom duty,Provident Fund

6. Miscellaneous topics

6.1 Customer Relationship Management (CRM)
- Definition and Need
- Types of CRM
- Customer satisfaction

6.2 Total Quality Management (TQM)
- Inspection and Quality Control

- Concept of Quality Assurance
- TQM

6.3 Intellectual Property Rights (IPR)

- Introduction, definition, and its importance
- Infringements related to patents, copyright, trademark

INSTRUCTIONAL STRATEGY

It is observed that diploma holders generally take up middle-level managerial positions; therefore, their exposure to basic management principles is essential. Accordingly, students may be given a conceptual understanding of different functions related to management. Some topics may be taught using question answer, assignment or seminar method. The teacher will discuss success stories and case studies with students, which will develop appropriate managerial qualities in the students. In addition, expert lectures may also be arranged from within the institutions or from management organizations. Appropriate extracted reading material and handouts may be provided.

RECOMMENDED BOOKS:

1. Principles of Management by Philip Kotler TEE Publication
2. Principles and Practice of Management by Shyamal Bannerjee: Oxford and IBMPublishing Co, New Delhi.
3. Financial Management by MY Khan and PK Jain, Tata McGraw Hill PublishingCo., 7, West Patel Nagar, New Delhi.
4. Modern Management Techniques by SL Goel: Deep and Deep Publications PvtLimited, Rajouri Garden, New Delhi.
5. Management by James AF Stoner, R Edward Freeman, and Daniel R Gilbert Jr.: Prentice Hall of India Pvt Ltd, New Delhi.
6. Essentials of Management by H Koontz, C O' Daniel, McGraw Hill Book Company,New Delhi.
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by DD Sharma, Sultan Chand and Sons, New Delhi.
9. Intellectual Property Rights and the Law by Dr. GB Reddy.
10. Service Quality Standards, Sales & Marketing Department, Maruti Udyog Ltd.
11. Customer Relationship Management: A step-by-step approach, Mohamed & Sagadevan Oscar Publication, Delhi
12. Customer Relation Management, Sugandhi RK, Oscar Publication, Delhi.

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	9	20
2.	6	10
3.	9	20
4.	6	10
5.	9	20
6.	9	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICALENGINEERING	
Course code: EEOE08	Course Title: Cyber-crime and Laws
Open Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

To maintain an appropriate level of awareness, knowledge, and skill required to minimize the occurrence and severity of incidents related to cybercrimes, digital forensics and cyber law.

COURSE CONTENT

1. Introduction to Cyber Crimes and Digital Forensics:

1.1 Defining Cybercrime, Understanding the Importance of Jurisdictional Issues, Quantifying Cybercrime, Differentiating Crimes That Use the Net from Crimes That Depend on the Net, working toward a Standard Definition of Cybercrime, Categorizing Cybercrime, and Reasons for Cyber-crime. Ethical Hacking and its Phases. Overview of computer forensics and Investigative Techniques.

2. Types and Categories of Cyber Crimes:

2.1 Demystifying Computer/Cybercrime, Investigating Computer Crime and its categories, and Ethical Hacking phases in detail.

3. Computer Investigation Process:

3.1 The concept of cyber security, meaning, scope, and the framework, Collecting and preserving Evidence.

4. Constitutional & Human Rights Issues in Cyberspace:

4.1 Freedom of Speech and Expression in Cyberspace Right to Access Cyberspace – Access to Internet, Right to Privacy, Right to Data Protection.

5. Need of Cyber ACT and Cyber Laws:

5.1 The Indian Context, Need for a Cyber Act, Information Technology Act, Scope and further development, Information Technology Act (Amendment), Coverage of Cyber Security ad Cyber Crime Indian Cyber laws vs. Cyber laws of U.S.A. Similarities, Scope and Coverage, Effectiveness, Intellectual Property Rights (IPR).

COURSE OUTCOME:

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

- Understand basic concepts of cyber laws, ethical hacking, and variousinvestigation techniques
- Understand the various types of cybercrime.
- Understand the concept of cyber security and methods for Collecting and preserving
- Understand the definition of Freedom of Speech and Expression in Cyber-space
- Understand why cyber acts and laws are required.

RECOMMENDED BOOKS:

1. Computer Forensics: Cybercriminals, Laws, And Evidence, Marie - Helen Maras,Jones & Bartlett Learn, 1st Edition, 2011.
2. Computer Forensics: Investigating Network Intrusions and Cyber Crime, EC-CouncilPress Series, Cengage Learning, 2010.
3. Hacking Exposed: Network Security Secrets & Solutions, Stuart McClure, JoelSeatnbra V and George Kurtz, McGraw-hill, 2005
4. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi,(2012).
5. Cyber Forensics: From Data to Digital Evidence, Albert J. Mar-cella Jr.,Wiley,1st Edition, 2012

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (hrs)	Marks Allotted(%)
1.	14	30
2.	6	10
3.	6	10
4.	8	20
5.	14	30
Total	**48**	**100**

THREE YEAR DIPLOMA

PROGRAMME

IN

FOOD

TECHNOLOGY

(SIXTH SEMESTER)

SUBJECT STUDY SCHEME (6th Semester: Food Technology)											
S.No	Code	Semester	Subjects	Th Hr	Tut Hr	Pr Hr	Tota Hr	Cr Th	Cr Tut	Cr Pr	Total cr
1	FTPC-601	6	Technology of oils and fats	3	0	0	3	3	0	0	3
2	FTPC-602	6	Technology of oils and fats- lab	0	0	2	2	0	0	1	1
3	FTPC-603	6	Food plant design and layout	4	0	0	4	0	0	4	4
4	FTPC-604	6	Food biotechnology	3	0	0	3	3	0	0	3
5	FTPC-605	6	Food biotechnology-lab	0	0	2	2	0	0	1	1
6	FTHS-606	6	Entrepreneurship and start ups	2	0	0	2	0	0	2	2
7	FTMP-607	6	Major Project	0	0	16	16	0	0	8	8
			Total	**12**	**0**	**20**	**32**	**6**	**0**	**16**	**22**

HS	BS	PC	ES	PE	OE	MP	SI/PR	AU	TOTAL
02	0	12	0	0	0	8	0	0	22

PROGRAM : THREE YEAR DIPLOMA PROGRAM IN FOOD TECHNOLOGY	
Course Code :**FTPC-601**	Course Title: **Technology Of Oils And Fats**
Semester : **6TH`**	Credits: **03**
Hours Per Week**: 3(L: 3, T: 0, P:0)**	

COURSE OBJECTIVE:

This subject is aimed at imparting thorough knowledge and skill related to the extraction and processing techniques of oils & fats and their nutritional and qualitative effects on food

COURSE CONTENT

1. **Unit I**
   Introduction-Oils and Fats, sources, composition their, physico-chemical properties
2. **Unit II**
   Nutritional importance of oils and fats
3. **Unit III**
   Functions of oils and fats in food
   - Tenderness
   - Texture
   - Flavour
   - Emulsion
4. **Unit IV**
   Processing of oil and fats -Pre-treatment, rendering, pressing, extraction methods, refining, bleaching, hydrogenation, fractionation, deodorizing, plasticizing, packaging.
5. **Unit V**
   Production and processing of animal fats
   - Butter and ghee
   - Margarine
   - Lard
   - Fish oil
   - Olive Balm and coconut oil
6. **Unit VI**
   Production and processing of vegetable oils
   - Soya bean oil
   - Mustard oil
   - Groundnut oil
   - Sunflower oil
7. **Unit V**
   Blending and nutritional enrichment of oils.

COURSE OUTCOME

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

- Gain basic knowledge about oils and fats.
- Learn about the nutritional importance of oils and fats.
- Gain the knowledge about functions of oils and fats.
- Learn about the processing of oils and fats.
- Gain knowledge about processing of animal fats.
- Gain knowledge about processing of vegetable oils.
- Gain knowledge about enrichment of oils.

RECOMMENDED BOOKS

1. Food Science: Norman. N. Potter CBS Publication, *CBS Publishers* and distributors Pvt. Ltd, New Delhi
2. Food Oils & Fats: Lawson Harry-CBS Publication, *CBS Publishers* and distributors Pvt. Ltd, New Delhi
3. Food Oils & Fats: Bailey Publication, Oxford & IBH *Publishing* Co., New Delhi
4. Bailey's Industrial Oil and Fat Products by Daniel Swern, Interscience *Publishers,* New York
5. The Chemical Analysis of Food and Food Products by Jacobs, Morris B *Jacobs Publisher*: New York,
6. A First Course in Food Analysis by A.K. Sathe, New Age Publications, New Delhi.
7. Standards for Fats & Oils by Lawson, AVI *Publishing* Company, Westport.

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	12
2	02	06
3	06	12
4	06	14
5	12	24
6	12	24
7	04	08
Total	**48**	**100**

PROGRAM : THREE YEAR DIPLOMA PROGRAM IN FOOD TECHNOLOGY	
Course Code :**FTPC-602**	Course Title**: Technology Of Oils And Fats-Lab**
Semester : **6TH**	Credits: **01**
Hours Per Week:**2 (L: 0, T:0 , P:2)**	

COURSE OBJECTIVE

This subject is aimed at imparting thorough knowledge and skill related to the extraction and processing techniques of oils & fats and their nutritional and qualitative effects on food

PRACTICALS

1. To determine the smoke point, flesh point and fire point of given sample.
2. To determine the acid value of given sample.
3. To determine the iodine value of given sample.
4. To determine the a saponification value of given sample.
5. Determination of rancidity of given sample.
6. To determine the melting point of given sample.
7. To determine the fat content of a given sample by apparatus.
8. Visit to oil processing industry.
9. Detection of adulteration in fats oils.

PROGRAM : THREE YEARS DIPLOMA PROGRAM IN FOOD TECHNOLOGY	
Course Code :**FTPC-603**	Course Title: **Food Plant Design And Layout**
Semester : **6TH**	Credits: **04**
Hours per week: **4 (L: 4, T: 0, P:0)**	

COURSE OBJECTIVES:

To give knowledge about materials of construction for food equipments/ accessories, design consideration and design of some food processing equipments. to impart knowledge about plant design consideration, feasibility study , plant location , food plant layout, process selection, facilities and aggregate planning , financial analysis, process flow analysis and decision analysis.

COURSE CONTENTS

1. **Material selection in design of food processing equipments.**
2. **Design of food handling and processing equipments**

   Design of equipments used in handling of foods, design of heat exchangers, design of pressure vessels, extruders and other food processing equipment.

3. **Design optimization**

   Optimization of designs for process efficiency, energy, cost

4. **Plant design concept and plant location:**

   Food plant design concepts and general design considerations, plant location- location factors and their interaction with plant location, location theory models, computer aided selection of location.

5. **Feasibility report and process flow chart:**

   Feasibility analysis and preparation feasibility report. factors affecting plant size and their interactions, estimation of breakeven and economic plant size. process design- process flow charts, computer aided development of flow charts. Equipment selection including economic analysis of equipment alternatives.

6. **Food plant layout:**

   Layout of food plants (fruit and vegetable industry, milk industry, meat industry, bakery industry, beverage industry)

7. **Unit VII**

   Plant design report; estimation of capital investment, analysis of plant costs and profit abilities, preparation of plant design report

COURSE OUTCOME

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

- Gain knowledge selection of material used for designing of food processing equipments
- Learn about the design of different food processing equipments.
- Gain the knowledge about optimization of designs
- Learn about the concept of plant design and plant location
- Comprehend and analyze the feasibility report and process flow charts.
- Learn about the design of different food industries
- Estimate the project cost

RECOMMENDED BOOKS:

1. Production engineering and industrial management by O.P. KHANA
2. Plant layout and design by Moore
3. Plant design for chemical engineering by Peterse and timmerhaus
4. Project engineering of process plant by Rase and Barrow

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	3	4
2	7	13
3	7	10
4	10	16
5	14	21
6	16	26
7	7	10
Total	**64**	**100**

PROGRAM : THREE YEAR DIPLOMA PROGRAM IN FOOD TECHNOLOGY	
Course Code :**FTPC-604**	Course Title :**Food Biotechnology**
Semester : **6TH**	Credits: **03**
Hours Per Week: **3 (L:3, T:0, P:0)**	

COURSE OBJECTIVE:

This subject is developed with an objective to impart knowledge and skills related to process technologies and equipment used for the production of various fermented food products to the students.

COURSE CONTENT

1. **Introduction to food biotechnology**
2. **Type of fermentation processes:**
   Different substrates for fermentation process; pure cultures and their maintenance procedures.
3. **Fermentor:**
   Basic configuration, different parts – agitator/impellers, sparger, baffles, process control, functions.
4. **Unit VI**
   Traditional application of food biotechnology- fermented foods: dairy products, oriental fermentations, alcoholic beverages and food ingredients: the role of biotechnology in fermented food products (dairy, meat and vegetable); starter culture development. Enzymes in dairy industry/ cheese making and whey processing, impact of enzyme technology
5. **Fermented Foods:-**
   Curd, yogurt, sauerkraut, butter milk, lassi, traditional fermented food products in JK.

COURSE OUTCOME

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

- Learn the concept of food biotechnology.
- Learn about the types of fermentation process of foods.
- Gain knowledge about the parts and functions of fermentor.
- Know about the application of food biotechnology in fermented foods
- Learn the preparation and production of different fermented foods.

INSTRUCTIONAL STRATEGY

This being one of the most important subject, teacher should lay emphasis on developing basic understanding of various concepts and principles and procedures involved herein. Suitable tutorial exercises may be designed by the teachers, which require students visit to various industries. Students may also be exposed to various national and international standards. Visits to the relevant industry for demonstrating various operations involved in the food beverage, is a must. Experts from the industry may be invited to deliver lectures on the latest technology. Knowledge about pollution control and devices for the same may be provided to the students. Wherever relevant, students may be made aware about safety aspects.

RECOMMENDED BOOKS:

1. Industrial Microbiology by Prescott and Don, CBS Publishers and distributors Pvt. Ltd, New Delhi
2. Industrial Microbilogy by Casida, Publishers, Inc., New York ... by Lester Earl Casida.
3. Biotechnology: Food Fermentation by VK Joshi and Ashok Pandey, AVI Publish co., Westport
4. Biotechnology – Food Processing Application by SS Marwaha, Asiatech Publishers Inc., New Delhi

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted(Hrs)	Marks Allotted(%)
1	8	12
2	10	22
3	10	22
4	10	22
5	10	22
TOTAL	**48**	**100**

PROGRAM : THREE YEAR DIPLOMA PROGRAM IN FOOD TECHNOLOGY	
Course code **:FTPC-605**	Course Title : **Food Biotechnology -Lab**
Semester : **6TH**	Credits: **01**
Hours Per Week: **2 (L:0,T:0,P:2)**	

COURSE OBJECTIVE:

This subject is developed with an objective to impart knowledge and skills related to process technologies and equipment used for the production of various fermented food products to the students

LIST OF PRACTICALS:

1. Demonstration and study of fermentor and its functioning.
2. Preparation of srikhand.
3. Preparation of lassi, dahi.
4. Preparation of buttermilk.
5. Preparation of traditional fermented products
6. Preparation of sauerkraut.
7. Preparation of kanji, cereal based fermented drinks.
8. Preparations of pure cultures.
9. Visit to beverage and distillation plant.

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN FOOD TECHNOLOGY	
Course Code:**FTPOC-606**	Course Title: **Entrepreneurship And Start Ups**
Semester**:6TH**	Credits:**02**
Hours Per Week**: 2(L: 2, T: 0, P: 0)**	

COURSE OBJECTIVE:

Entrepreneurship and start-ups is one of the courses from "Human Science" subject area. Entrepreneurship and start up development aim at developing conceptual understanding for setting-up one's own business venture/enterprise.

COURSE CONTENTS

1. Entrepreneurship

1.1. Introduction

Concept/Meaning and its need Competencies/qualities of an entrepreneur Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level.

1.2. Market Survey and Opportunity Identification (Business Planning) How to start small scale industry Procedures for registration of small-scale industry List of items reserved for exclusive manufacture in small-scale industry Assessment of demand and supply in potential areas of growth. Understanding business opportunity Considerations in product selection Data collection for setting up small ventures.

2. Preparation of project report:

Project Report Preparation, Preliminary Project Report, Techno-Economic Feasibility Report. Exercises on Preparation of Project Report in a group of 3-4 students.

3. Innovation and creativity of new food products, Design thinking process, Learn start up and customer validation.

COURSE OUTCOME

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

- Learn about planning and start ups of new business.
- Learn about the project report.
- Gain knowledge about new product development.

INSTRUCTIONAL STRATEGY

This subject will require a blend of different teaching and learning methods beginning with lecture method. Some of the topics may be taught using question answer, assignment, case studies or seminar. In addition, expert lectures may be arranged from within the institution or from management organizations. Conceptual understanding of Entrepreneurship, inputs by teachers and outside experts will expose the students so as to facilitate in starting one's own business venture/enterprise. The teacher will discuss success stories and case studies with students, which in turn, will develop managerial qualities in the students. There may be guest lectures by successful diploma holding entrepreneurs and field visits also. The students may also be provided relevant text material and handouts.

RECOMMENDED BOOKS:

1. Soft Skills for Interpersonal Communication by S.Balasubramaniam; Published by Orient BlackSwan, New Delhi.
2. Generic skill Development Manual, MSBTE, Mumbai.
3. Lifelong learning, Policy Brief.
4. Lifelong learning in Global Knowledge Economy, Challenge for Developing Countries – World Bank Publication.
5. Towards Knowledge Society, UNESCO Paris Publication.
6. Your Personal Pinnacle of Success by DD Sharma, Sultan Chand and Sons, New Delhi.
7. Human Learning, Ormrod.
8. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana).
9. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi 10. Handbook of Small Scale Industry by PM Bhandari.

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted(Hrs)	Marks Allotted(%)
1	15	48
2	10	31
3	7	21
TOTAL	**32**	**100**

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN FOOD TECHNOLOGY	
Course Code:**FTPC-607**	Course Title: **Major Project**
Semester:**6TH**	Credits:**08**
Hours Per week: **16 (L:0, T:0, P:16)**	

COURSE OBJECTIVE:

The objectives of the project work are: To develop understanding of various field activities in which students are going to play a role as food technologists after completing diploma programme and To Develop understanding of subject based knowledge given in the class room in the context of its application at work places .

For the fulfilment of above objectives, polytechnic(s) offering diploma course in food technology may establish close linkages with 8 – 10 food processing and preservation industries/organizations. The industries/organizations may be contacted by the teachers and students for project oriented and professional training of students during third year. The practical industrial training has to be well planned, structured and supervised by polytechnic teachers clearly specifying complete schedule of the students on day to day basis for whole of their training period.

Proforma may be prepared by polytechnics related to the concerned industries to access daily, weekly and monthly progress of the students and the students must be asked to fill these proformas regularly duly signed by them and countersigned by personnel from industry and concerned teacher attached to a particular student. Each teacher is supposed to supervise and guide 4 to 6 students.
Following schedule, as a sample, is proposed for the training.
Familiarization and Training about Various Food Processing Operations
Students should be familiarized with various materials, principles and operations involved in processing of different types of food used for different purposes Specific Task Students should be given specific task related to following: -

- Complete flow chart and plant layout for food-processing unit
- Preparation and preservation of food products, including raw material identification, testing and processing
- Hygiene and sanitation for a food processing and preservation unit –
- Fault diagnosis and rectification
- Problem-Solving Work Site

After undergoing above two phases of vigorous practical project orientation professional training, students may be given practical problems, which are of interest to industry where he/she is taking practical training. The problem should be identified and guided by the personnel from industry in collaboration with teacher and the solutions suggested by the students may be tried

Note: - Students are supposed to prepare detailed notes of each of above phases of training and write complete report of the whole of practical industrial training which shall be used for the learning and evaluation purposes

CURRICULUM
FOR
SIXTH SEMESTER
OF
THREE-YEAR DIPLOMA COURSE
IN
GARMENT TECHNOLOGY

STUDY SCHEME SIXTH SEMESTER

S.No	Code No.	Subjects	Study Scheme Hrs/Week			Credits (C)		Total Credits
			L	T	P	L	p	L+P+T
6.1	GTPC601	Advanced Pattern Making - II	-	1	4	-	2	3
6.2	GTPC602	Garment Construction – VI	-	1	6	-	3	4
6.3	*	Core Elective-III	3	-	-	3	-	3
6.4	**	Open Elective-II	4	-	-	4	-	4
6.5	GTPC603	Major Project Work			12	-	6	6
		TOTAL	**7**	**2**	**22**	**7**	**11**	**20**

***Core Elective-III**		
S. No.	**Course Code**	**Subject**
1	GTPE10	Apparel Merchandizing
2	GTPE11	Fashion Management & Merchandizing
3	GTPE12	Clothing culture& communication
4	GTPE13	Apparel Retailing
****Open Elective-II**		
S. No.	**Course Code**	**Subject**
1	GTOE10	Basics of Management
2	GTOE11	Disaster Management
3	GTOE12	Art& Literature
4	GTOE13	Personality Development

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN GARMENT TECHNOLOGY	
Course Code :**GTPC601**	**Course Title : ADVANCED PATTERN MAKING - II**
Semester: **6TH**	Credits :**3**
Periods per week: **5(L: 0 T: 1 P: 4)**	

COURSE OBJECTIVE:

The students are supposed to perform the jobs of pattern maker when engaged in garment manufacturing.

COURSE CONTENT:

1. **Unit 1**
   Long coat –Special features (convertible collar, pockets, Princess Lines, tucks etc)
2. **Unit2**
   Night Gown –Ladies special features (shawl collar, bell sleeves, Patch pockets)
3. **Unit 3 Bridal wear**:
   Top variation and skirt variation
4. **Unit 4**
   Gents Khan Suit
5. **Unit 5**
   Gents Kurta Pyjama

RECOMMENDED BOOKS

1. Pattern Cutting for Women's Outwear by Cooklin, Gerry
2. Islamic Patterns: An Analytical and Cosmological Approach by Critchlow
3. Repeat Patterns: A Manual for Designers, Artists and Architects by Phillips and Bunce

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	15	20
2	15	20
3	20	20
4	10	20
5	20	20
TOTAL	**80**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN GARMENT TECHNOLOGY	
Course Code :**GTPC602**	Course Title: **GARMENT CONSTRUCTION - VI**
Semester: **6TH**	Credits :**4**
Periods per week: **7(L: 0 T: 1 P: 6)**	

COURSE OBJECTIVE:

The diploma holders in garment technology are supposed to fabricate the garments so it is very essential that they should be able to fabricate various garments as per the layouts and specifications. Hence this subject has been included in the curriculum in order to develop such competencies

COURSE CONTENT:

1. **Unit 1**

   Long coat –Special features (convertible collar, pockets, Princess lines, tucks etc)

2. **Unit2**

   Night Gown –Ladies special features (shawl collar, bell sleeves, Patch pockets)

3. **Unit 3 Bridal wear**:

   Top variation and skirt variation

4. **Unit 4**

   Gents Khan Suit

5. **Unit 5**

   Gents Kurta Pyjama

RECOMMENDED BOOKS:

1. Pattern Making for Fashion design by Armstrong
2. Clothing Construction by Doongaji; Raj Parkashan, Delhi
3. System of Cutting by Zarapkar, Navneet Publications (India) Ltd.
4. Clothing Construction by Evelyn A Mansfield, Hougutan Miffin Co., Boston
5. Creative Sewing by Allynie Bane; McGraw Hill Book Co., Inc., New York
6. How You Look and Dress by Byrta Carson; McGraw Hill Book Co., Inc., New York
7. Complete Guide to Sewing by Reader's Digest

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	20	20
2	20	20
3	18	20
4	20	20
5	18	20
TOTAL	**96**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN GARMENT TECHNOLOGY	
Course Code :**GTPE10**	Course Title **: APPAREL MERCHANDISING (Core Elective-III)**
Semester: **6TH**	Credits :**3**
Periods per week: **3(L: 3 T: 0 P: 0)**	

COURSE OBJECTIVE:

Some diploma holders of garment technology may find employment in export houses and apparel merchandizing agencies. After studying this subject, the students will understand marketing in domestic and international markets and their quota systems. It focuses attention on apparel industry giving thorough knowledge of merchandising.

COURSE CONTENT:

1. **Unit 1 Apparel Industry Profile**
   - 1.1 Current Indian export and India's position in the world apparel/textile market
   - 1.2 Organizational structure of export house, buying houses and domestic companies and export procedures
   - 1.3 Buyer classification and buying network in exports
2. **Unit 2 Merchandising**
   - 2.1 Merchandising concepts
   - 2.2 Role and responsibilities of apparel merchandiser
   - 2.3 Sample Approval
   - 2.4 Need of merchandising for Garment Industry
   - 2.5 Time and action plan – Buying offices
3. **Unit 3 Fashion merchandizing**
   - 3.1 Study of fashion principles, theories and fashion cycle and terminology
   - 3.2 Introduction to fashion marketing and merchandizing principles – retail, whole sale, boutique, designer - wear, couture, pret-o-porter (ready to wear), haute couture (hi- fashion)
   - 3.3 Consumer Behaviour
4. **Unit 4 Marketing:**
   - 4.1 Definition, Concepts of marketing
   - 4.2 4 P's of marketing (marketing mix)
   - 4.3 Target market
   - 4.4 Product cycle
   - 4.5 Marketing strategy
5. **Unit 5 Sourcing**
   - 5.1 Assignment based on the market survey within the local market for various fabrics, trims and accessories
   - 5.2 Factors in deciding fabrics, price, quality, lead time, factory suitability, fly accessibility.
   - 5.3 Trim sourcing – buttons, beads, laces, labels, tags, packaging

COURSE OUTCOME:

By the end of this course the student will be able to:

- To understand need and role of merchandising
- To understand the export procedure and export position of the country in the apparel/textile market
- To understand the planning and promotion of sales by presenting a product to right market
- To understand the concept of marketing and changes that took place from time's again
- To understand the suitability of time and requirements for a particular design

RECOMMENDED BOOKS:

1. Fashion from Concept to Consumer, McGraw Hill Book Co. Inc. New York
2. Fashion and Retail Merchandising
3. Inside the Fashion Business by Joonow, Jea
4. Fashion Merchandising by Stone, Ela, McGraw Hill Book Co. Inc., New York
5. Ready to Wear Apparel Analysis by Petty and Brown, New Age Publisher, Delhi

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	12	20
2	7	20
3	7	20
4	12	20
5	10	20
TOTAL	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN GARMENT TECHNOLOGY	
Course Code :**GTOE10**	**Course Title : BASICS OF MANAGEMENT (Open Elective-II)**
Semester: **6TH**	Credits :**4**
Periods per week: **4(L: 4 T: 0 P: 0)**	

COURSE OBJECTIVE:

The diploma holders are generally expected to take up middle level managerial positions, their exposure to basic management principles is very essential. Topics like Structure of Organization, Leadership, Motivation, Ethics and Values, Customer Relationship Management (CRM), Legal Aspects of Business, Total Quality Management (TQM), Intellectual Property Rights (IPR) etc. have been included in the subject to provide elementary knowledge about these management areas.

COURSE CONTENT

1. **Principles of Management**
   - 1.1 Introduction, definition and importance of management.
   - 1.2 Functions of Management
   - 1.3 Planning, Organizing, Staffing, Coordinating, Directing, Motivating and controlling
   - 1.4 Concept and Structure of an organization
   - 1.5 Types of industrial organization
     - 1.5.1 Line organization
     - 1.5.2 Functional organization
     - 1.5.3 Line and Functional organization
     - 1.5.4 Hierarchical Management Structure
     - 1.5.5 Top, middle and lower level management
     - 1.5.6 Departmentalization Introduction and its advantages
2. **Work Culture**
   - 2.1 Introduction and importance of Healthy Work Culture in organization
   - 2.2 Components of Culture
   - 2.3 Importance of attitude, values and behaviour
     Behavioural Science – Individual and group behaviour
   - 2.4 Professional ethics – Concept and need of Professional Ethics
3. **Leadership and Motivation**
   - 3.1 Leadership
     - 3.1.1 Definition and Need of Leadership
     - 3.1.2 Qualities of a good leader
     - 3.1.3 Manager vs. leader
   - 3.2 Motivation
     - 3.2.1 Definition and characteristics of motivation
     - 3.2.2 Factors affecting motivation
     - 3.2.3 Maslow's Need Hierarchy Theory of Motivation
   - 3.3 Job Satisfaction

4. **Legal Aspects of Business: Introduction and need**
    - 4.1 Labour Welfare Schemes
        - 4.1.1 Wage payment: Definition and types
        - 4.1.2 Incentives: Definition need and types
    - 4.2 Factory Act 1948
    - 4.3 Minimum Wages Act 1948

5. **HRD**
    - 5.1 Introduction and objectives of HRD
    - 5.2 Introduction, functions and objectives of material management
    - 5.3 Introduction, importance and functions of sales and marketing
    - 5.4 Elementary knowledge of Income tax, sales tax, Excise duty, custom duty and provident fund

6. **Miscellaneous topics**
    - 6.1 Customer Relationship Management (CRM)
        - 6.1.1 Definition and Need
        - 6.1.2 Types of CRM
        - 6.1.3 Customer satisfaction
    - 6.2 Total Quality Management (TQM)
        - 6.2.1 Inspection and Quality Control
        - 6.2.2 Concept of Quality Assurance
        - 6.2.3 TQM
    - 6.3 Intellectual Property Rights (IPR)
        - 6.3.1 Introduction, definition and its importance
        - 6.3.2 Infringements related to patents, copyright, trade mark

COURSE OUTCOME:

By the end of this course the students will be able to:

- Understand the foundational concepts of management, including its definition and significance.
- Comprehend the functions of management, such as planning, organizing, staffing, directing, and controlling.
- Analyze the different types of organizational structures and their implications.
- Recognize the elements of a healthy work culture and its impact on organizational success.
- Differentiate between leadership and management, and identify the qualities of effective leaders.
- Examine motivational theories and factors influencing employee motivation and job satisfaction.

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	10	15
2	07	10
3	10	15
4	07	10
5	15	25
6	15	25
TOTAL	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN GARMENT TECHNOLOGY	
Course Code :**GTPC603**	Course Title **: MAJOR PROJECT WORK**
Semester: **6TH**	Credits :**6**
Periods per week: **12 (L:0 T:0 P:12)**	

COURSE OBJECTIVE:

Project work aims at developing professional skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of a practical problem undertaken as a project work. The students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be explained the objectives of the project work and then asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective departments may have a brainstorming session to identify suitable project assignments. The students should identify themselves or be given project assignment at least two to three months in advance. The identified project work must lead students to exposure and interaction with industry/field organizations in the world of work.

COURSE CONTENT:

Collecting the information regarding the selected topic. It can be any garment like shirt, trouser, skirt etc. (Developing a range of 5 garments in design)

- Sourcing of raw material
- Pattern development and operation breakdown
- Construction of one garment
- Cost sheet development
- Presentation

Note: A viva voce examination shall be conducted at the end of the project for assessing the work of the student. The examination committee for this purpose shall consist of a professional and teacher who have guided the project.

CURRICULUM
FOR
SIXTH SEMESTER
OF
THREE-YEAR DIPLOMA COURSE
IN
INSTRUMENTATION
AND
CONTROL ENGINEERING

SUBJECT STUDY SCHEME
(6th SEMESTER: INSTRUMENTATION AND CONTROL ENGINEERING)

Course code	Subjects	Time in Hours				Credits		
		Theory	Tutorial	Practical	Total	Theory	Practical	Total
ICPC601	Industrial Automation	3	--	--	3	3	--	3
ICPC602	Industrial Automation Lab	--	--	4	4	--	2	2
ICPC603	Virtual Instrumentation	2	--	--	2	2	--	2
ICPC604	Virtual Instrumentation Lab	--	**--**	4	4	--	2	2
	Elective-II	4	--	--	4	4	--	4
	Consumer Electronics (ICPE605)							
	Electric Vehicles (ICPE606)							
	Instrumentation For Agriculture And Food Processing (ICPE607)							
ICPC606	Entrepreneurship and start-up	3	--	--	3	3	--	3
MP607	Major project	--	--	12	12	--	6	6
	Total	**11**	**--**	**22**	**33**	**11**	**11**	**22**

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN INSTRUMENTATION AND CONTROL ENGINEERING	
COURSE CODE: **ICPC601**	COURSE TITLE: **INDUSTRIAL AUTOMATION**
SEMESTER: **6th**	CREDITS: **3**
PERIODS PER WEEK**: 3 (L: 3, T: 0, P:0)**	

COURSE OBJECTIVES:

The Subject enable the Students to study a broad range of Techniques and Technologies (PLC,DCS,SCADA) implemented in Industrial Process Control System .This is Usually deployed in addition to basic Process Controls and typically added subsequently to address particular Performance or economic improvement opportunities in the Process.
A diploma holder when employed in automated industrial process controls or in automated power station will be required to know the basics of Programmable Logic Controllers, their working and their programming. In industry, many manufacturing processes demand a sequence of operation, which are to be performed repetitively. Early automation systems were mechanical in design, timing and sequencing being effected by gears and cams. Slowly these design concepts were replaced by electrical drives which were controlled by relays and now by programmable logic controllers (PLCs). PLCs are widely used in all industries for efficient control operations. A diploma holder in industry is called upon to design, modify and troubleshoot such control circuits. Looking at the industrial applications of PLCs in the modern industry, this subject finds its usefulness in the present curriculum.

COURSE CONTENTS

1. ARCHITECTURE AND OPERATION OF PLC

1.1 Automation – Needs and Benefits - PLC – Definition – Functional Block Diagram of PLC

1.2 CPU – Power Supply – Memory (ROM, RAM, EPROM, EEPROM) – I/O Modules – Input Field Devices – Output Field Devices

1.3 Memory Organization: System Memory – Data Memory - Comparison between Hardwired Control and PLC Control - Advantages and Disadvantages of PLC over hard wired control

1.4 PLC Specifications – Criteria for Selecting PLC - Leading Manufactures of PLC – Application Areas of PLC – PLC Working Principle

1.5 Self Test - Input Scan – Program Scan, Output Scan, communications Ports available in PLC

2. PLC PROGRAMMING

2.1 Types of PLC Programming Languages – Ladder Diagram (LD) – Functional Block Diagram (FBD) – Structured Text (ST) – Instruction List (IL) – Sequential Function Chart (SFC).

2.2 Program control instructions, Logical Instructions: AND, OR, NAND, NOR, XOR, NOT, XNOR.

2.3 Timer Instructions: On Delay (TON), Off Delay (TOF), Retentive (RTO) and Non-retentive (RES) – Counter Instructions: Count-Up (CTU), Count-Down (CTD), Reset (RST), Data Manipulation Instructions, Data Compare Instructions

3. SCADA AND HMI

3.1 Introduction to SCADA – Typical SCADA architecture / block diagram – Benefits of SCADA

3.2 HMI Features: Benefit, installation procedure, communication and control functions of HMI with PLC

3.3 Applications of SCADA – Traffic light control – Water distribution – Pipeline Control, etc

4. Distributed Control System (DCS)

4.1 DCS elements and applications

4.2 Various architectures

4.3 DCS, PLC and SCADA comparison

5. Variable Frequency drives (VFD)

5.1 Basic concepts, parts of a VFD,

5.2 Block diagram of VFD, types of VFD, How speed is controlled in VFD

CONTENT OUTCOMES:

After completion of the subject, the learner should be able to:

- To understand the detailed Hardware of PLC and it sparts
- To understand the working of PLC and scan cycle
- To understand the program and data memory organization
- To know the Different timers of PLC and programming them
- To know the different counters of PLC and its parameters
- To understand the Ladder logic programming of PLC
- To develop simple ladder programs
- To study the Advanced instructions of PLC
- To understand the communication module of PLC
- To understand different editors and features of SCADA
- To understand the HMI.
- To understand DCS.
- To understand VFD.

RECOMMEMDED BOOKS:

1. Introduction to Programmable Logic Controllers by G. Dunning, Thomson/ Delmar Learning, New Delhi(3rdedition)
2. Programmable Logic Controller by V.R.Jadhav, Khanna Publishers,New Delhi,2017.
3. Programmable Logic Controllers by F.D.Petruzella, McGraw Hill India, NewDelhi,2003.
4. Supervisory Control and Data Acquisition by S.A.Boyar, ISA Publications, USA.
5. Programmable Logic Controllers and Industrial Automation–AnIntroduction by Madhuchandra Mitra, Samarjit Sengupta,PenramInternational.
6. Programmable Logic Controllers, JackHackworth, Federic Hackworth, PHILearning, New Delhi

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)

1.	10	25
2.	12	25
3.	10	20
4.	08	15
5.	08	15
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN INSTRUMENTATION AND CONTROL ENGINEERING	
COURSE CODE: ICPC602	**COURSE TITLE: INDUSTRIAL AUTOMATION LAB**
SEMESTER: 6th	**CREDITS: 2**
PERIODS PER WEEK: 4 (L: 0 ,T: 0, P:4)	

COURSE OBJECTIVE:

This subject is a lab course to be supplemented by theory subject and aims to develop proficiency and understanding of practical outcomes of the subject taught in theory.

LIST OF PRACTICALS

1. Components/sub-components of a PLC, Learning functions of different modules of a PLC system
2. Practical steps in programming a PLC (a) using a Hand held programmer (b) using Computer interface
3. Basic logic operations, AND, OR, NOT functions
4. To develop ladder logic program for basic functions and implementing in a PLC
5. To develop ladder logic using Timers in a PLC
6. To develop and implement ladder logic for the timer application
7. To develop and implement ladder logic to control a motor
8. To develop and implement ladder logic using sequencer in a PLC
9. To develop and implement ladder logic to control a conveyor belt
10. To develop and implement ladder logic to control a lift
11. To develop and implement ladder logic to control a water level in a Tank
12. To control a motor using VFD
13. Study of basic SCADA system

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN INSTRUMENTATION AND CONTROL ENGINEERING	
COURSE CODE:**ICPC603**	COURSE TITLE**: VIRTUAL INSTRUMENTATION**
SEMESTER**: 6th**	CREDITS**: 3**
PERIODS PER WEEK: **3 (L: 03 ,T: 00, P:00)**	

COURSE OBJECTIVE:

Virtual instrumentation is one of the latest emerging techniques in the field of instrumentation. Because of its numerous advantages over traditional instruments, VI is being used in almost every field. Knowledge of this subject will enable diploma students to make them aware of hardware, software and interfacing devices and its importance in the field of instrumentation.

COURSE CONTENTS

1. **Introduction to virtual instrumentation**
   - 1.1 Historical perspective, advantages of virtual instruments over traditional instruments
   - 1.2 Block diagram and architecture of virtual instruments.
2. **Learning Lab view**
   - 2.1 Introduction, Front panel, Block diagram, Menus, Palettes, VI &Sub VI
   - 2.2 Editing and Debugging VI, Structures, Arrays, clusters, charts& Graphs
   - 2.3 Data acquisition, Instrument control, signal processing examples
3. **Data acquisition basics**
   - 3.1 ADC, D to A, DIO, connectors and timers, PC hardware structure
   - 3.2 Introduction to various Data Acquisition Cards.
4. **Common instrumentation interfaces**
   - 4.1 RS232C/RS485, GPIB, USB,
   - 4.2 Instrumentation buses (introduction such as inter bus).
5. **Applications of VI in various fields**
   - 5.1 High Voltage, Defense, Industrial, Medical, Automotive, Nuclear Energy

RECOMMENDED BOOKS:

1. LABVIEW Graphical Programming by Gary Johnson; Tata McGraw Hill Publishing Co. New Delhi
2. Basic Concepts of LABVIEW 4by SOKO loft; PHI
3. PC Interfacing for data acquisition and Process Control by S Gupta, JP Gupta; Instrument Society of America.
4. Learning with LabView 7 by Robert H. Bishop, Pearson Education

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT. NO.	TIME ALLOTTED (HRS)	MARKS ALLOCATION (%)
1.	4	15
2.	14	40
3.	6	15
4.	4	10
5.	4	10
Total	**32**	**100**

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN INSTRUMENTATION AND CONTROL ENGINEERING	
COURSE CODE: **ICPC604**	COURSE TITLE: **VIRTUAL INSTRUMENTATION LAB**
SEMESTER: **6th**	CREDITS: **02**
PERIODS PER WEEK: **4 (L: 0 ,T: 0, P:4)**	

COURSE OBJECTIVE:

This subject is a lab course to be supplemented by theory subject and aims to develop proficiency and understanding of practical outcomes of the subject taught in theory.

LIST OF PRACTICALS

1. G-programming using LABview/ flexpro.
2. Create a simple VI consisting of a dial and a thermometer.
3. Developing VI for converting temperature in degree Centigrade to degree Fahrenheit.
4. Creation of sub-VI using above VI as sub VI to convert the temperature in degree Kelvin.
5. Develop a VI to find average of n numbers.
6. Developing a VI to find the factorial of a number using loop
7. Simulation of Process control system using computer simulation.
8. Acquisition of signals from transducers such as temperature, acceleration or function generator using USB interface and transfer the same to PC.

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN INSTRUMENTATION AND CONTROL ENGINEERING	
COURSE CODE: **ICPE601**	COURSE TITLE: **ELECTIVE-II (CONSUMER ELECTRONICS)**
SEMESTER: **6th**	CREDITS: **4**
PERIODS PER WEEK: **4 (L: 04 ,T: 00, P:00)**	

COURSEOBJECTIVES:

To train and develop professional skills for interaction, installation, problem diagnosis and rectification of minor and major malfunctioning of the air conditioner, refrigerator, washing machine and other home appliance at customer's site or at factory/workshop

COURSE CONTENTS

1. **Refrigerator and Air Conditioner**
   - 1.1 Refrigeration cycle, types of compressors
   - 1.2 Functioning of various electromechanical parts of the refrigerator, control circuits and sensors of refrigerators
   - 1.3 Air Conditioner: types, features and functions of various electromechanical parts
   - 1.4 Frequently occurring faults, studying various controls used in Air-conditioning system
2. **Electrical Appliances**
   - 2.1 Working principle of washing machines
   - 2.2 Microwave oven: Functioning and Block diagram of microwave oven
   - 2.3 Vacuum cleaner: Block diagram and working principle, parts of Vacuum cleaner
   - 2.4 Principles of working, parts and servicing of Electric fan, Electric Iron box,
   - 2.5 Water heater; Induction heater, Microwave oven, Electric bulbs, CFL, LED lights
   - 2.6 Energy efficiency in electrical appliances, IS codes & IE codes

COURSEOUTCOMES:

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

- Develop the interactive and professional skills
- Checking appliance functioning
- Understand the working principles of different household domestic appliances

RECOMMENDED BOOKS:

1. Handbook of Repair & Maintenance of domestic electronics appliances; BPB Publications
2. Consumer Electronics, S.P. Bali, Pearson
3. Domestic Appliances Servicing, K.P. Anwer, Scholar Institute Publications.
4. Bali S.P. Consumer Electronics, Pearson Education India,2010, latest edition

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED(HRS)	MARKS ALLOCATION (%)
1.	26	40
2.	38	60
Total	**64**	**100**

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN INSTRUMENTATION AND CONTROL ENGINEERING	
COURSE CODE: **ICPE602**	COURSE TITLE: **ELECTIVE-II (ELECTRIC VEHICLES)**
SEMESTER: **6th**	CREDITS: **4**
PERIODS PER WEEK: **4 (L: 4, T: 0, P:0)**	

COURSEOBJECTIVE:

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

COURSE CONTENTS

1. Introduction to Hybrid Electric Vehicles

1.1 Evolution of Electric vehicles
1.2 AdvancedElectricdrivevehicletechnologyVehicles-Electricvehicles(EV), Hybrid Electric drive (HEV), Plugin Electric vehicle (PIEV)
1.3 Components used Hybrid Electric Vehicle
1.4 Economic and environmental impacts of Electric hybrid vehicle
1.5 Parameters affecting Environmental and economic analysis
1.6 Comparative study of vehicles for economic, environmental aspects

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
2.3 Drive train configuration, Automobile power train, classification of vehicle power plant
2.4 Performance characteristics of IC engine, electric motor, need of gearbox
2.5 Classification of motors used in Electric vehicles
2.6 Basic architecture of hybrid drive trains, types of HEVs
2.7 Energy saving potential of hybrid drive trains
2.8 HEV Configurations-Series, parallel, Series-parallel, complex.

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 Principle of step down operation Boost and Buck-Boost converters
3.4 Principle of Step-Up operation Two quadrant converters; multi quadrant converters

4. DC-AC Inverter & Motors for EV and HEVs

4.1 DC-AC Converters
4.2 Principle of operation of half bridge DC-AC inverter (R load, R-L load)
4.3 Single phase Bridge DC-AC inverter with R load, R-L load
4.4 Electric Machines used in EVs and HEVs, principle of operation, working & control
4.5 Permanent magnet motors, their drives, switched reluctance motor
4.6 Characteristics and applications of above motors

5. Batteries

5.1 Overview of batteries
5.2 Battery Parameters, types of batteries

5.3 Battery Charging, alternative novel energy sources-solar photo voltaic cells, fuel cells, super capacitors, flywheels
5.4 Control system for EVs and HEVs, overview, Electronic control unit ECU
5.5 Schematics of hybrid drive train, control architecture
5.6 Regenerative braking in EVs

COURSEOUTCOMES:

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

- Interpret the salient features of Hybrid electric vehicles.
- Interpret the Dynamics of hybrid and Electric vehicles
- Maintain the DC-DC converters in EV applications.
- Maintain the DC-AC converters in EV applications
- Select the batteries for EV applications.

RECOMMENDED BOOKS:

1. Electric & Hybrid Vehicles A. K. Babu, Khanna Publishing House, NewDelhi (Ed.2018)
2. Electric and Hybrid Vehicles: Power Sources, Models, Sustainability, Infrastructure And The Market, Gian franco, Pistoia Consultant, Rome, Italy,
3. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, Ehsani, M. CRC Press
4. Electric and Hybrid Electric Vehicles Husain, I., CRC Press
5. Modern Electric Vehicle Technology, Chan C.C. and K.T. Chau, Oxford Science Publication,
6. Automotive Transmissions: Fundamentals, Selection, Design and Application, Lechner G. and H. Naunheimer, Springer
7. Power Electronics: Circuits, Devices and Applications Rashid, M. H.,3rd edition, Pearson,
8. Power Electronics: Devices, Circuits and Industria l Applications, Moorthi, V. R. Oxford University Press
9. Electric motor drives: modelling, analysis, and control, Krishnan, R. PrenticeHall
10. Analysis of electric machinery. Krause, O. P. ; C. Wasynczuk, S. D. Sudhoff,, IEEE Press

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED(HRS)	MARKS ALLOCATION (%)
1.	14	20
2.	16	25
3.	12	20
4.	12	20

5.	10	15
Total	**64**	**100**

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN INSTRUMENTATION AND CONTROL ENGINEERING	
COURSE CODE: **ICPE603**	COURSE TITLE: **ELECTIVE-II (INSTRUMENTATION FOR AGRICULTURE AND FOOD PROCESSING)**
SEMESTER: **6th**	CREDITS: **4**
PERIODS PER WEEK: **4 (L: 4, T: 0, P:0)**	

COURSE OBJECTIVES:

Agricultural industries are mostly dependent on nature behavior. To avoid crop failure, increasing crop quantity and quality, protecting crop, etc is a big challenge for farmers as well as for agro industries. There for it will be very appropriate to provide knowledge of a automation and sensing technology associated with agriculture and food processing plants/ systems to instrumentation and control engineers.

COURSE CONTENTS

1. **Introduction**
   - 1.1 Necessity of instrumentation & control for agriculture and food processing requirement
   - 1.2 Remote sensing, biosensors in agriculture, standard for food quality
2. **Soil Analysis**
   - 2.1 Soil science and sensors: Engineering properties of soil pH, conductivity, resistivity, temperature, soil moisture and salinity, ion concentration measurement,
   - 2.2 method of soil analysis, Instrumentation for environmental conditioning of seed Germination and growth
3. **Agro based Industrial Plants**
   - 3.1 Flow diagram of sugar plant & instrumentation set up for it
   - 3.2 Flow diagram of dairy industry & instrumentation set up for it,
   - 3.3 Juice extraction control process & instrumentation set up for it.
   - 3.4 Pesticides manufacturing process and control
4. **SCADA Automation**
   - 4.1 Application of SCADA for DAM parameters & control
   - 4.2 Irrigation canal management up- stream & down - stream control systems
   - 4.3 Water distribution and management control, Auto drip irrigation system
5. **Equipments**
   - 5.1 Automation in earth moving equipments & farm equipments
   - 5.2 Implementation of hydraulic, pneumatic & electronics control circuits in harvesters cotton pickers, tractor etc.

COURSE OUTCOMES:

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

- Characterize problems and possible technological solution of agro industries.
- Familiarize with current literature, research in agricultural instrumentation.
- Analyze and design of automation system by evaluating agricultural parameter measurement constraint.

RECOMMENDED BOOKS:

1. Industrial Instrumentation by D. Patranabis, Tata Mcgraw Hill pub
2. Process control and instrumentation technology by C.D. Johnson, 7 th edition, Pearson education
3. Process Instrumentation and control handbook by Considine D. M., McGraw Hill pub.
4. Mineral Processing Technology by Wills B.A., Pergamon Press, 4th Ed.
5. G.S. Sawhney —Non-Conventional Energy Resources, PHI Learning Private Limited, 1st ed., 2012

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOCATION (%)
1.	10	15
2.	14	20

3.	18	30
4.	12	20
5	10	15
Total	**64**	**100**

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN INSTRUMENTATION AND CONTROL ENGINEERING	
COURSE CODE:ICPC606	COURSE TITLE: **ENTREPRENEURSHIP AND STARTUP**
SEMESTER: **6th**	CREDITS: **3**
PERIODS PER WEEK: **3 (L: 03 ,T: 00, P:00)**	

COURSE OBJECTIVES:

Students advance their skills in customer development, customer validation, competitive analysis, and iteration while utilizing design thinking and process tools to evaluate in real-world problems and projects.

COURSE CONTENTS

1. Introduction

1.1 Definitions, Traits of an entrepreneur, Entrepreneurship, Motivation.
1.2 Types of Business Structures, Similarities/differences between entrepreneurs and managers.

2. Business Ideas and their implementation:

2.1 Discovering ideas and visualizing the business.
2.2 Activity map.
2.3 Business Plan.

3. Idea to Start-up:

3.1 Market Analysis–Identifying the target market.
3.2 Competition evaluation and Strategy Development.
3.3 Marketing and accounting.
3.4 Risk analysis.

4. Management:

4.1 Company's Organization Structure.
4.2 Recruitment and management of talent.
4.3 Financial organization and management.

5. Financing and Protection of Ideas:

5.1 Financing methods available for start-ups in India.
5.2 Communication of Ideas to potential investors–Investor Pitch.
5.3 Patenting and Licenses.
5.4 Exit strategies for entrepreneurs, bankruptcy, and succession

COURSEOUTCOMES:

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

- Have the ability to discern distinct entrepreneurial traits.
- Know the parameters to assess opportunities and constraints for new business ideas
- Understand the systematic process to select and screen a business idea
- Design strategies for successful implementation of ideas
- Knowledge of patent

RECOMMENDED BOOKS:

1. Entrepreneurship Development and Small Business Enterprises by CHARANTIMATH
2. Exploring Entrepreneurship By Richard Blundel, Nigel Lockett, Catherine Wang
3. Entrepreneurship Management: Practices and Policies by Babar Khan
4. Entrepreneurship, Innovations and Start-ups in India by Savita Joshi

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOCATION (%)
1.	8	15
2.	8	15
3.	8	15
4.	12	25
5.	12	30
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA PROGRAM IN INSTRUMENTATION AND CONTROL ENGINEERING	
COURSE CODE: **MP607**	COURSE TITLE: **MAJOR PROJECT**
SEMESTER: **6th**	CREDITS: **6**
PERIODS PER WEEK: **12 (L: 00 ,T: 00, P:12)**	

COURSEOBJECTIVE:

Project Work aims at developing innovative skills in the students where by they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place students for project oriented practical training in actual work situation for the stipulated period.

GENERALGUIDELINES

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him / her as a major project work. It is also essential that the faculty of the respective department may have a brain storming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

This practical training cum project work should not be considered as merely conventional industrial training in which students are sent at work places with either minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial / field organizations. Each teacher is expected to supervise and guide 5-6 students.

Some of the project activities are given below:

- Projects related to designing small electronic equipment / instruments.
- Projects related to increasing productivity in electronic manufacturing areas.
- Projects related to quality assurance.
- Projects connected with repair and maintenance of plant and equipment.
- Projects related to design of PCBs.
- Projects related to suggesting substitutes of electronics components being used.
- Projects related to design of small oscillators and amplifier circuits.
- Projects related to design, fabrication, testing and application of simple digital circuits and components.

- Projects related to microprocessor / microcontroller based circuits / instruments. Some of the projects based on above are as are listed below for the benefit of students:
    1. Microprocessor / Microcontroller based rolling display / bell and calendar
    2. Microprocessor based stepper motor control.
    3. Speed control of DC Machines by Microprocessor / Microcontrollers
    4. Temperature monitoring using Microprocessor / Microcontroller based systems.
    5. Microprocessor / Microcontroller based liquid level indicator and control
    6. Fabrication and assembling of digital clock.
    7. Fabrication of Online /OFFline UPS of different ratings and inverters
    8. Design, fabrication and testing of different types of experimental boards
    9. Repair of oscilloscope, function generator
    10. Microprocessor / Microcontroller based solar tracking system
    11. GSM based car or home security system
    12. Bank token display using microcontroller
    13. Microprocessor / Microcontroller Based A/D converter
    14. Microprocessor / Microcontroller Based D/A converter
    15. Simulation of half wave and full wave rectifiers using Simulation Software
    16. Simulation of class A, Class B, Class AB and Class C amplifiers
    17. Setting up home security system using biometrics and video recording
    18. Making an overhead tank water level controller using a pump and control system
    19. PLC based water level controller / sequential motor starter / bottling plant / traffic light control.

Some Suggested Projects for I&C Engg

Motion Based Automatic Door Opener
Ultrasonic Distance Measurement
Liquid Level Controller System
Liquid Flow Measurement & Control
Boiler Pressure Controller System
PLC based Temperature / Level / Pressure / Flow Control System
DC Motor Speed Control
Home Automation
Robotic Arm Movement Control
Room Temperature Controller
Fire and Hazardous Gas Detection Alarming System
Automatic Light Intensity Controller

COURSEOUTCOMES:

After undergoing the project work, the students will be able to:

- Apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project.
- Develop understanding regarding the size and scale of operations and nature of field-

work in which students are going to play their role after completing the courses of study.

- Develop understanding of subject based knowledge given in the classroom in the context of its application at workplaces.
- Develop firsthand experience and confidence amongst the students to enable them to use and apply polytechnic / institute based knowledge and skills to solve practical problems related to the world of work.
- Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc. Assemble / fabricate and test an electronics gadget

CURRICULUM
FOR
SIXTH SEMESTER
OF
THREE-YEAR DIPLOMA COURSE
IN
LEATHER TECHNOLOGY

STUDY SCHEME FOR 6TH SEMESTER LEATHER TECHNOLOGY

Code	Subjects	Study Scheme Periods Per Week			Total Hours L+P+T	Credits			Total Credits L+P+T
		L	T	P		L	T	P	
LTMP 601	Major Project	0	0	24	24	0	O	12	12
LTCE 601 LTCE 602 LTCE 603	Core Elective: • Tannery Bi-Products Utilization • Polymer Science and Technology • Economics of Leather Industry	4	0	0	4	4	0	0	4
LTOE 601 LTOE 602 LTOE 603	Open Elective: • Economic Policies in India • Professional Ethics • Internet of Things	4	0	0	4	4	0	0	4
LTMP601	Industrial Training	4 weeks to 6weeks during summer/winter break				0	0	2	2
Total		**8**	**0**	**24**	**32**	**8**	**0**	**14**	**22**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN LEATHER TECHNOLOGY	
Course code: **LTMP 601**	Course Title: **Major Project**
Semester:**6th**	Credits:**12**
Hours Per Week: **24(L:0,T:0,P:24)**	

COURSE OBJECTIVE:

The primary aim of the Major Project in Leather Technology is to provide students with a platform to apply the theoretical knowledge and practical skills acquired throughout their diploma program to address real-world challenges encountered in the leather industry. The project endeavors to foster innovation and encourage students to generate novel ideas within their field of interest. By identifying, analyzing, and developing solutions for pertinent issues in leather technology, the project aims to enhance students' proficiency, originality, and ability to apply acquired knowledge effectively. Additionally, the project seeks to instill in students a sense of social responsibility and an understanding of the legal and ethical principles governing the leather industry through the examination of relevant articles and engagement with real-time projects. Ultimately, the project serves as a comprehensive assessment tool to evaluate students' level of expertise and capacity for practical application upon completion of the program.

COURSE CONTENT

During Vacations after the completion of the 5th Semester, the students should be sent to leather manufacturing industry for practical training and as a precursor to the final project.

The General Guidelines for the Final Semester Project in Leather Technology that should be followed are as

1. Project Selection: Students are encouraged to select a project topic within the realm of Leather Technology that aligns with their interests and the objectives of the diploma program. Projects should aim to address practical problems or challenges encountered in the leather industry.

2. Innovation and Originality: Emphasis should be placed on fostering innovation and encouraging students to propose novel ideas or solutions relevant to the field of Leather Technology. Projects should demonstrate originality and creativity in addressing industry-related issues.

3. Practical Application: The project should provide students with an opportunity to apply the theoretical knowledge and practical skills acquired throughout their diploma program to real-world scenarios within the leather industry. Projects should have tangible outcomes or deliverables that contribute to the advancement of Leather Technology.

4. Industry Relevance: Projects should be designed to address current or emerging issues faced by the leather industry. Students are encouraged to conduct thorough research and analysis to ensure that their projects are relevant and responsive to industry needs.

5. Interdisciplinary Approach: Students may explore interdisciplinary perspectives by integrating concepts and techniques from related fields such as chemistry, materials science, engineering, and environmental science to address complex challenges in Leather Technology.

6. Ethical Considerations: Students should adhere to ethical principles and practices in conducting their projects, including respect for intellectual property rights, environmental sustainability, and social responsibility. Projects should be conducted in compliance with relevant regulations and guidelines governing the leather industry.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN LEATHER TECHNOLOGY	
Course code: LT**CE 601**	Course Title: **Tannery By-Products Utilization**
Semester:**6th**	Credits:**4**
Hours Per Week: **4(L: 4, T: 0,P: 0)**	

COURSEOBJECTIVE:

The objective of this course is to provide the knowledge to the students of Leather Technology that recycling of waste materials/By-products of tannery saves natural resources saves energy, reduces solid waste, and reduces air and water pollutants proper leather waste management is critical to reduce the environmental impact of the leather industry. Leather waste can cause significant pollution if not managed properly, including land, water, and air pollution.

COURSECONTENT

1. **Unit-I**
   By-products: Types of animal bi-products from abattoirs, meat processing plants, tannery and other sources including fallen animals.

2. **Unit-II**
   Glue and gelatin from different raw materials; difference in glue and gelatin, manufacturing process of glue and gelatin, equipments necessary for glue and gelatin manufacture, quality controls for technical, edible and pharmaceutical gelatins, difference between acid and alkali treated gelatin-their manufacturing process, properties and uses.

3. **Unit-III**
   Assessment of quality-chemical treatments- preservation and packing for wool industry. Bone products and their utilization.

4. **Unit-IV**
   Detanning and recovery of chromium, methods of making glue, gelatin, detergents, amino acids from chrome shavings.

5. **Unit-V**
   Manufacture of Leather Board. Industrial applications of collagen other than leather industry, Manufacture of manure from unusable tannery products, recovery of chromium from effluents of tan yard.

COURSEOUTCOME:

After completing this course, student will be able to:

- Understand how to convert the By-products of the tannery into valuable products
- Reduce the different pollutions created by these by-products of the tannery.

RECOMMENDEDBOOKS:

1. An Introduction to The Principles Of Leather Manufacture. – S.S. DUTTA. 4th edition, ILTA, Calcutta.
2. The Chemistry and Technology Of Leather. - Roddy, Lollar, Vol. II & III. Robert. E. Krieger Publishing Co. N.Y
3. Practical Aspects of the Manufacture of UpperL eathers.–J.M.DEY.ILTA, Calcutta.

4. Theory and Practice of Leather Manufacture. -K.T.SARKAR. Mcmillan India Press, Madras.
5. Journals of ILTA.
6. Leather Technician's Hand Book- J.H. Sharp house .VernomLockRoad,125 , HighHolborn, London, W– C1
7. Practical Leather Technology-Thomas C. Thorstenson, Robert. E. Krieger Publishing Co. Inc. N. Y.
8. Processing & Utilization of animal bye-products- Mann. I, Food & agriculture Organization of the United Nations, Rome(1962)
9. Animal Bye-products-their processing and utilization- Scaria, K.J., Mahendra Kumar and Divakarons, C.L.R.I. Madras-20 (1981) 10. Animal wastes- taiganides, E.P. applied Science Publishers Ltd. Essex(1977).

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED(HRS)	MARKS ALLOTTED (%)
1	5	10
2	15	35
3	8	15
4	8	15
5	12	25
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN LEATHER TECHNOLOGY	
Course code: LT**CE 602**	Course Title: **POLYMERSCIENCE AND TECHNOLOGY**
Semester:**6th**	Credits:**4**
Hours Per Week: **4 (L: 4, T: 0,P: 0)**	

COURSEOBJECTIVE:

The objective of this course is to present concepts of polymerization of various polymers used. Analytical skills on testing of polymers will be emphasized that will enable them to understand various polymer properties and manufacturing methods.

COURSECONTENT

1. **Science of Macromolecules:**
   Basic concepts, molecular forces and chemical bonding in polymers, molecular weight and its distribution.
2. **Step Reaction Polymerization:**
   Classification of polymers and polymerization mechanisms, mechanisms of step-growth polymerization, kinetics, poly functional step-growth polymerization
3. **Radical Chain polymerization:**
   Mechanism of vinyl- polymerization, kinetics of chain growth polymerization, molecular weight and its distribution,
4. **Ionic and Co-ordination Chain Polymerization:**
   Similarity and contrasts in ionic polymerization, mechanisms and kinetics of anionic, cationic and co-ordination polymerizations.
5. **Co-polymerization:**
   Kinetics of co polymerization, composition of copolymers, mechanism of co polymerization, blocks and graft polymers.
6. **Polymerization Conditions and polymer Reactions:**
   Polymerization in homogeneous and heterogeneous systems, polymerization engineering, chemical reaction of polymers.
7. **Polymer Solutions:**
   Criteria for polymer solution, conformation of dissolved polymer chains, thermodynamics of polymer solution.
8. **Measurement of Molecular Weight and Size:**
   End group analysis, colligative properties measurement.
9. **Structure–Property Relationship:**
   Polymer folding, thermodynamic and kinetic flexibility, Crystallization and melting of polymers and the factors responsible, glass transition and phase transition of polymers.
10. **Determination of Thermal Behavior of Polymers:**
    Principles of DSC, DTA, and TGA analyses.
11. **Plasticization and Cross linking of polymers:**
    The ory and mechanisms of plasticization, kinds of plasticizers, cross linking of polymers and its effect in the physical property of polymer network.

COURSEOUTCOME

After completing this course, student will be able to:

- Have knowledge on the chemistry of most common polymeric materials used in leather industry as supplements.
- Understand the importance of polymers for industrial application. Understand the fabrication process of polymer.

RECOMMENDEDBOOKS:

1. Text book of Polymer Science Billmeyer, F. W. Jr. (1994), 3rd Edn. Wiley Inter science Publication N.Y.
2. Polymer Science and Technology of Plastics and Rubbers-Ghosh, P.M.(1990), 2nd Edn. Tata McGraw-Hill Publishing Co. N.D.
3. The Chemistry and Physics of Polymers Kuleznev, V. N. and Shershnev, V. A. (1990) Mir Publishers, Moscow.

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED(HRS)	MARKS ALLOTTED (%)
1	6	10
2	4	10
3	4	8
4	4	8
5	4	8
6	4	10
7	4	8
8	4	8
9	6	10
10	4	10
11	4	10
Total	**48**	**100**

PROGRAM:THREEYEARSDIPLOMAPROGRAMMEINLEATHERTECHNOLOGY	
Course code**: LTCE 603**	Course Title: **ECONOMIS OF LEATHER INDUSTRY**
Semester:**6th**	Credits**:4**
Hours Per Week: **4 (L:4, T: 0,P: 0)**	

COURSEOBJECTIVE:

TheobjectiveofthiscourseistoprovidetheknowledgetotheStudentsofLeatherTechnology that how the leather sector occupies a very important place in the development of our economy on account of its substantial export earnings, potential for creation of employment opportunities and favorable conditions for its sustained growth.

COURSECONTENT

1. **Introduction:**
   Economic importance of leather. Antiquity of leather industry. Uses of leather in different sorts of life.

2. **Hides and Skins:**
   Indian livestock population over two decades – Hides and skins availability, their sizes, marketing centers, channels and prices over two decades.

3. **Leather Industry:**
   Leather production - centers, prices and marketing channels. Statistics of production of leather in organized and village sector of tanning industry. Present and past condition ofindigenous leather industry of India. Obstacles in the way of development of tanning in India and their possible Remedies.

4. **Leather Products Industry:**
   Leather Products manufacturing centre, prices and marketing channels. Statistics ofproductionofleatherproductsinorganisedandvillagesector.Presentandpastcondition of indigenous leather products industry of India.

5. **Export Trade of Indian Leather Industry**:
   Procedures involved in imports and exports. India's export trade in leather and leather products – India's share at the global level – India's competitors and their strength –International prices – Indian Government policies in the export promotion – Role of Indian and Overseas promotional institutions for export growth – Strategies for export promotion–Market constraints (Quality, image, brand name & merchandising methods).

6. **Project Identification and Preparation:**
   General considerations – Engineering aspects – Cost estimates and demand forecasting for leather and leather products – Different sources of finance – Budget preparation –Annual cost, variable cost and allocation of cost.

COURSEOUTCOME:

After completing this course, student will be able to:

- Understand the financial management and economics in the leather industry.
- Understand the profit value analysis. Have knowledge in organizational aspects of

implementation

RECOMMENDEDBOOKS:

1. Indian Leather 2010(A Technology, Industry and Trade Forecast)–Central Leather Research Institute, Madras.
2. The Indian Leather Industry–Secretariat for industrial assistance, Ministry of Industry, Govt. of India.
3. How To Export (Handbook on export business)– Small Industry Research Institute, Govt. of India.
4. Kothari's Desk Book Series –The Leather Industry.
5. Choice of technique in leather manufacture–M.M. Haq, H. Argaw–Scottish Academic Press. Edinburgh(1981)
6. Economics of Leather Industry-B. R. Rau, Calcutta University Press(1920).

UNITWISETIMEANDMARKSDISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	5	10
2	12	25
3	8	15
4	8	15
5	8	25
6	7	10
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN LEATHER TECHNOLOGY	
Course code: LT**OE 601**	Course Title: **ECONOMIC POLICIES IN INDIA**
Semester:**6th**	Credits:**4**
Hours Per Week: **4 (L: 4, T: 0,P: 0)**	

COURSEOBJECTIVE:

The objective of this course is to familiarize the students of different streams with the basic concepts, structure, problems and issues concerning Indian economy.

COURSECONTENT

1. **UNIT-I**
   Basic features and problems of Indian Economy: Economic History of India; Nature of Indian Economy, demographic features and Human Development Index, Problems of Poverty, Unemployment, Inflation, income inequality, Black money in India.
2. **UNIT-II**
   Sectoral composition of Indian Economy: Issues in Agriculture sector in India, land reforms Green Revolution and agriculture policies of India,
3. **UNIT-III**
   Industrial development, small scale and cottage industries, industrial Policy, Public sector in India, service sector in India.
4. **UNIT-IV**
   Economic Policies: Economic Planning in India, Planning commission v/s NITI Aayog, FiveYear Plans, monetary policy in India, Fiscal Policy in India, Centre state Finance Relations ,Finance commission in India. LPG policy in India
5. **UNIT-V**
   External sector in India: - India's foreign trade value composition and direction, IndiaBalance of payment since 1991, FDI in India, Impact of Globalization on Indian Economy, WTO and India.

COURSEOUTCOME:

After completing this course, student will be able to:

- Understand Indian economics policy,planning strategies
- Comprehend theoretical and empiricaldevelopment across countries and region for policy purposes.
- Development Economics as a discipline encompasses different approaches to the problems of unemployment, poverty, income generation, industrialization from different perspectives.
- Identify the problems and capable to decide the application for future development and willanalyze economic issues and find solutions to complex economic problems and take correct economic judgment.

RECOMMENDEDBOOKS:

1. Dutt Rudder and K.P. M Sunderam(2017). Indian Economy. S Chand & Co. Ltd. NewDelhi.

2. Mishra S.K & V.K Puri (2017).Indian Economy and –Its Development Experience. Himalaya Publishing House.
3. Singh, Ramesh, (2016): Indian Economy, Tata- Mc Graw 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.

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	12	25
2	8	15
3	8	5
4	10	20
5	10	25
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN LEATHER TECHNOLOGY	
Course Code: LT**OE 602**	Course Title: **PROFESSIONAL ETHICS**
Semester:**6th**	Credits:**4**
Hours Per Week: **4 (L:4, T: 0,P: 0)**	

COURSEOBJECTIVE:

To create awareness on Engineering Ethics and Human Values and to instill Moral and SocialValuesandLoyalty.AlsotoCreateawarenessamongengineersabouttheirsocialresponsibilities and appreciate the Ethical issues .The engineers should know the Human rights and concept of women empowerment.

COURSE CONTENT

1. Human Values

Professional Ethics - Objectives of study of professional ethics - Human values - Definition of Morals and Ethics - Difference between Morality and Ethics - Values - Definition - Types of values - Definition of Integrity - Concept of Work Ethic - Service Learning - Definition Virtues - Definition Civic Virtue - Duties and Rights - Respect for Others – Attitude and values, opinions - changing attitude - beliefs - Reliability - Living Peacefully - Means to be adopted for leaving peacefully - Caring Sharing - Honesty - Valuing Time - Co-operation - Commitment - Empathy - Self-Confidence Spirituality.

2. Engineering Ethics

Engineering ethics - Definition - Approach - Senses of Engineering Ethics - variety of moral issues – Inquiry - Types - Moral dilemmas - Steps to solve dilemma - Moral autonomy – Definition - consensus & controversy – Profession - Definition – Ethical theories - Theories about right action Personality – Self-control - Self-interest – Self-respect.

3. Safety, Responsibilities Of Engineers

Safety and risk - definition - assessment of safety and risk - risk benefit analysis and reducing risk – Personal risk - Public risk - Reducing risk - Voluntary Risk - Collegiality and loyalty – Authority Types - collective bargaining - occupational crime – Responsibility of engineers – Types - Social responsibility - Professional responsibility - confidentiality - conflicts of interest – liability

4. Ethical Issues In Engineering Practice

Ethical issues – Industrial standards - Environmental ethics – Plastic waste disposal - E-Waste Disposal - Semiconductor waste Disposal - Industrial waste disposal - Human centered environmental ethics - computer ethics – Types of issues - Computer as the Instrument and Object of Unethical Acts - Engineers as managers - Codes of ethics - Sample code of Ethics like - Institution of Engineers (India) - Institute of Electrical & Electronics engineers - Institute of Electronics & Telecommunication Engineers - Indian Institute of Materials Management.

5. Human Rights

Human Rights - Definition - constitutional provisions - right to life and liberty - Human Rights of Women - Discrimination against women - steps that are to be taken to eliminate discrimination against women in Education, employment, health care, Economic and social life, Women in rural areas - Status of Women in India -

Constitutional Safeguards - Dowry Prohibition act 1961 - Domestic violence act 2005 - Sexual harassment at work place bill 2006 - Human Rights of Children - Who is a child - list the Rights of the Child - Right to education - Protection of Children from Sexual Offences Act (POCSO) - 2012 - National Human Rights Commission - Constitutional Powers and function of the Commission - Employee rights - Provisions made - Contractual - Non-contractual employee rights - Whistle-blowing - definition - Aspects - Intellectual Property Rights (IPR) – Meaning - Need for protection - Briefly description of concept of patents, Copyright, Trademark.

COURSEOUTCOME

After completing this course, student will be able to:

- Discover the set of justified moral principles of obligation, ideals that ought to be endorsed by the engineers and apply them to concrete situations
- Know the definitions of risk and safety also discover different factors that affect the perception of risk.
- Justify the need for protection of human rights and to know about concept of women empowerment.

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED(HRS)	MARKS ALLOTTED (%)
1	12	25
2	8	20
3	8	15
4	8	15
5	12	25
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN LEATHERTECHNOLOGY	
Course Code: LT**OE 603**	Course Title: **INTERNET OF THINGS**
Semester:**6th**	Credits: **4**
Hours Per Week:**4(L: 4, T: 0,P: 0)**	

COURSE OBJECTIVE:

The objective of the course is to develop skill set and domain knowledge in students of the field of Internet of Things, which is considered as one among the advancements in Computer Engineering and to further provide them with the knowledge for classification of Real World IoT applications in various Domains. The course focuses on hands-on IoT Concepts such as Sensing, Actuation and Communication

COURSE CONTENT:

1. C-Programming
- 1.1. Introduction- Hello World Program
- 1.2. Data Types and Variable Declaration
- 1.3. If-else
- 1.4. Loops (for, while, do-while)

2. **Introduction to Internet of Things (IoT)**
- 2.1. Definition and characteristics of IoT
- 2.2. Physical design of IoT
- 2.3. IoT Protocols (M2M vs IOT)
- 2.4. Logical Design of IoT
- 2.5. IoT functional blocks
- 2.6. IoT communication Models

3. Introduction to Arduino
- 3.1. Arduino Uno Architecture and its setup
- 3.2. Interfacing LED , push button and buzzer with Arduino

4. Sensors and Actuators working
- 4.1. Overview of Sensors Working
- 4.2. Analog and Digital Sensors
- 4.3. Interfacing of
  - 4.3.1. Temperature Sensor
  - 4.3.2. Humidity Sensor
  - 4.3.3. Motion Sensor
  - 4.3.4. Light Sensor
- 4.4. Interfacing of Actuators
- 4.5. Interfacing of Servo Switch and Servo Motor with Arduino

5. Applications of IOT
- 5.1. Applications of IoT
- 5.2. IoT Wearables
- 5.3. Smart Home Applications

COURSE OUTCOME:

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

- Write basic c-programs and illustrate the use of C-Programming using basic concepts like data types, loops etc,
- Interpret the vision of IoT from a global context.
- Understand the differences and Similarities between IoT and M2M.
- Develop real time applications using Sensors/Actuators/Arduino Uno
- Explain the concept of Wi fi module functionalities and its applications.
- Implement IOT using Raspberry Pi
- Enumerate and illustrate the applications of IOT in various domains

RECOMMENDED BOOKS:

1. C-Programming by Balagursamy (for Unit 1)
2. nternet of Things – A Hands on Approach, By Arshdeep Bahga and Vijay Madisetti Universities Press
3. Internt of Things by Michael Miller ,Pearson
4. Arduino Programming: The Ultimate Intermediate Guide to Learn Arduino Programming Step by Step, Ryan Turner
5. IOT for Begineers ,Vibha Soni
6. Getting Started with Arduino" by Massimo Banzi, Michael Shiloh
7. The ESP8266 Wi-Fi Module for Dummies" by Cefn Hoile
8. Building the Internet of Things" by Maciej Kranz

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	15	30
2	07	15
3	10	20
4	12	25
5	06	10
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN LEATHER TECHNOLOGY	
Course Code: LT**MP601**	**Course Title**: Industrial Training
Semester: **6thth**	Credit: **2**
Duration: 04 to 06 Weeks during Summer/Winter Break	

COURSE OBJECTIVE:

Industrial training for the Diploma in Leather Technology is designed to equip students with practical knowledge and hands-on experience in the leather industry. This program aims to bridge the gap between theoretical learning and real-world application, allowing students to gain expertise in various aspects of leather production, processing, and finishing. The training focuses on developing students' technical skills in areas such as leather tanning, dyeing, cutting, stitching, and quality control, ensuring alignment with industry standards and emerging trends.

Throughout the training, students will engage in activities that enhance their understanding of the entire leather production process, from raw material sourcing to the final product. They will be exposed to industry-specific machinery, tools, and technologies, enabling them to operate and maintain equipment used in leather manufacturing. Additionally, the program emphasizes the importance of sustainability and environmental responsibility, encouraging students to explore eco-friendly practices and materials.

Students will also develop essential soft skills, such as teamwork, communication, and problem-solving, which are crucial for success in the industry. Practical training opportunities may include working in leather processing units, tanneries, footwear manufacturing companies, or accessory design studios, providing a comprehensive understanding of the diverse applications of leather technology.

The students shall have to attend an industrial training for a period of 04 to 06 weeks during the summer/winter vacations after the completion of the 3rd or 4th Semester (2nd Year) in any of the relevant or related domains. The students may also opt to undergo training in Online Mode/Work from Home.

Upon completion of the training, students are required to submit a certificate from the training institute as part of their examination requirements. A viva voce will be conducted both during the internal and external examinations, where students will be evaluated on the knowledge gained and skills acquired during the training period.

This training program aims to prepare students for entry-level positions in the leather industry, ensuring they possess both the technical expertise and professional acumen necessary to excel in their careers as leather technology professionals.

CURRICULUM

FOR

6th SEMESTER

DIPLOMA IN

MECHANICAL

ENGINEERING

SUBJECT STUDY SCHEME (6TH Semester: Mechanical Engineering)

		Time in Hours				Credits			
Course Code	**Subjects**	**Theory**	**Tutorial**	**Practical**	**Total**	**Theory**	**Tutorial**	**Practical**	**Total**
MEPC601	Refrigeration & Air Conditioner	3	1	-	4	4	-	-	4
MEPC602	Industrial Engineering	4	-	-	4	4	-	-	4
MEPC603	CNC Machines	3	-	-	3	3	-	-	3
Open Elective-III • Basics of Management (MEOE601) • Soft Skills (MEOE602)		3	-	-	3	3	-	-	3
MEPC604	Refrigeration & Conditioning Lab	-	-	2	2	-	-	1	1
MEPC605	CNC Machines Lab	-	-	2	2	-	-	1	1
MEPR601	Major Project	-	-	10	10	-	-	5	5
MEPR602	Seminar	-	-	2	2	-	-	1	1
MEAU601	MOOC (Online Mode) (non-Creditable)	-	-	-	-	-	-	-	-
		13	1	16	30	14	-	8	22

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN MECHANICAL ENGINEERING	
Course Code: **MEPC 601**	Course Title: **REFRIGERATION & AIR CONDITIONING**
Semester:**6TH**	Credits: **4**
Hours Per Week: **4 (L: 3, T: 1, P: 0)**	

COURSE OBJECTIVE:

This course aims to identify refrigeration system components, refrigerants, and lubricants of a refrigeration system and to familiarize candidates with control strategies for refrigeration systems and the basics of air conditioning systems.

COURSE CONTENT

1. **Introduction to Refrigeration:**
   - **1.1** Definition of Refrigeration;
   - **1.2** Refrigerating effect-unit of refrigeration- Coefficient of performance;
   - **1.3** Types of Refrigeration-Ice, dry ice, Steam jet, Throttling, Liquid nitrogen refrigeration; Carnot refrigeration Cycle; Air refrigeration- Bell - Coleman cycle, P V&T.S. diagram; Advantages and disadvantages in air refrigeration;
   - **1.4** Simple problems.
2. **Refrigeration systems:**
   - **2.1** Basic Components, a Flow diagram of working of the Vapour compression cycle; Representation of the vapor compression cycle on P-H, T-S & P-V Diagram; Expression for
   - **2.2** Refrigerating effect, work done and power required; Types of Vapour Compression cycle; Effects of superheating and under cooling, its advantages and disadvantages;
   - **2.3** Simple Vapour absorptions cycle and its flow diagram; Simple Electrolux system for domestic units;
   - **2.4** Comparison of Vapour absorption and vapor compression system;
   - **2.5** Simple problems on vapor compression cycle.
3. **Refrigeration equipment:**
   - **3.1** Compressor - types of compressors: Hermetically sealed and semi-hermeticallysealed compressors;
   - **3.2** Condensers - Air Cooled, water-cooled, natural, and forced draught cooling system; Advantages and disadvantages of air-cooled and water-cooled condensers;
   - **3.3** Evaporators -natural, convection, and forced convection types.
   - **3.4** Refrigerant flow controls: Capillary tube; Automatic Expansion valve; Thermo static expansion valve; High side and low side float valve; Solenoid valve; Evaporator pressure regulator.
4. **Refrigerants and lubricants:**
   - **4.1** Introduction to refrigerants; Properties of good refrigerants; Classification of refrigerants by group number and commonly used refrigerants in practice;
   - **4.2** Detection of refrigerant leakage;
   - **4.3** Charging the system with refrigerant;
   - **4.4** Lubricants used in refrigeration and their properties.
   - **4.5** Application of refrigeration: Slow and quick freezing; Cold and Frozen storage; Dairy refrigeration; Ice making industry; Water coolers.

5. **Air conditioning:**
   - **5.1** Introduction to Air conditioning; Factors Affecting air conditioning;
   - **5.2** Psychometric chart and its use; Psychometric process-sensible heating and cooling,Humidifying and dehumidifying; Adiabatic saturation process;
   - **5.3** Equipment used in the air conditioning cycle: Air conditioning units and plants.
   - **5.4** Window air-Conditioning, Split type air-Conditioning, Central air-Conditioning.
   - **5.5** Refrigeration and Air-conditioning tools: Tools used in refrigeration and Airconditioner installation; Installation procedure;
   - **5.6** Faults in refrigeration and air conditioning system; Servicing procedure.

COURSE OUTCOME

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

- Define refrigeration and types of Refrigeration cycles
- Explain the Vapour Compression and Vapour Absorption System working principles
- Identify the components required for the refrigeration system.
- Identify the controlling components for a refrigeration system.
- Explain the working principles of Air-conditioning.

RECOMMENDED BOOKS:

1. Refrigeration and Air Conditioning by Domkundwar; Dhanpat Rai and Sons, Delhi.
2. Refrigeration and Air Conditioning by CP Arora; Tata McGraw Hill, New Delhi.
3. Refrigeration and Air Conditioning by R.S Khurmi and J.K. Gupta; S Chand and Company Limited, New Delhi.
4. Refrigeration and Air Conditioning – Sadhu Singh, Khanna Book Publishing Co., New Delhi
5. Refrigeration and Air Conditioning – A.S.Sarao & G.S. Gabi, 6th edition, Satya Prakashan publications, New Delhi
6. Refrigeration and Air Conditioning – M.Zakria Baig, Premier/ Radiant Publishing House

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	16
2	12	26
3	12	26
4	08	16
5	08	16
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN MECHANICAL ENGINEERING	
Course Code: **MEPC 602**	Course Title: **INDUSTRIAL ENGG**
Semester: **6TH**	Credits: **4**
Hours Per Week: **4 (L: 4, T: 0, P: 0)**	

COURSE OBJECTIVE:

The objective of this course is to introduce the basic role of an industrial engineer, starting from the production planning to the costing, to have a systematic and comprehensive understanding of various aspects related to industrial engineerings such as plant location and plant layout, production planning and control, scheduling, forecasting etc and its relevance in the industrial environment.

COURSE CONTENT

1. **Production Planning and Control (PPC):**
   - 1.1 Introduction to functions of PPC-
   - 1.2 Forecasting – Definition and Methods; Routing – Definition and Procedure; Scheduling – Definition factors affecting scheduling- Gantt chart;
   - 1.3 Dispatching – Definition and orders in dispatching.
   - 1.4 Concept of Production and Productivity
   - 1.5 Methods for Improving Productivity.Types of Production: Mass Production, Batch Production, and Job Order Production.
   - 1.6 Plant Engineering: Factors for Selection of site of industry; Plant layout; Types; Process; Product, Fixed position, Combination layout;

   1.5 Principles of Material handling equipment; Types of material handling equipment –AGV, forklift truck, cranes, conveyor, hoist (Introduction only)

   1.6 Plant maintenance: Importance; Bathtub curve; Planned and Condition maintenance; Break down maintenance; Preventive maintenance, Predictive maintenance, and Scheduled maintenance

2. **Work-Study, Method and Measurement**
   - 2.1 Work Study: Definition
   - 2.2 Method Study: Definition; Objectives; Basic procedure for the conduct of Method study; Tools used; Operation process chart; Flow process chart; Two-handed process chart; Man, Machine chart; String diagram and flow diagram. Therbligs – Symbols, SIMO chart.
   - 2.3 Work Measurement: Definition; Basic procedure in making a time study; Employees rating factor; Application of time allowances: Rest, Personal, Process, Special and Policy allowances; Calculation of standard time; Numerical Problems;

3. **Quality Control**
   - 3.1 Quality Control: Definition; Objectives; Q.C. Process -Types of Inspection- First piece,Floor and Centralized Inspection; Advantages and Disadvantages;
   - 3.2 Statistical Quality Control (SQC): Definition, Normal distribution. Measure of central tendency and dispersion- Mean, Median, Mode, Standard Deviation, Variance-numerical problems Variables; Attributes; Normal Curve; Uses of X-bar, R, p and c charts; Simple problems

4. Sampling, Estimation, Costing and Depreciation

4.1 Acceptance Sampling: Operating Characteristics curve- Terms in acceptance sampling, O.C. curve for Ideal plan and General plan; sampling plan- single, double, multiple sampling plan

4.2 Estimating: objectives-Principal Constituents of the project estimate

4.3 Costing: objectives - -elements of cost -material cost, labor cost, expenses -Direct Cost; Indirect Cost; overheads-types of Overhead; cost structure- Prime Cost; FactoryCost; Office Cost; Selling Price of a product; Numerical Problems;

4.4 Comparison Between Estimating and Costing

4.5 Depreciation: Definition; Causes; Methods: Straight line, Sinking fund, Diminishing Balance Method, Annuity method, Sum of the year's digit method; Numerical Problems.

COURSE OUTCOME

On Completion of the course, the student will be able to:

- Describe the functions of PPC, different types of plant layouts and plant maintenance
- Apply method study and work measurement techniques in job standardization.
- Interpret the control charts used in quality control.
- Explain the risks involved in acceptance sampling, a product's selling price components, and asset depreciation.

RECOMMENDED BOOKS:

1. M. Mahajan, Statistical Quality Control. Dhanpat Rai Publishing Co Pvt Ltd.
2. O.P. Khanna, Industrial Engineering and Management, Revised Edition, New Delhi: Dhanpat Rai Publications (P) Ltd.
3. R. Keith Mobley, Maintenance Fundamentals. 2nd Edition. Elsevier.
4. Industrial Engineering And Production Management by Martand T Telsang, S. Chand
5. Industrial Engineering and Organization Management by S.K.sharma and Savita Sharma,Katson Publication

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	16	25
2	16	25
3	16	25
4	16	25
Total	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN MECHANICAL ENGINEERING	
Course Code: **MEPC 603**	Course Title: **CNC Machines**
Semester: **6TH**	Credits: **3**
Hours Per Week: **3 (L: 3, T: 0, P: 0)**	

COURSE OBJECTIVE:

This course aims to comprehend candidates with various code programs for CNC Turning and Milling Centre and Illustrate common problems with tooling and fixtures in CNC programming.

COURSE CONTENT

1. Introduction

1.1 Introduction to N.C., CNC & DNC, their advantages, disadvantages, and applications,

1.2 Machine Control Unit, input devices, selection of components to be machined on CNCmachines,

1.3 Problems with conventional N.C., New developments in N.C., Axis identification, PLC Control,and its components. Its advantages and disadvantages.

2. Construction and Tooling

2.1 Design features, specification Chart of CNC machines,

2.2 Use of slideways, balls, rollers and coatings, motor and leadscrew, swarf removal, safety andguarding devices,

2.3 Various cutting tools for CNC machines, an overview of tool holders, different pallet and automatic tool changer systems, and tool room management.

3. Part Programming

3.1 Part programming and basic concepts of part programming, N.C. words,

3.2 Part programming formats, simple programming for rational components, part programmingusing conned cycles, subroutines, and do loops,

3.3 Tool offsets, cutter radius compensation, and wear compensation.

4. System Devices

4.1 Actuators, Transducers and Sensors, Tachometer, LVDT, opto-interrupters,

4.2 Potentiometers for linear and angular position, encoder and decoder, axis drives, open loop, and closed loop systems.

5. Problems in CNC Machines

5.1 Common problems in mechanical, electrical, pneumatic, electronic, and P.C. components ofN.C. machines,

5.2 Diagnostic study of common problems and remedies, use of on-time fault-finding diagnosistools in CNC machines.

6. Automation and N.C. system

6.1 Role of computers in automation,

6.2 Emerging trends in automation, automatic assembly, manufacture of magnetic tape,manufacture of printed circuit boards, manufacture of integrated Circuits,

6.3 Overview of FMS, Group technology, CAD/CAM, and CIM.

7. Robot Technology

7.1 Introduction to robot technology,
7.2 Basic robot motion, robot applications

COURSE OUTCOME

After Completion of the course, the student will be able to:

- Demonstrate the working of the CNC turning and milling machine
- Develop the part program using simulation software for Lathe and Milling
- Assess the part program, edit and execute in CNC turning and machining center

RECOMMENDED BOOKS:

1. CNC Machines – Programming and Applications by M Adithan and BS Pabla;
2. New Age International (P) Ltd., Delhi.
3. Computer Aided Manufacturing by Rao, Kundra, and Tiwari; Tata Mc Graw Hill, New Delhi.
4. CNC Machine by Bharaj; Satya Publications, New Delhi.
5. CAD/CAM/CIM – P. Radhakrishnan, S. Subramaniyan & V. Raju, New Age International Pvt.Ltd., New Delhi, 3rd Edition,
6. CNC Machines and Automation by Khushdeep Goyal, Katson Publication

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	6	15
2	08	16
3	10	20
4	8	16
5	6	12
6	6	12
7	4	9
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN MECHANICAL ENGINEERING	
Course Code: ME**OE601**	Course Title: **Basics of Management**
Semester: **6TH**	Credits: **3**
Hours Per Week: **3 (L: 3, T: 0, P: 0)**	

COURSE OBJECTIVE:

This course aims to explain the basic concepts, principles, and processes of management and how to use management thought to understand better how gender, race, class, culture, and other contextual differences play out among people in the workplace.

COURSE CONTENT

1. Principles of Management

1.1 Introduction, definition, and importance of management.
1.2 Functions of Management Planning, Organizing, Staffing, Coordinating, Directing, Motivating and Controlling.
1.3 Concept and Structure of an organization Types of industrial organization a) Lineorganization b) Functional organization c) Line and Functional organization
1.4 Hierarchical Management Structure Top, middle, and lower-level management

2. Work Culture

2.1 Introduction and importance of Healthy Work Culture in an organization
2.2 Importance of attitude, values, and behavior Behavioral Science – Individual and group behavior
2.3 Professional ethics – Concept and need of Professional Ethics

3. Leadership and Motivation

3.1 Leadership a) Definition and Need of Leadership b) Qualities of a good leader
3.2 Motivation a) Definition and characteristics of motivation b) Factors affecting motivation c) Maslow's Need Hierarchy Theory of Motivation
3.3 Job Satisfaction

4. Legal Aspects of Business: Introduction and need

4.1 Labour Welfare Schemes a) Wage payment: Definition and types b) Incentives: Definition, need and types
4.2 Factory Act 1948
4.3 Minimum Wages Act 1948

5. Management Scope in Different Areas

5.1 Human Resource Development a) Introduction and objective b) Manpower Planning, recruitment and selection
5.2 Material and Store Management a) Introduction, functions, and objectives of material management b) Purchasing: definition and procedure c) Just in time (JIT)
5.4 Marketing and Sales a) Introduction, importance, and functions b) Difference betweenmarketing and selling.
5.5 Financial Management – Introduction a) Concept of NPV, IRR, Cost-benefit analysis b) Elementary knowledge of Income Tax, Sale Tax, Excise duty, Custom duty, Provident Fund

6. Miscellaneous topics

6.1 Customer Relationship Management (CRM) a) Definition and Need b) Types of CRM

6.2 Total Quality Management (TQM) a) Inspection and Quality Control b) Concept of QualityAssurance c) TQM

6.3 Intellectual Property Rights (IPR) a) Introduction, definition, and its importance b)Infringements related to patents, copyright, trademark

COURSE OUTCOME

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

- identify leadership roles in organizations.
- Explaining various theories, processes, and functions of management.
- Developing strategic planning and decision-making strategies in an organization.
- Developing an understanding of staffing, leadership, and motivation in an organization

RECOMMENDED BOOKS:

1. Principles of Management by Philip Kotler TEE Publication
2. Principles and Practice of Management by Shyamal Bannerjee: Oxford and IBM PublishingCo, New Delhi.
3. Financial Management by MY Khan and PK Jain, Tata McGraw Hill Publishing Co., 7, West Patel Nagar, New Delhi.
4. Modern Management Techniques by S.L. Goel: Deep and Deep Publications Pvt Limited, Rajouri Garden, New Delhi.
5. Management by James AF Stoner, R Edward Freeman, and Daniel R Gilbert Jr.: Prentice Hallof India Pvt Ltd, New Delhi. Essentials of Management by H Koontz, C O' Daniel, McGraw Hill Book Company, New Delhi.
6. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	09	18
2	07	14
3	09	18
4	07	14
5	08	18
6	08	18
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN MECHANICAL ENGINEERING	
Course Code: ME**OE602**	Course Title: **Soft Skills**
Semester: **6TH**	Credits: **3**
Hours Per Week: **3 (L: 3, T: 0, P: 0)**	

COURSE OBJECTIVE:

The objectives of this course are to equip the students with competencies to manage themselves inorganizations with a scientific outlook towards communication to develop career orientation through an understanding of Mock interviews and G.D.s. Also, to facilitate an insight into the functioning of individuals and groups.

COURSE CONTENT

1. **Verbal and Non-Verbal Communication Skills:**
   - 1.1 Introduction;
   - 1.2 Listening to customers, team members, and managers; listening to electronic media; communicating with customers, team members, and managers; referencing for verbal communication.
   - 1.3 Presentation Skills – Stages involved in an effective presentation, selection of topic, content, aids, engaging the audience,
   - 1.4 Time management, Feedback, Mock Presentations.
2. **CV, G.D., and P.I.:**
   - 2.1 Introduction; SOP; career objective; educational qualification; projects and assignments; skillset; achievements and interests;
   - 2.2 Introduction to G.D.; Foundation skills in G.D.; Mock GD; Introduction to P.I.; foundation skills in P.I.; Mock PI
3. **Interpersonal skills:**
   - 3.1 Definition: understanding, analyzing, and responding to people's needs, requirements, and capabilities at different levels.
   - 3.2 Goal Setting Skills: Introduction; relevance of SWOT on goal setting; setting career goal; action plan and measures to achieve career goal; corporate role models; three to five years career roadmap; competitive work environment and realization of goals; anticipating challenges and utilizing opportunities.
   - 3.3 Time Management Skills: Planning, Scheduling, Prioritizing, multitasking.
4. **Corporate Etiquette:**
   - 4.1 Customer interaction etiquette; office etiquette; meeting etiquette; telephone etiquette;
   - 4.2 presentation etiquette.

COURSE OUTCOME

After completing this course, the student will be able to:

- Participate in the campus selection process, focusing on aptitude and G.D.
- Prepare themselves for the campus Interviews.
- Develop professional behavior for entry into the professional world.
- Think logically and solve problems in professional life.

RECOMMENDED BOOKS:

1. Business Communication and Personality Development by Biswajit Das & Ipseeti Satpathy,The Encel Publications, 1st Edition
2. Managerial Communication – Strategies and Applications by Hynes; The McGraw Hill Company, 4th Edition
3. Effective Business Communication by Murphy; The McGraw Hill Company, 7th Edition
4. Winning at Interviews by Edger Thorpe, Showik Thorpe; Pearson Publications, 1st Edition
5. Professional Communication by Aruna Koneru; The McGraw Hill Company
6. Developing Soft Skills by Robert M. Sherfield, Rhonda J., Patricia J. Moodi; CornerstonePublications

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	16	25
2	16	25
3	16	25
4	16	25
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN MECHANICAL ENGINEERING	
Course Code: **MEPC 604**	Course Title: **REFRIGERATION & AIR CONDITIONING Lab**
Semester: 6TH	Credits: **1**
Hours Per Week: **2 (L: 0, T: 0, P: 2)**	

COURSE OBJECTIVE:

The objective of this course is to make candidates familiar with different refrigeration test rigs and, conduct various performance tests, apply technical skills in dismantling, servicing, and assemblingvarious refrigeration equipment like the air conditioner, water cooler, deep freezer, etc

LIST OF PRACTICALS

1. Identify the parts of a Vapor Compression refrigeration system and perform generalservicing and maintenance.
   - Study the parts and functions of the vapor compression refrigeration system.
   - Carry out general servicing like filter removal, air conditioner cleaning, etc.
2. Apply technical skills in dismantling, servicing, and assembling various compressors, condensers, expansion devices, and evaporators, including evacuation, gas charging, etc.
   - Dismantle, service, and assembling of compressors.
   - Dismantle, service, and assembling of condensers.
   - Dismantle, service, and assembling of expansion devices.
   - Dismantle, service, and assembling of evaporators.
   - Filling of suitable refrigerant using a gas charging kit.
3. Familiarize with different refrigeration test rigs and conduct various performance tests.
   - Conduct the performance test and find the COP of the vapor compression refrigerationtest rig.
   - Conduct the performance test and find the COP of the cold storage.
   - Conduct the performance test and plot the different thermodynamic curves in theair conditioner test rig.
   - Conduct the test on an air conditioning unit and find out psychrometric properties.
4. Apply technical skills in dismantling, servicing, and assembling refrigeration equipment like air conditioners, water coolers, deep freezers, etc.
   - Dismantle, service& assembling of air conditioner.
   - Dismantle, service& assembling of w a t e r cooler.
   - Dismantle, service& assembling of deep freezer.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN MECHANICAL ENGINEERING	
Course Code: **MEPC 605**	Course Title: **CNC Lab**
Semester: **6TH**	Credits: **1**
Hours Per Week: **2 (L: 0, T: 0, P: 2)**	

COURSE OBJECTIVE:

This course will familiarize students with the CNC Turning and Milling Center anddevelop part programs.

LIST OF PRACTICALS

1. Study the constructional details of the CNC lathe.
2. Study the constructional details of the CNC milling machine.
3. Study the constructional details and working of: -
   a) Automatic tool changer and tool setter
   b) Multiple pallets
   c) Swarf removal
   d) Safety devices.
4. Develop a part program for following lathe operations and make the job on the CNC latheand CNC turning center.
   a) Plain turning and facing operations
   b) Taper turning operations
   c) Operation along contour using circular interpolation.
5. Develop a part program for the following milling operations and make the job on CNCmilling.
   a) Plain milling
   b) Slot milling
   c) Contouring
   d) Pocket milling.
6. Preparation of work instructions for the machine operator.
7. Preparation of preventive maintenance schedule for CNC machine.
8. Demonstration through industrial visits for awareness of the actual working of FMS in production.
9. Use of software for turning operations on CNC turning center.
10. Use of software for milling operations on machine centers.
11. Operation of the robot.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN MECHANICAL ENGINEERING	
Course Code: **MEPR601**	Course Title: **MAJOR PROJECT**
Semester: **6TH**	Credits: **5**
Hours Per Week: **10 (L: 0, T: 0, P: 10)**	

COURSE OBJECTIVE:

Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course to solve a particular problem or undertake a project. The students have various aptitudes and strengths. Project work, therefore, should match the strengths of students.

DESCRIPTION

For the above objective, students should be asked to identify the type of project work they would liketo execute. It is also essential that the faculty of the respective departments have a brainstorming session to identify suitable project assignments. The project assignment can be an individual assignment or a group assignment. The students should identify the project at least twoto three months. The project work identified in collaboration with the industry may be preferred.

Each teacher is expected to guide the project work of 5-6 students.

- Projects related to increasing productivity
- Projects related to quality assurance
- Projects related to estimation and economics of production
- Projects connected with the repair and maintenance of plant and equipment
- Projects related to the identification of raw material, thereby reducing the wastage
- Any other related problems of interest to the host industry

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN MECHANICAL ENGINEERING	
Course Code: **MEPR602**	Course Title: **Seminar**
Semester: **6TH**	Credits: **1**
Hours Per Week: **2 (L: 0, T: 0, P: 2)**	

COURSE OBJECTIVE:

Students will develop persuasive speech, present information in a compelling, well-structured, and logical sequence, respond respectfully to opposing ideas, show depth of knowledge of complex subjects, and develop their ability to synthesize, evaluate, and reflect on information.

DESCRIPTION:

To complete the above objective, students should be allowed to choose the topic of their choice forpresentation

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN MECHANICAL ENGINEERING	
Course Code: **MEAU601**	Course Title: **MOOC COURSE**
Semester: **6TH**	Credits: -**0**
Hours Per Week: - **(L: 0, T: 0, P: 0)**	

COURSE OBJECTIVE:

The objective of this course is to give students more online learning experiences, and it provides an affordable and flexible way to learn new skills, advance student's careers, and deliver quality educational experiences at scale

DESCRIPTION

Massive Open Online Courses (MOOCs) are free online courses for anyone to enroll. This course is a non-creditable but mandatory course added to the curriculum. Students are free to join MOOC courses from any online platform.

CURRICULUM
FOR
SIXTH SEMESTER
OF
THREE-YEAR DIPLOMA COURSE
IN
MEDICAL ELECTRONICS

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN MEDICAL ELECTRONICS

SIXTH SEMESTER

Code	Subjects	Study Scheme			Total Hours L+T+P	Credits			Total Credits L+T+P
		Hours							
		L	T	P		L	T	P	
MEPC601	Bio-Medical Instrumentation-III	3	0	0	3	3	0	0	3
MEPC602	Bio-Medical Instrumentation-III Lab	0	0	2	2	0	0	1	1
MEPC603	Telemedicine	3	0	0	3	3	0	0	3
MEPC604	Troubleshooting and Maintenance of Bio-medical Instruments	0	0	4	4	0	0	2	2
****	PE- III(Branch specific elective)	3	0	0	3	3	0	0	3
OE607	Open Elective-II	3	0	0	3	3	0	0	3
SI/PR609	Major project	0	0	14	14	0	0	7	7
Total		**12**	**0**	**20**	**32**	**12**	**0**	**10**	**22**

PE- III (Branch specific elective):- Bio-Statistics(MEPE601)/Nuclear Medicine(MEPE602)

Open Elective II:- Energy Conservation and Audit(MEOE601) /Disaster Management **(**MEOE602**)/** E-commerce(MEOE603)/Enterpreneurship and StartUps(MEOE604)

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN MEDICAL ELECTRONICS	
Course Code: MEPC601	Course Title: Bio-Medical Instrumentation-III
Semester: 6th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVE

The students have been exposed to the basics of medical instruments like Transducers, Recorders etc. in the lower version of Medical Instruments. Now this course explores the advance technology used in the medical field along with the safety aspects. Students undergoing this course will learn about the basic concept of higher end instruments used in the medical field.

COURSE CONTENTS

1. PATIENT SAFETY.

   1.1 Introduction, electric shock hazards, gross and micro current shock.

   1.2 Leakage current & its type, precautions to minimize electric shock hazards, safety codes for electro medical equipments.

   1.3 Testing of Biomedical equipment-chassis leakage current measurement, leakage current in patient leads, ground continuity test .

2. INSTRUMENTS FOR SURGERY

   2.1 Principle of surgical diathermy, safety aspects of active and return electrode, surgical diathermy machine.

   2.2 Electro surgery techniques, safety aspects in electro surgical units.

   2.3 Laser application in Biomedical field, laser safety .

3. PATIENT MONITORING SYSTEM

3.1 System concepts, cardiac monitor, bedside patient monitoring systems.

3.2 Central monitors, blood pressure measurement, automatic blood pressure measuring apparatus using korotkoff's method (sphygmomanometer)

4. CARDIAC PACE MAKERS & DEFIBRILLATOR

4.1 Need for cardiac pacemaker, types of pacemaker-external pacemaker, implantable pacemakers, and power sources for implantable pacemakers.

4.2 Defibrillators-Need for a defibrillator, DC defibrillator, defibrillator electrodes, automatic or external defibrillators.

5. ANESTHESIA MACHINE.

5.1 Need for anesthesia, delivery of anesthesia, anesthesia machine.

5.2 Gas supply system, vapor delivery, delivery system, Humidification, ventilators, patient circuit.

5.3 Electronics in the anesthetic machine.

6. AUTOMATED DRUG DELIVERY SYSTEM

6.1 Infusion pumps, components of drugs infusion systems, delivering the drug, syringe pumps, closed loop control in infusion systems.

6.2 Programmable volumetric infusion pump

6.3 Programme controlled insulin dosing device

7. HEMODIALYSIS MACHINE & LITHOTRIPTERS

7.1 Function of the kidneys, artificial kidney, dialyzers & its types.

7.2 Haemo-dialysis machine.

7.3 Lithotripters:-Modern Lithotripter systems, Extra Corporeal Shock wave therapy

8. ENDOSCOPY

8.1 Introduction to various types of endoscopes and cystoscopes

8.2 Fiber optic endoscopes & endoscopes with integral TV cameras

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

CO1: Understand importance of Patient Safety

CO2: Describe the Instruments for surgery different levels of OSI model .

CO3: Understand the working of Patient Monitoring Systems and Cardiac Pacemakers and defibrillators .

CO4: Study different types of advanced imaging and diadnostic tools in medicine.

RECOMMENDED BOOKS

1. Handbook of medical instruments by R.S. Khandpur

2. Biomedical instrumentation & measurements by Leslie Cromwell

3. Medical instrumentation by John Webster

DISTRIBUTION OF MARKS

Unit	Name of the Unit	Teaching Hours	Marks
1	Patient Safety	05	10
2	Instruments for surgery	05	10
3	Patient Monitoring System	05	10
4	Cardiac Pacemakers and Defibrillators	08	20
5	Anesthesia Machine	08	20
6	Automated Drug Delivery System	06	10
7	Hemodialysis Machines & Lithotripters	06	10
8	Endoscopy	05	10
Total		48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN MEDICAL ELECTRONICS	
Course Code: MEPC602	**Course Title**: Bio-Medical Instrumentation-III Lab
Semester: 6th	**Credits:** 1
Periods Per Week : 2 (L:0 , T:0, P: 2)	

COURSE OBJECTIVES :

This subject is a lab course supplementing the theory subject and aims to develop proficiency and understanding of practical outcomes of the subjects treated in theory.

COURSE CONTENTS:

LIST OF PRACTICALS

1. Study of surgical diathermy machines.
2. Study of defibrillators.
3. Study of pacemaker.
4. Study of patient monitoring system.
5. Study of nebulizer.
6. Study of LASER based surgical equipments.
7. Study of Anesthesia Unit
8. Study of Ventilators.
9. Study of Infusion Pump.
10. Study of Dialysis Machine.
11. Study of Lithotripter.
12. Study of Endoscopes.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN MEDICAL ELECTRONICS	
Course Code: MEPC603	Course Title: Telemedicine
Semester: 6th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVES

Telemedicine is the broad description of providing medical and healthcare services by means of telecommunications. Information Technology (IT),has enabled a wide range of applications to be supported.To address the growing trend of telemedicine throughout the world, this course discusses different technologies and applications surrounding telemedicine.

COURSE CONTENTS

UNIT 1:Introduction to telemedicine

1.1 Definition of Telemedicine ,Telehealth and Telecare.

1.2 Types of Telemedicine: Tele-consultation, Tele-education, Tele-monitoring, Tele-surgery.

1.3 Network connection from human body to the outside world

1.4 Basic requirements of telemedicine : sensors, cameras, actuators, communication network (definitions only)

1.5 Benefits and Limitations of Telemedicine.

UNIT 2. Types of Telemedicine Information & Wireless Networks.

2.1 Types of Telemedicine Information, Text and Data ,Audio ,Still Images, Video.
2.2 Bluetooth, infrared, wireless local area networks (WLAN) and Wi-Fi, cellular networks.
2.3 Broadband wireless access (BWA), satellite networks

UNIT 3. Wireless Technology in Patient Monitoring .

3.1 Body area network ,Emergency rescue.

3.2 Block diagram of Medical information system, Bio signal transmission and processing.

3.3 Block diagram of MIS for collecting patient's information.

UNIT 4. Bio-telemetry systems

4.1 Introduction, single channel radio telemetry system: Transmitter and receiver block diagram.

4.2 Instance of single channel radio telemetry system
i) E.C.R Telemetry system.
ii) Temperature Telemetry system.

4.2 Multi channel radio telemetry system :Transmitter and receiver block diagram.

4.3 Instance of Multi-channel Telemetry systems
i) Telemetry of ECG and respiration.
ii) Implantable Telemetry System for Blood Pressure and Blood flow.

4.4 Wireless telemetry system in ambulances and remote centres.

4.5 Description of IoMT (Internet of Medical Things **)**Devices
On-Body Devices, InHome Devices, Community Devices, In-Clinic Devices, InHospital Devices .

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

CO1: Understand various aspects of telemedicine communication systems.

CO2: Attain knowledge of various telemedicine information systems.

CO3: Shall gain theoretical background in understanding of various digital communication systems.

RECOMMENDED BOOKS

1. Telemedicine Technologies (Information Technologies in Medicine and Tele health) by Bernard Fong, A.C.M.Fong C.K.Li , Publication Wiley A John Wiley &Sons, Ltd.

2.Essentials of Telemedicine and Telecare by A.C. Norris . Publication Wiley A John Wiley &Sons.

3. Connected Health: A Review of Technologies And Strategies To Improve Patient Care With Telemedicine And Telehealth by Kvedar, Coye & Everett.

DISTRIBUTION OF MARKS

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Introduction to telemedicine	10	20
2	Types of Telemedicine Information & Wireless Networks	10	20
3	Wireless Technology in Patient Monitoring	10	20
4	Bio-telemetry systems	18	40
Total		48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN MEDICAL ELECTRONICS	
Course Code: MEPC604	Course Title: Troubleshooting and Maintenance of Bio-Medical Instruments
Semester: 6th	Credits: 2
Periods Per Week : 4 (L:0 , T:0, P: 4)	

COURSE OBJECTIVES :

A comprehensive maintenance programme prevents equipment failure which impacts productivity, worker morale and financial returns. The goal of maintenance engineering should be to ensure top quality performance from each piece of hardware which can be achieved by establishing and practicing a good maintenance management system.

COURSE CONTENTS:

Unit-I Troubleshooting Procedures

1.1 Reliability curve, failure rate, accelerated assessment of reliability.

1.2 Thermal acceleration, electrical acceleration, damp heat acceleration.

1.3 Maintenance terminology-troubleshooting, breakdown maintenance, preventive maintenance, inspection, acceptance test, calibration, overhaul.

1.4 Causes of equipment failures, nature of faults.

1.5 Troubleshooting process-fault establishment, fault location procedure. Troubleshooting methods-functional area approach, split half method , troubleshooting circuits with divergent paths, convergent paths, feedback paths, switching paths.

Unit-II Objectives of maintenance management

2.1 Essentials of a good equipment management programme
2.2 Maintenance policy, equipment service options
2.3 Types of maintenance service contracts, general contract provisions.
2.4 Maintenance organization, planning of spare parts inventory, prioritization procedure for purchase of spare parts requirement

Unit-III Medical Equipment Maintenance

3.1Operation and function of the following medical equipment (along with troubleshooting chart and user maintenance check list)-

i. Anaesthetic Machines

ii. Autoclaves and Sterilizers

iii. ECG (Electrocardiograph) Machines

iv. Electrosurgical Units (ESU) and Cautery Machines

v. Incubators, Nebulizers, Oxygen Cylinders and Flowmeters

vi. Suction Machines (Aspirators)

vii. Tables (Operating Theatre and Delivery)

viii. Ultrasound Machines, X-Ray Machines.

Course Outcome:

The student will be able to practically establish the fault finding and maintenance concepts of medical equipments. For this the student has to visit maintenance unit in a hospital or a reputed private medical equipment maintenance unit.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN MEDICAL ELECTRONICS	
Course Code: MEPE601	Course Title: Program Elective-III a) Bio-Statistics
Semester: 6th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVES

The science of statistics has a definite place in the skill sets of Medical Electronics Technician. Knowledge of statistical methods opens up new paths of experimental procedures and helps the students to understand and interpret the facts and findings of medical research.

COURSE CONTENTS

Unit-I INTRODUCTION

1.1 Meaning of statistics; limitations in statistics;

1.2 Medical statistics: application & uses of Bio statistics as a science.

1.3 Common statistical terms: variable, constant, observation, observatorial unit, Data, population, sampling unit, sample parameter, and statistic.

1.4 Notation for population & sample value Unit 2 Internet of Medical Things

Unit-II SOURCES & PRESENTATION OF DATA

2.1 Sources for collection of medical statistics namely, experiments, surveys, records.

2.2 Methods of presentation: Tabulation; frequency distribution drawings for quantitative and qualitative date.

Unit-III LOCATION ,VARIABILITY & ITS MEASURES

3.1 Measures of central tendency-Averages, mean, median, mode

3.2 Measures of location-Percentiles, graphic method and Arithmetic method Types of variability -Biological real and experimental.

3.3 Measures of variability of individual observation; range ,interquartile range, mean deviation, standard deviation ,Coefficient of variation

Unit-IV SAMPLING

4.1 Sample characteristics-Precision and unbiased .

4.2 Sampling techniques-Simple random sampling, systematic sampling, stratified sampling, multistage sampling, cluster sampling, multiphase sampling.

Unit V DEMOGRAPHY AND VITAL STATISTICS

5.1 Demography-Meaning and types.

5.2 Vital statistics-definition; sources for collection of demographic data.

5.3 Population census, records of health departments, records of health institutions, reports of special surveys.

COURSE OUTCOMES

After completion of the course the student should be able to understand the statistical applications in the field of medicine.

RECOMMENDED BOOKS

1. Methods in Biostatistics by Dr. B. K. Mahajan

2. Study Guide for fundamentals of Biostatistics by Bernard Rosner.

3. Biostatistics by David L. Streiner

DISTRIBUTION OF MARKS

Unit No.	Name of the Unit	Teaching Hours	Marks
1	INTRODUCTION	7	15
2	SOURCES & PRESENTATION OF DATA	5	10
3	LOCATION ,VARIABILITY & ITS MEASURES	12	25
4	SAMPLING	12	25
5	DEMOGRAPHY AND VITAL STATISTICS	12	25
Total		48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN MEDICAL ELECTRONICS	
Course Code: MEPE603	Course Title: Program Elective-II b) Nuclear Medicine
Semester: 6th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVES

The Objective of this course is to study the effects of radiation in matter & how isotopes are produced. In this course students will learn different types of radio diagnostic techniques & know techniques used for visualizing different sections of the body. This course covers radiation therapy methodologies & the radiation safety.

COURSE CONTENTS

UNIT 1: BASICS OF NUCLEAR PHYSICS

1.1 Radio activity, radioactive decay law.

1.2 units of radioactivity measurement , interaction of radiation with matter.

UNIT 2. IN VIVO TECHNIQUES

2.1 General principle.

2.2 Radiopharmaceuticals-selection & localization, uptake monitoring system, rectilinear scanner.

2.3 Gamma Camera fundamentals.

UNIT 3. EMISSION TOMOGRAPHY TECHNIQUES

3.1 Introduction.

3.2 principles & applications of SPECT

3.3 principles & applications of PET.

3.4 System performance parameters & quality control functions

UNIT 4. RADIATION SAFETY

4.1 External radiation hazards & prevention.

4.2 Internal radiation exposure.

4.3 Biological effects of radiation exposure.

4.4 Disposal of biological waste.

Unit 5 DETECTORS

5.1 Detectors In Nuclear Medicine.

5.2 Scintillation detectors

5.3 Solid state detectors .

COURSE OUTCOME:

After Undergoing the course the student shall be able to

CO1. Understand basics nulear medicine .

RECOMMENDED BOOKS

1. Text book of Nuclear Medicine by A.F.G Rocha

2. Hand book of Nuclear Medicine Instruments by Bairi, Singh, Rathod, Narurkar.

DISTRIBUTION OF MARKS

UNITS	Name of Topic	TIME ALLOTTED (Hrs.)	MARKS ALLOTTED (%)
1	BASICS OF NUCLEAR PHYSICS	06	15
2	IN VIVO TECHNIQUES	13	25
3	EMISSION TOMOGRAPHY TECHNIQUES	14	30
4	RADIATION SAFETY	11	20
5	DETECTORS IN NUCLEAR MEDICINE	04	10
TOTAL		48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN MEDICAL ELECTRONICS	
Course Code: MEOE601	Course Title: Open Elective-II a)Energy Conservation and Audit
Semester: 6th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVES:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experience which among other things includes undertaking energy conservation and energy audit.

COURSE CONTENTS:

UNIT-I: Introduction

1.1 General energy problem.

1.2 Sector wise Energy consumption, demand supply gap.

1.3 Scope for energy conservation and its benefits.

1.4 Energy Efficiency Principle – Maximum energy efficiency, Maximum cost effectiveness; Mandatory provisions of EC act.

1.5 Features of EC Act-Standards and labeling, designated consumers, Energy Conservation Building Codes (ECBC).

Unit-II: Energy Conservation Approaches In Industries

2.1 Methods and techniques of energy conservation in ventilation and air conditioners- compressors pumps, fans and blowers.

2.2 Area Sealing, Insulating the Heating / cooling fluid pipes, automatic door closing, Air curtain, Thermostat / Control.

2.3 Energy conservation in electric furnaces, ovens and boilers.

Unit-III : Energy Conservation Approaches In Industries

3.1 New equipment, technology, staffing, training.

3.2 Calculation and costing of energy conservation project; Depreciation cost, sinking fund method.

3.3 Cost evaluation by Return On Investment(ROI) and pay back method etc.

Unit-IV Performance improvement of existing power plant

4.1 Cogeneration, small hydro, DG Set.

4.2 Demand side management; Load response programmes; Types of tariff and restructuring of electric tariff

4.3 Technical measures to optimize T and D losses.

Unit-V Energy Audit

5.1 Energy audit and its benefits.

5.2 Energy flow diagram; Preliminary, Detailed energy audit.

5.3 Methodology of preliminary energy audit and Detailed energy audit –
Phase I, Pre audit.
Phase II- Audit
Phase III- Post audit.

5.4 Energy audit report; Electrical Measuring Instruments - Power Analyzer.

COURSE OUTCOMES.

CO1 Identify demand supply gaps in the present scenario.
CO2 Understand the conservation approaches for an industry.
CO3 Draw the energy flow diagram of and industry and identify waste stream.
CO4 Identify energy wastage and suggest alternative methods.
CO5 Evaluate the concepts of energy audit.

RECOMMENDED BOOKS.

1. Electric Energy Generation, Utilisation and Conservation by Sivaganaraju, S Pearson, New Delhi,2012
2. Project Management by Prasanna Chandra, Tata Mcgraw Hill, New Delhi
3. O.P. Jakhar, Energy Conservations in Buildings by Khanna Publishing House, New Delhi
4. Financial Management by Prasanna Chandra Tata Mcgraw Hill, New Delhi.
5. Energy management Handbook by Prasanna Chandra, Tata Mcgraw Hill, New Delhi.
6. O.P. Gupta, Energy Technology by Khanna Publishing House, New Delhi

DISTRIBUTION OF MARKS

UNITS	Name of Topic	TIME ALLOTTED (Hrs.)	MARKS ALLOTTED (%)
1	Introduction	14	30
2	Energy Conservation Approaches In Industries	08	15
3	Energy Conservation Approaches In Industries	08	15
4	Performance improvement of existing power plant	08	15
5	Energy Audit	10	25
TOTAL		48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN MEDICAL ELECTRONICS	
Course Code: MEOE 602	Course Title: Open Elective-II b)Disaster Management
Semester: 6th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE CONTENT

Unit – I: Understanding Disaster

1.1 Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity

1.2 Disaster and Development, and disaster management.

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

2.1 Geological Disasters (earthquakes, landslides, tsunami, mining);

2.2 Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves)

2.3 Biological Disasters (epidemics, pest attacks, forest fire);

2.4 Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemi- cals and biological disasters)

2.5 Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.

Unit- III: Types, Trends, Causes, Consequences and Control of Disasters

3.1 Disaster Management Cycle – Paradigm Shift in Disaster Management.

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

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

3.4 Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Stretegy, Hyogo Frame- work of Action.

Unit– IV: Disaster Management in India

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

4.2 Disaster Management Act 2005 – Institutional and Financial Mechanism,

4.3 National Policy on Disaster Management, National Guidelines and Plans on Disaster Management;

4.4 Role of Government (local, state and national),Non-Government and Inter Governmental Agencies

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

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

5.2 Disaster Communication System (Early Warning and Its Dissemination).

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

5.4 S&T Institutions for Disaster Management in India

COURSE OUTCOMES.

After competing 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
- Familiarised with organisation in India which are dealing with disasters

RECMMMENDED BOOKS

1.Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management

2. An overview on natural & man-made disasters and their reduction, Bhandani, R. K., CSIR, New Delhi

3. Management of Natural Disasters in developing countries by Srivastava, H. N., and Gupta G. D., , Daya Publishers, Delhi

4. Natural Disasters by Alexander, David, Kluwer Academic London

5.Disaster Management by Ghosh, G. K., , A P H Publishing Corporation

6. Disaster Management: Text & Case Studies by Murthy, D. B. N., , Deep & Deep Pvt. Ltd.

DISTRIBUTION OF MARKS

UNITS	Name of Topic	TIME ALLOTTED (Hrs.)	MARKS ALLOTTED (%)
1	Understanding Disaster	08	20
2	Types, Trends, Causes, Consequences and Control of Disasters	08	20
3	Types, Trends, Causes, Consequences and Control of Disasters	08	20
4	Disaster Management in India	08	20
5	Applications of Science and Technology for Disaster Management	08	20
TOTAL		48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN MEDICAL ELECTRONICS	
Course Code: MEOE603	Course Title: Open Elective a) Electronic commerce(E-commerce)
Semester: 6th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVE

The electronic commerce has changed the way the world is buying commodities with direct contact between business , consumer and other businesses. This subject aims at understanding the technology and methodology of electronic commerce.

COURSE CONTENTS

UNIT I Introduction to E-Commerce

1.1 Brief History of E-Commerce

1.2 Forces behind E-Commerce

1.3 E-Commerce Industry Framework.

1.4 Inter Organizational E-Commerce(B2B)

1.5 Intra Organizational E-Commerce

1.6 Consumer to Business Electronic Commerce(C2B)

UNIT II Architectural framework of e-commerce.

2.1 Network Infrastructure for E-Commerce.

2.2 Market forces behind I-way(Information super highway)

2.3 Components of I –Way.

2.4 Access Equipment, Global Information Distribution Network, Broadband Telecommunication.

UNIT III Introduction to Mobile Commerce

3.1 Mobile Computing Application,

3.2 Wireless Application Protocols, WAP Technology,

3.3 Mobile Information Devices.

UNITIV Introduction to Web Security

4.1 Firewalls & Transaction Security

4.2 Client Server Network, Emerging Client Server Security Threats

4.3 Firewalls & Network Security.

4.4 World Wide Web & Security,

4.5 Encryption,Transaction security.

4.6 Secret Key Encryption, Public Key Encryption.

4.7 Virtual Private Network (VPN).

UNITV Implementation Management Issues.

5.1 Overview of Electronics payment,

5.2 Digital Token based Electronics Payment System(EPS),

5.3 Smart Cards, Credit Card/Debit Card based EPS,

5.4 Emerging financial Instruments

i)Home Banking ii) Online Banking.

5.5 EDI(Electronic data interchange), EDI Application in Business.

UNITVI Legal requirement in E-Commerce.

6.1 Introduction to supply Chain Management,

6.2 CRM(Customer Relationship Management), Issues in CRM.

Books Recommended

1. Frontiers of Electronic Commerce, Ravi Kalakota, Andrew Winston

2. E-Commerce the cutting edge of Business, Bajaj and Nag

DISTRIBUTION OF MARKS

UNITS	Name of Topic	TIME ALLOTTED (Hrs.)	MARKS ALLOTTED (%)
1	Introduction to E-Commerce	08	20
2	Architectural framework of e-commerce.	08	20
3	Introduction to Mobile Commerce	04	10
4	Introduction to Web Security	14	25
5	Implementation Management Issues	08	15
6	Legal requirement in E-Commerce	04	10
TOTAL		48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING	
Course Code: MEOE604	Course Title: Open Elective -III b) Enterpreneurship and StartUps
Semester: 6th	Credits: 3
Periods Per Week : 3 (L:3 , T:0, P: 0)	

COURSE OBJECTIVE

Entrepreneurship Development and Start Ups aims at developing conceptual understanding for setting-up one's own business venture/enterprise. This aspect of Human Resource Development has become important in the era, when wage employment prospects have become meagre.

COURSE CONTENTS

1. Introduction to Entrepreneurship (12 hrs)

   1.1 Concept/Meaning and its need

   1.2 Competencies/qualities of an entrepreneur

   1.3 Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/ organizations at State/National level.

2. Market Survey and Opportunity Identification (Business Planning)

   2.1 How to start a small scale industry

   2.2 Procedures for registration of small-scale industry

2.3 List of items reserved for exclusive manufacture in small-scale industry

2.4 Assessment of demand and supply in potential areas of growth.

2.5 Understanding business opportunity

2.6 Considerations in product selection

2.7 Data collection for setting up small ventures.

3. Project Report Preparation

3.1 Preliminary Project Report

3.2 Techno-Economic Feasibility Report

3.3 Exercises on Preparation of Project Report in a group of 3-4 students

4. Start Ups & Modern world

4.1 Use of modern tools for success of Startups

4.2 Concept of inbound marketing

4.3 Concept of content marketing

4.4 Concept of conversion path and CTAs(call to action) in online marketing.

4.5 Introduction to closed loop marketing.

4.6 Social prospecting

4.7 Decision making strategies in Startups

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN MEDICAL ELECTRONICS	
Course Code: MEMP601	Course Title: Major Project
Semester: 6th	Credits:8
Periods Per Week : 12 (L:0 , T:0, P: 12)	

COURSE OBJECTIVE

This course will provide a platform to the student to apply the concepts learned during previous semesters to the field of medical electronics to design and develop innovative equipments/software , troubleshoot and repair medical electronic equipment, find solutions to industry related problems, etc.

COURSE CONTENTS

A project may be chosen from any one of the fields given below:

1	Projects related to designing electronic equipment/ instruments
2	Projects related to designing of any health care equipment/gadget
3	Projects related to designing of Android Apps.
4	Projects related to increasing productivity
5	Projects related to quality assurance
6	Projects connected with repair and maintenance of plant and equipment
7	Projects related to design, fabrication, testing and application of electronic circuits and components.
8	Projects related to microprocessor-based circuitry/ instruments.
9	Projects related to design, fabrication, testing and troubleshooting of medical electronics equipment
10	Software related projects.
11	Any other related problems of interest to industry

NOTE:

The list is only the guideline for selecting a project; however a student is at liberty to select any other related project of his choice independently under guidance of his teacher.

CURRICULUM

FOR

FIFTH & SIXTH SEMESTER

DIPLOMA

IN

MEDICAL LAB TECHNOLOGY

Revised SUBJECT STUDY SCHEME
(Semester: 5th | Branch: MEDICAL LAB TECHNOLOGY)

S. No.	Subject/Labs	STUDY SCHEME Hrs/Week		MARKS EVALUATION SCHEME							Total Marks of Internal & External	Credits
		Theory	Practical	INTERNAL ASSESSMENT			EXTE150RNAL ASSESSMENT					
				Theory	Practical	Total	Theory	Hours	Practical	Total		
MLPC 501	Clinical Pathology	-	10	-	150	600	-	-	100	400	1000	20
MLPC 502	Clinical Microbiology	-	10	-	150		-	-	100			
MLPC 503	Clinical Biochemistry	-	5	-	75		-	-	50			
MLPC 504	Blood Banking	-	5	-	75		-	-	50			
MLPC 505	Histopathology & Cytology	-	10	-	150		-	-	100			
	Total		**40**	**-**	**600**	**600**	**-**	**-**	**400**	**400**	**1000**	

Revised SUBJECT STUDY SCHEME
(Semester: 6th | Branch: MEDICAL LAB TECHNOLOGY)

S. No.	Subject/ Labs	STUDY SCHEME Hrs/Week		MARKS EVALUATION SCHEME							Total Marks of Internal & External	Credits
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Theory	Practical	Theory	Practical	Total	Theory	Hours	Practical	Total		
MLPC 601	Clinical Pathology	-	10	-	150	600	-	-	100	400	1000	20
MLPC 602	Clinical Microbiology	-	10	-	150		-	-	100			
MLPC 603	Clinical Biochemistry	-	5	-	75		-	-	50			
MLPC 604	Blood Banking	-	5	-	75		-	-	50			
MLPC 605	Histopathology & Cytology	-	10	-	150		-	-	100			
	Total	**-**	**40**	**-**	**600**	**600**	**-**	**-**	**400**	**400**	**1000**	

5. PRACTICAL PROFESSIONAL TRAINING – I (Structured and Supervised) AND 6. PRACTICAL PROFESSIONAL TRAINING – II (Structured and Supervised)

L	T	P
-	-	40

OBJECTIVE

The objective of providing professional training is to:

1. Provide real life experience by creating necessary awareness regarding use of various types of diagnostic equipment, particularly sophisticated ones which are used in the field of medical laboratory technology.

2. Create confidence in the students to work in world of work by developing practical skills pertaining to laboratory management and diagnostic skills in the field of clinical hematology, transfusion medicine blood banking, clinical biochemistry, clinical microbiology, histopathology and cytology and ensuring laboratory safety and quality assurance.

3. Develop appreciation regarding size and scale of operations, environment and other related aspects like value of team work, interpersonal relations and professional ethics in the field of medical laboratory technology.

4. Develop necessary traits for starting small clinical laboratories as per requirements.

SELECTION OF TRAINING PLACES

The institute offering diploma programme in Medical Laboratory Technology should establish contact/rapport by personal visit to following types of organizations:

1. Medical Colleges/Research institutions
2. Civil Hospitals at District Headquarters having well equipped laboratory
3. Hospitals in private sector
4. Well established clinical laboratories being run by a qualified person

LIST OF LABROROTIES WHERE STUDENTS HAVE TO UNDEGO PROFESSIONAL TRAINING

List of laboratories suggested below where students should do practical training during 5th semester and 6th semester.

5TH SEMESTER	
MLPC 501	Clinical Pathology
MLPC 502	Clinical Microbiology
MLPC 503	Clinical Biochemistry
MLPC 504	Blood Banking
MLPC 505	Histopathology & Cytology

6TH SEMESTER	
MLPC 601	Clinical Pathology
MLPC 602	Clinical Microbiology
MLPC 603	Clinical Biochemistry
MLPC 604	Blood Banking
MLPC 605	Histopathology & Cytology

In addition to the above, students are expected to learn various tests being conducted at the training centre, where ever they are undergoing training.

NOTE:

- The Principal of the institute where diploma programme in Medical Laboratory Technology is being offered, with the help of Directorate of Technical Education/Secretary, Technical Education may approach Director, Health Services/Director, Medical Education/Secretary, and Health to collaborate in offering structured and supervised project work/practical training of students in above organizations. It will be worthwhile to sign a "Memorandum of Understanding" regarding the involvement of students in undergoing practical training.
- The Principal of the institute may also approach Regional Apprenticeship Adviser (Northern Region), Kanpur to provide training seats under Apprenticeship Act to the students

METHODOLOGY OF ORGANIZING PROFESSIONAL TRAINING

Each concerned teacher will be responsible for a group of students in respective specialty to plan, supervise and monitor the progress when placed in different organizations for practical training. For this purpose, necessary recurring expenditure for making payment of TA/DA to the faculty of institute and the experts may be worked out by respective institutes, keeping in view, number of visits and the distances involved in such travelling. The concerned teacher will have to continuously interact with training centres to monitor the progress of the students

EVALUATION OF STUDENTS FOR PROFESSIONAL TRAINING

Professional training will have 1000 marks. Out of which 600 marks will be awarded by the organization where placed for practical/professional training and 400 marks are for (Board) external examination. The criteria for internal assessment will be as under:

S. No.	Criteria for internal assessment by Weightage Organization where placed for Practical/Professional training		(%)
1.	Attendance/Punctuality	10	
2.	Proficiency in conducting laboratory test	30	
3.	Preparation of portfolio based on day to day work done in various laboratories		20
4.	Initiative/responsibility exhibited	10	
5.	Interpersonal relations		10
6.	Behaviour/attitude	10	
7.	Maintenance of equipment and work place		10

Note:

For Practical Courses: The weightage of internal assessment is 60% and for external examination is 40%. The student has to obtain atleast 40% marks individually both in internal assessment and external assessment.

GENERAL GUIDELINES

I. The students are expected to prepare practical record book as per given list of the experiments. Besides, they can also add other experiments as well.

II. External examiner along with internal faculty should evaluate the student's performance through viva voice/spotting/performance and synopsis.

CURRICULUM
FOR
SIXTH SEMESTER
DIPLOMA IN
OFFICE MANAGEMENT
AND
COMPUTER
APPLICATIONS

STUDY SCHEME FOR SIXTH SEMESTER OMCA

Course Code	Subjects	Time in Hours				Credits			
		Lecture	Tutorial	Practical	Total	Lecture	Tutorial	Practical	Total
OMPC601	Entrepreneurship and Business Development	4	-	-	4	4	-	-	4
OMPC602	Stenography-V	-	-	6	6	-	-	3	3
OMMP603	Major Project	0	-	22	22	0	-	11	11
OMPC605	Business Law	4	-	-	4	4	-	-	4
	Total	8	0	28	36*	8	0	14	22

*The extra hours shall be managed during Major Project by the Candidates themselves.

PROGRAM FOR THREE YEAR DIPLOMA IN OFFICE MANAGEMENT AND COMPUTER APPLICATIONS	
Course Code: OM**PC601**	Course Title: **Entrepreneurship and Business Development**
Semester: **6th**	Credits:**04**
Periods per week: **04 (L:04, T:00, P:00)**	

COURSE OBJECTIVE:

The necessary objective of this course is to develop Entrepreneurial mindset so as to opt for self-employment, promote Entrepreneurship as life skill to improve quality of life, skill of creation and management of Entrepreneurial pursuit.

COURSE CONTENT:

1. **Introduction**
   - 1.1 Meaning/Importance
   - 1.2 Evolution of term Entrepreneurship
   - 1.3 Factors influencing Entrepreneurship
     - 1.3.1 Psychological Factors
     - 1.3.2 Social Factors
     - 1.3.3 Economic Factors
   - 1.4 Characteristic of Entrepreneur

2. **Government Policies and Entrepreneur**
   - 2.1 Government policies supporting entrepreneurship
   - 2.2 Entrepreneurship Development Institutions-National, State and district levels

3. **Entrepreneurship Journey**
   - 3.1 Idea generation
   - 3.2 Feasibility study & opportunity assessment
   - 3.3 Business plan: Meaning/Purpose/Element

4. **Management of a Small Enterprise**
   - 4.1 Financial management
   - 4.2 Personnel management
   - 4.3 Production and operations management (Elementary inputs of above mentioned functional areas of management of a small enterprise)
   - 4.4 Marketing management (sales promotion meaning and importance of TQM)

5. **Project report**
   - 5.1 Introduction
   - 5.2 Idea selection
   - 5.3 Selection of product/service
   - 5.4 Aspects of project
   - 5.5 Phases of project
   - 5.6 Project report

5.7 Content of project report
5.8 Perform of project report

COURSE OUTCOME:

- Identify aptitude for Entrepreneurship.
- Strategies for growth of new business.
- Able to select and utilize appropriate tools for specific business.

UNIT WISE TIME &MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HOURS)	MARKS ALLOTTED (%)
1.	09	15
2.	13	20
3.	13	20
4.	12	20
5.	17	25
TOTAL	**48**	**100**

PROGRAM FOR THREE YEAR DIPLOMA IN OFFICE MANAGEMENT AND COMPUTER APPLICATIONS	
Course Code: OM**PC602**	Course Title: **Stenography-V**
Semester: **6th**	Credits:**03**
Periods per week: **06 (L:00, T:00, P:06)**	

COURSE OBJECTIVE:

The objective of this subject is to enable the students to acquire a good speed in stenography In order to save time as they have to take dictation quite often on matters of confidential nature. The students must have some knowledge about typing skill.

COURSE CONTENT:

1. Intersection
2. Business Phrases
3. Political Phrases
4. Banking Phrases
5. Stock Broking Phrases
6. Insurance Phrases
7. Shipping Phrases
8. Technical Phrases
9. Railway Phrases
10. Legal Phrases
11. Theological Phrases
12. Special List of words
13. Practice important names of Indian cities And personalities
14. Special list of contractions

COURSE OUTCOME:

- Take dictation, transcript and all types of correspondence, prepare report in less time.

UNIT WISE TIME &MARKS DISTRIBUTION

UNIT No.	Time Allotted (Hours)	Marks Allotted (%)
5	08	08
6	07	07
7	07	07
8	06	07
9	07	07
10	07	07
11	06	07
12	07	07
13	06	07
14	07	07
15	06	07
16	07	07
17	07	07
18	08	08
TOTAL	**96**	**100**

PROGRAM FOR THREE YEAR DIPLOMA IN OFFICE MANAGEMENT AND COMPUTER APPLICATIONS	
Course Code: OMMP**603**	Course Title: **Major Project**
Semester: **6th**	Credits:**11**
Periods per week: 22 **(L:00, T:00, P:22)**	

MODE OF CONDUCTION:

INHOUSE or OUTSOURCE

PROJECT ORIENTED PROFESSIONAL TRAINING

The students of diploma in Office Management and Computer Applications will be required to Undergo Major Project in the sixth semester during the final year in an office which will be arranged by the implementing institutions/students. The following organizations may be considered for arranging the project oriented professional training:

- Government Departments/Offices
- Business/Commercial Organizations
- Industrial Establishments
- Hospitals
- Educational Institutions
- Railways, Airlines and other Transport Undertakings
- Publishing Houses/Press
- Banking and Insurance Companies
- Job-work Centres
- Computer Centres/Documentation Centres/Call Centres

This is, however, a tentative list. Heads of Departments may be given the complete autonomy/freedom to select relevant organization to place all the students by rotation e.g.1-2 months in secretarial work section, 1-2 months for stenography work and 1-2 months in computer section and 1-2 months in administrative/management section of various organizations. While selecting the training station, care should be taken to select such organizations that are willing to accept the trainees and where there is sufficient scope for the trainee to undertake varied kind of experiences relevant to their profession and aptitude.

Suggested departments/sections for on-the-job professional training are:

- Stenography work and typing with various executives (1-2 months)
- Handling mail, filing, indexing and operation of traditional and modern office machines and equipment (1-2 months)
- Receptionist, Operation of computer, duplicating, stores handling, accounts, and editing jobs (1-2 months)

The purpose of this project oriented professional training is to expose the students to the world of work and provide professional experience in real life situation. The students will have to maintain a daily/weekly/monthly diary/work book and submit detailed reports of their activities. These reports will be certified by a responsible officer of the organization where the student is undergoing professional training and doing his/her project. Each student is required to undergo one Practical Oriented Project according tohis/her area of interest and the project report is to be submitted at the end of project oriented professional training period. The concerned teachers will guide and supervise the students on work stations at regular intervals. A systematic plan of action is required to be prepared, well in advance, by the polytechnic in consultation with the organizations where professional training and project has to be carried out. The teachers should clearly specify the expected learning outcomes and schedule on day-to-day basis for the whole of the period of student's project oriented professional training. Performa may be developed by the polytechnic teachers in consultation with personnel from industry to monitor the progress of the students. The Performa should be filled by the students on daily, weekly and monthly basis, and should be duly countersigned by the personnel from industry and concerned teacher attached to the particular student. Each teacher is supposed to guide and supervise about 5 – 8 students.

PROGRAM THREE YEAR DIPLOMA IN OFFICE MANAGEMENT AND COMPUTER APPLICATIONS	
Course Code: OM**PC605**	Course Title: **BUSINESS LAWS**
Semester: **6th**	Credits:**04**
Periods per week: **04(L:04, T:00, P:00)**	

COURSE OBJECTIVE:

The main objective of this course is to acquaint Knowledge about the various Business Laws affecting the day-to-day working of the business. Since the students have to work in capacity of legal assistant, the knowledge of latest business Laws and amendments are essential. In these days deep business is governed by different business Laws so students have to be made familiar with some important Laws.

COURSE CONTENTS:

1. Income Tax Act

1.1 Meaning of income and objectives of income tax
1.2 Heads of taxable income (only outlines)
1.3 Definition of salary, allowances and requisites, Deductions.
1.4 Elementary knowledge of filing of income tax return of salary Income.

2. Factories Act, 1948

2.1 Introduction- Definition of factory, worker, Employers
2.2 Provision of health, safely, welfare, working hours, and leave under factory Act.

3. Contract Act

3.1 Introduction and Definition
3.2 Essential of valid contract
3.3 Classification of contract
3.4 Breach of contract

4. Consumer Protection Act, 1986

4.1 Introduction, Meaning, Objectives and Scope of Act.
4.2 Definition and Meaning- Consumer Complaint and dispute.
4.3 Consumer Disputes Redressal Agencies:-
  4.3.1 District Forum
  4.3.2 State Commission
  4.3.3 National Commission 109

5. The Information Technology Act 2000 (Cyber laws)

5.1 Introduction and importance of cyber laws

6. Right to information Act 2005

6.1 Meaning and Importance

6.2 Method of acquiring Information

7. Intellectual Property Right (IPR)

Introduction, scope, importance and Elementary knowledge about registration procedure of:

1.1 Copyright

1.2 Patents

1.3 Trade Marks

COURSE OUTCOME:

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

- Understand about Income Tax Act.
- Acquire knowledge regarding Factories and Contract Act
- Learn about different Consumer Protection Act.
- Acquire knowledge about different Cyber Laws.
- Understand RTI and IRP.

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTED (HRS)	MARKS ALLOTED (%)
1.	14	25
2.	08	10
3.	11	20
4.	11	20
5.	06	05
6.	07	10
7.	07	10
TOTAL	**64**	**100**

CURRICULUM
FOR
SIXTH SEMESTER
OF
THREE-YEAR DIPLOMA COURSE
IN
TEXTILE DESIGNING

Code	Subjects	Study Scheme			Total Hours L+T+P	Credits			Total Credits L+T+P
		Periods Per Week				L	T	P	
		L	T	P					
TDPC 601	Fundamentals of Knitting	4	0	0	4	4	0	0	4
TDPC 602	Fundamentals of Knitting Lab	0	0	2	2	0	0	1	1
TDPC 603	Quality Control in Textiles	4	0	0	4	4	0	0	4
*	Elective-I	4	0	0	4	4	0	0	4
*	Elective-I Lab	0	0	2	2	0	0	1	1
**	Open Elective-II	4	0	0	4	4	0	0	4
TDPC 607	Employability Skills	4	0	0	4	4	0	0	4
TTBS 609	Constitution of India	2	0	0	2	0	0	0	0
TOTAL		**22**	**0**	**04**	**26**	**20**	**0**	**02**	**22**

Elective–I Subjects for 6th Semester

(*) Course Code	Subject Name	L-T-P-C
TDPE601	Fashion and Textile	4-0-0-4
TDPE602	Fashion and Textile Lab	0-0-2-1
TDPE603	Fashion Designing	4-0-0-4
TDPE604	Fashion Designing Lab	0-0-2-1
TDPE605	Clothing Science	4-0-0-4
TDPE606	Clothing Science Lab	0-0-2-1
TDPE607	Basics of Garment Construction	4-0-0-4
TDPE608	Basics of Garment Construction Lab	0-0-2-1
Note: student has to opt theory and lab course of same subject		

Open Elective–II Subjects for 6th Semester

(**) Course Code	Subject Name	L-T-P-C
TTOE601	Apparel marketing &Merchandising	4-0-0-4
TTOE602	Costing and its application in Textiles	4-0-0-4
TTOE603	Financial Management in Textiles	4-0-0-4
TTOE604	Marketing Management in Textiles	4-0-0-4
TTOE605	Textile marketing & Merchandising	4-0-0-4

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
Course Code: TDPC 601	Course Title : Fundamental of Knitting *
Semester: 6th	Credits:4
Hours per week: 4(L: 4 T: 0 P: 0)	

(*Subject common for textile technology and textile design)

COURSE OBJECTIVE:

The aim of this subject is to impart knowledge and skills to the students regarding various types of knits and their use in the textile design as they may have to work in knitting industry and import and export houses as well.

COURSE CONTENT

1. **Unit 1**
   Comparison between knitted and woven fabrics, warp and weft knitting - Types of knitting needles, their knitting cycle, advantages and disadvantages of each
2. **Unit 2**
   Weft Knitting - Types of stitches: Knit, tuck, float, lay their representation, effects, methods of formation, and their end uses. Preparation of knit, tuck, and float stitches.
3. **Unit 3**
   Weft knit structures: Plain, Rib, Interlock and Purl, their characteristics, representation, derivatives, end uses and knitting cycles. Passage of yarn through Flat Bed and Circular Weft Knitting Machines. Design of plain, rib, inter lock and purl knits.
4. **Unit 4**
   Fabric defect in weft knitting, cover factor/tightness factor, Robbing back
5. **Unit 5**
   Warp Knitting: Introduction to underlap and overlap, closed lap and open lap. Brief description of Tricot and Raschel machines and fabrics, lapping movement, design of warp knitting.

COURSE OUTCOME

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

- Construct different types of knitting design
- Control the Knitting parameters
- Operate the weft and warp knitting machine

RECOMMENDED BOOKS:

1. Knitting technologies by D.B.Ajgaonkar
2. Knitting technology by David J.Spencer
3. Textile Mathematics Vol III by J. E. Booth

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Alloted(%)
1	15	26
2	10	16
3	15	26
4	10	12
5	14	20
Total	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
Course Code: TDPC 602	Course Title : Fundamental of Knitting-Lab *
Semester: 6th	Credits:1
Hours per week: 2(L: 0 T: 0 P: 2)	

(*Subject common for textile technology and textile design)

LISTOFPRACTIALS

1. To study different types of knitting needle
2. To study different types of Knitting Stitches.
3. To study passage of yarn through flatbed knitting machine
4. To study passage of yarn through circular weft machine
5. Identification of fabric defects of weft knitted fabrics
6. To study knitting cycle of latch needle
7. To study knitting cycle of needle
8. To study knitting cycle of Compound needle
9. To study knitting cycle of Purl needle
10. To study lapping movement of warp knitting

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
Course Code: TDPC 603	Course Title : Quality Control in Textile*
Semester: 6th	Credits:4
Hours per week:4 (L: 4 T: 0 P: 0)	

(*Subject common for textile technology and textile design)

COURSE OBJECTIVE:

The students of Textile Designing have to learn the quality control parameters of various sections in Textile industry so that the competence of the students can be utilized to improvise the product.

COURSE CONTENT

1. Unit 1

1.1 System of Quality control in spinning: Role and scope, key variables, establishing norms or standards, Collection and interpretation of data and corrective action.
1.2 Mixing quality and Cost: Instrumental evaluation of cotton, control of mixing quality through fiber characteristics, control of mixing cost and quality, linear programming for cotton mixing and its formulation and approach.
1.3 Yarn realization: Records and estimation of yarn realization and waste in spinning mill, norms for yarn realization.
1.4 Waste and cleaning in Blowroom and carding: Calculation of Trash content and cleaning efficiency, Norms for waste and cleaning efficiency, assessing the performance of Blowroom and card.
1.5 Comber waste control: Technological conditions, optimization of comber waste extraction, norms and procedures for control of comber waste.
1.6 Control of yarn quality: Measurement, assessment and control of count, strength, unevenness, and imperfections of yarn.

2. Unit 2

2.1 System of Quality control in weaving: Scope and approach to process control in weaving. Establishing and standards schedule of checks and machinery audit.
2.2 Quality Control in winding, warping, and sizing: Approach, scope, control, and optimization.
2.3 Control of Quality in Loom shed: scope and approach, control of loom speed, efficiency, and stops. Expected loom efficiency, loom allocation.
2.4 Fabrics Quality in Weaving: Scope and approach, control of some specific fabric defects, grey fabric imperfection.

3. Unit 3

3.1 System of Process Control in Chemical Processing: Scope and approach, norms and standards.
3.2 Quality control and Productivity: Quality control and productivity in Bleaching, dyeing, printing, and finishing. Control of damages in chemical processing.

COURSE OUTCOME

After completion of the course the student be able to:

- Work in the Quality Control Cell in the Industry
- Control the quality of the end product
- Work in the R & D section

RECOMMENDED BOOKS

1. GardeARandSubramanianTA,"ProcessControlinCottonSpinning,"ATIRA,Ahmedabad, 2nd Ed., 1978.
2. PaliwalMCandKimothiPD,"ProcessControlinweaving",ATIRA,Ahmedabad2ndEd, 1978.
3. GokhaleSVandModiJR,"ProcessandQualityControlinChemicalProcessingof Textiles", ATIRA, Ahmedabad, 1992
4. RatanamTV,"Qualitycontrolinspinning",SITRA,Coimbatore,1994.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Alloted (%)
1	25	40
2	22	35
3	17	25
Total	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
Course Code: TDPE601	Course Title:- (Elective-1) Fashion and Textile
Semester: 6th	Credits:4
Hours per week: 4 (L: 4 T: 0 P: 0)	

COURSE OBJECTIVE:

Students of Textile Design must have enough knowledge about fashion and textile. He must be aware of the latest trend and making fabric more appealing.

COURSE CONTENT:

1. **Unit 1**
   Fashion: Introduction to fashion and apparel design, Origin of fashion, Definition, Terminology, Fashion concepts, Fashion analysis, Fashion trends, Fashion creations.
2. **Unit 2**
   Fashion theories:- Fashion of different eras, French revolution.
3. **Unit 3**
   Fashion promotion:- From design to production. Style, Fad, Trends, Fashion industry. Design, Dress designing and creating varieties, Through designs.
   Principals of design, Definition, Harmony, Proportion balance, Rhythm, Emphasis, Meaning, Types and application on apparel.
   Colour:- definition dimension of colour, Hue, Value, Intensity.
   Colour scheme: - importance, and application of colour in apparel.
   Psychology of clothing:- First impression, role of socio psychological and economical aspects of clothing. Comfort of the apparel.
4. **Unit 4**
   Textiles:- Historical development of textile fibres. Classification of fibres, definition and general properties. Natural fibres-cellulose, cotton, Wool and silk, Mineral fibres; Physical and chemical properties. Man- made and synthetic fibres, Rayon, Nylon, Polyster, Acrylic fibres, Physical and chemical properties; Identification offibres.
   Yarn:- Yarn properties, yarn count, Yarn twist, yarn types single, plied and cord yarn, Sewing thread,
   Complex Yarns:-Novelty Yarns, Textured Yarns and metallic Yarns.

5. **Unit 5**
   Fabric: - Characteristics, Types, weaves - plain, Twill, Satin and variations. Fancy weaves: - dobby, jacquard, Leno, double cloth. Knitting: - circular, Tubular, Jersey. Nonwovens: - films, foams, felting, braiding, bonding and laminating

COURSE OUTCOME

After completion of the course the student be able to:

- Scour the cotton cloth
- Bleach and mercerize the cellulosic and protein fibre as well as synthetic.
- Classify various category of coloring matter for Textile.

RECOMMENDED BOOKS

1. Technology of Finishing - V A Shenai.
2. Textile Finishing by J T Marsh, B I Publications, New Delhi
3. Technology of Printing by V A Shenai
4. Technology of Printing by Kalley
5. A glimpse of Chemical Technology of Fibrous Materials by R R Chakravorty
6. Dyeing and Printing by Varke
7. Dyeing and Printing by Joyce Storey

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	15
2	10	15
3	18	30
4	16	25
5	10	15
TOTAL	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
Course Code: TDPE602	Course Title : (Elective-1) Fashion and Textile Lab
Semester: 6th	Credits:1
Hours per week: 2(L: 0 T: 0 P: 2)	

LIST OF PRACTICALS

1. Identify and apply the principles and elements of design in the creation of visual solutions to art and design
2. Create and compose abstract compositions that effectively apply the principles and elements of design as appropriate for the content to be communicated in an art or design piece.
3. Create and compose representational graphic reductions that effectively apply the principles and elements of design as appropriate for the content to be communicated in an art or design piece
4. Identify and analyze different type of knits samples and enlist their characteristics (design)
5. Physical analysis of fabrics composed of different fibres like cotton, wool, silk, polyester.
6. Identification of fibres in a fabric sample through:
   -Burning test
   -Microscopic test
   -Chemical test (Solubility Test)

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
Course Code: TDPE 603	Course Title: (Elective-1) Fashion Designing
Semester: 6th	Credits:4
Hours per week:4 (L: 4 T: 0 P: 0)	

COURSE OBJECTIVE:

The skill in fashion designing is essential for the students of Textile Designing so as to develop in them the creativity. After going through this subject, the student of Textile designing will be able to illustrate different types of figures and dresses in different colour media.

COURSE CONTENT:

1 Fashion:
Introduction to fashion and apparel design. Origin of fashion, concept, analysis, trends and creations.

2 Fashion Theories:
Fashion of different eras, French and Greek revolutions, fashion promotion, style-fad-trends.

3. Fashion Design fundamentals: Basic Concept of design, elements of art, Definition of line, shape, form, size, space, texture, and colour. Structural and decorative dress designing, creating varieties through designs.

4. Principles of Design:
Definition Harmony, Proportion, Balance, Rhythm, Emphasis, meaning types and application on apparel, psychology of clothing.

5 Anatomy for designers:
Human Proportion and figure construction. Methods of determining individual proportions.

6. Psychology of Clothes:
First impression, role of socio-psychological and economical aspects.
Display of fashion materials: definition and importance, source technique and window display, classic fashion shows. Important fashion centers of the world and India.

7. Computer-aided designing:
Fashion sketching, colour matching, and computer graphics.
Folios: Creative, Dress, designer.

COURSE OUTCOME

After completion of the course the student be able to:

- Work on the corel draw and photoshop
- Make design using various CAD application
- Construct 3-D modeling of the design

RECOMMENDED BOOKS

1. Fashion Drawing Designs from Magazine of Thailand, New Age Publisher, Delhi
2. Fashion Drawing – The Basic Principles by Anne Allen and Julion Seaman, Happer & Row Publishers, New York
3. Fashion Illustration by Bina Abling, Fair child books, New York

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
01	8	10
02	11	20
03	11	20
04	10	15
05	10	15
06	7	10
07	7	10
TOTAL	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
Course Code: TDPE 604	Course Title : (Elective-1) Fashion Designing Lab
Semester: 6th	Credits:1
Hours per week: 2(L: 0T: 0P: 2)	

LIST OF PRACTICALS:

1. Developing a theme by taking inspiration from different sources – Nature, Architecture, History, Folk art.
2. Develop outfits based on the developed theme keeping in mind the silhouette, colour, texture and other details.
3. Sourcing the fabric for the designed outfits and collection of swatches
4. Identify and apply the principles and elements of design in the creation of visual solutions to art and design
5. Front View, Side View & Back View of Fashion Figure
6. Designing of layout for the following:
    a. High fashion garment
    b. Basic garment
7. Identification of different types of stitches and seams

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
Course Code: TDPE605	Course Title: (Elective-1) Clothing Science
Semester: 6th	Credits:4
Hours per week: 4(L: 4 T: 0 P: 0)	

COURSE OBJECTIVE:

The students of textile design should have knowledge and skills in clothing science so that they are able to employ this knowledge in making better products.

COURSE CONTENT:

1. **Introduction:**
   Factors involved in the study of clothing; clothing considered as a system interacting with the body.
2. **Dimensional Stability:**
   Hygral expansion, Relaxation shrinkage, swelling shrinkage. Felting shrinkage, Shrinkage in knitted fabrics. Stretch and recovery properties.
3. **Serviceability:**
   Abrasion resistance, Tear strength, Colour fastness, Seam slippage, Seam strength, Snagging, Pilling.
4. **Transmission properties:**
   Air permeability, Water vapour permeability, Wetting Longitudinal and transverse wicking, Water absorption, Thermal conductivity, Electrical conductivity.
5. **Thermal Comfort:**
   Thermal transfer processes – Dry heat transfer and Rapid heat transfer.
   Flammability – burning behaviour. Thermal degradation, Function of textiles in enhancing thermal comfort.
6. **Fabric Handle:**
   Tensile properties. Shear properties. Bending properties, Compressional properties. Roughness and Frictional properties. Buckling behaviour. Low stress mechanical properties and tailorability. Sewability of fabrics.

COURSE OUTCOME

After completion of the course the student be able to:

- Analyze the cloth structure
- Construct a comfortable cloth by taking into account technical parameters.
- Calculate the different parameter of cloth
- Find out the seam strength.

RECOMMENDED BOOKS:

1. Garment Finishing and Care Labelling by S S Satsangi, M/s Usha Publications, Delhi.
2. Textiles - Fibres and Fabrics by Bernard Polytechnic Corbman, M/s McGraw Hill, International Edition
3. Garment Design by Armstrong.
4. The Technology of Clothing Manufacture by Harold Carr & Barbara Latham.
5. Fashion Production Terms by Debbie Ann Gioello & Berke

SUGGESTED WEBSITES

1. https://online courses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
01	10	15
02	10	15
03	13	20
04	13	20
05	9	15
06	9	15
TOTAL	64	100

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
Course Code: TDPE606	Course Title : Clothing Science Lab
Semester: 6th	Credits:1
Hours per week: 2(L: 0T: 0P: 2)	

LIST OF PRACTICALS

1. Determine the Air permeability of a fabric.
2. Determine the water repellency of a fabric.
3. Determine the water permeability of a fabric.
4. Determine the abrasion resistance and pilling resistance of a fabric.
5. To find out the seam strength of a Garment.
6. Determine the water absorption capacity of fabric.
7. Determine the Drape coefficient of a fabric sample.
8. Determine the thickness of fabric.
9. Determine the tear resistance of a fabric using Elmendorf Tear Tester.
10. Determine the tensile strength of a woven fabric.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
Course Code: TDPE607	Course Title : (Elective-1) Basics of Garment Construction
Semester: 6th	Credits:4
Hours per week:4 (L: 4 T: 0 P: 0)	

COURSE OBJECTIVE:

The students of textile design should have knowledge and skills in cutting, sewing, pressing, etc. so that they are able to employ the knowledge in making better products.

COURSE CONTENT:

1. **Garment Manufacturing:**

   Introduction, present scenario and future of Indian apparel industry.

2. **Raw material:**

   Woven and knitted fabrics with their characteristics and applications for different uses, Garment manufacturing from woven and knitted fabrics.

3. **Designing and Pattern making:**

   Introduction to designing, Pattern making – draft construction, advanced Pattern making, grading of pattern, marker planning, fabric spreading, laying methods, Factors affecting spreading, fabric cutting, computerized cutting machines, automatic ticketing and bundling, garment size and size charts.

4. **Garment Sewing:**

   Introduction to sewing machine and its parts and working details, Different types of sewing machine, driving system of sewing machines, Various attachments of sewing machine, high speed sewing and sewing room planning, Preparation of seamless garments and its applications.

5. **Stitches and seams types:**

   Stitch formation, types of stitches, seam classification, seam geometry, seam strength and slippage, seam puckering. Thread calculation and its consumption, seam quality.

6. **Sewing Needles and Threads –**

   Needle – functions, special needles, Needle size, Needle points; sewing thread – construction, material, thread size and packages.

7. Trimming and Garment accessories:

Linings, interlinings, wadding, lace, braid, elastic, hook and loop fastenings, shoulder pads, eyelets and laces, Zip fasteners and buttons.

8. Garment finishing:

Fasteners, thread tucking, care and size labeling system, checking, pressing, folding and packing, packaging standards for domestic and export markets.

COURSE OUTCOME

After completion of the course the student be able to:

- Perform operation of Semi-automatic and automatic loom.
- Control the warp protecting mechanism on the loom
- Control the weft stop motions on the loom

RECOMMENDED BOOKS

1. Garment Finishing and Care Labelling by S. S. Satsangi, M/s Usha Publications, Delhi.
2. Textiles - Fibres and Fabrics by Bernard Polytechnic Corbman, M/s McGraw Hill, International Edition
3. Garment Design by Armstrong.
4. The Technology of clothing manufacture by Harold Carr & Barbara Latham.
5. Fashion Production Terms by Debbie Ann Gioello & Berke.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	15
2	10	15
3	10	15
4	9	15
5	6	10
6	5	8
7	9	15
8	5	7
Total	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
Course Code:TDPE608	Course Title: (Elective-1) Basics of Garment Construction Lab
Semester: 6th	Credits:1
Hours per week:2 (L: 0 T: 0 P: 2)	

LISTOFPRACTICALS

1. To study tools and equipments used in clothing/garment constructions.
2. To demonstrate the sewing machine, functions and working of various parts.
3. To use different sewing equipments used in the Garment design.
4. To demonstrate various sewing aids used in garment design lab.
5. To make simple stitches on cloth like circular, straight lines etc.
6. To make different types of pleats and gather.
7. To study and prepare different necklines.
8. Appliances required for pressing and finishing and pressing of textiles and finishes (mill visits only).

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
CourseCode:TTOE601	Course Title : (Open Elective-II) Apparel Marketing and Merchandising*
Semester: 6th	Credits:4
Hours per week:4(L: 4T: 0P: 0)	

(*Subject common for textile technology and textile design)

COURSE OBJECTIVE:

The students of textile design should have knowledge and skills in Apparel Marketing and Merchandising so that they are able to work in this section of the textile industry.

COURSE CONTENT

1. **Apparel Industry Profile:**
   Current Indian export and India's position in the world apparel market Organizational structure of export house, buying houses and domestic companies and export procedures, Buyer classification and buying network in exports

2. **Marketing:**
   Domestic and International marketing, challenges for international marketing, Development of a product line, design, costing, developing a sample, specifications, market research, identification of markets, promotion mix, advertising, sale promotion, promotion budget, coordination between sales and production

3. **Merchandising:**
   Exporthouses,startradingexporthouses,Outsourcing,Merchandisebuyingandhandlingprocess,Merchandiseplans,determiningmerchandisesources,demandanalysis,evaluating merchandise, merchandise forecasting and budgeting, planning inventory levels, development of relationship between the textile and retailing industry, setting up the dealers and merchandisers

COURSE OUTCOME

After completion of the course the student be able to:

- Perform as marketing and merchandiser.
- Work in export house
- Set up dealership and retail outlet.

RECOMMENDED BOOKS

1. Kotler Philip, "Marketing Management", Prentice Hall of India, Delhi, 9th Edition, 1998.
2. Bheda R, "Managing Productivity in the apparel Industry", Communications, New Delhi, 2000.
3. Cooklin G, "Introduction to Clothing Manufacture", Om book service, New Delhi, 2002.
4. Mehta PV and Bhardwaj SK, "Managing Quality", New Age International, New Delhi, 2001.

5. Rosenau J A and Wilson DL, "Apparel Merchandising", Amazon, USA, 2001.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No	Time Allotted(Hrs)	Marks Allotted(%)
1	16	25
2	16	25
3	32	50
Total	**64**	**100**

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
CourseCode:TTOE602	Course Title : (Open Elective-II) Costing and its application in Textile*
Semester: 6th	Credits:4
Hours per week:4 (L: 4 T: 0 P: 0)	

(*Subject common for textile technology and textile design)

COURSE OBJECTIVE:

The students of textile design should have knowledge and skills in costing and its application in textile as they have to work in the textile industry.

COURSE CONTENT:

1. **Costing as an aid to management**
   Elements of cost, treatment of stock, Cost terms related to income measurement, profit planning and cost control for textile industry.
2. **Material cost**
   Costing of materials, Methods of valuing materials: FIFO, LIFO, Average cost method, Inflated price method, identification method, base stock method, HIFO, Market price method, Techniques of material control: Economic order quantity, Just in Time inventory system, stock control through ABC Analysis.
3. **Labour cost**
   Types of labour, control of labour cost, labour turnover and turnover cost, Time and motion study, job analysis and job evaluation, Remuneration and Incentives.
4. **Overheads**
   Importance and classification of overheads.
5. **Methods of costing**
   Job, Batch and contract costing, Process costing; waste cost and its control in a textile mill, Joint and by-product costing, Unit cost; costs of yarns and fabrics, fabric processing cost.
6. **Techniques of cost analysis and control**
   Absorption and marginal costing, cost-volume-profit-analysis, break-even point, contribution margin, margin of safety, standard costing, budgetary control, productivity and value analysis.

COURSE OUTCOME

After completion of the course the student be able to:

- make the profit/ loss statement
- utilize expertise in starting their own ventures
- make the organization profitable.

RECOMMENDED BOOKS

1. Kotler Philip, "Marketing Management", Prentice Hall of India, Delhi, 9th Edition, 1998.
2. Bheda R, "Managing Productivity in the Apparel Industry", Communications, New Delhi, 2000.
3. Cooklin G, "Introduction to Clothing Manufacture", Om book service, New Delhi, 2002.
4. Mehta PV and Bhardwaj SK, "Managing Quality", New Age International, New Delhi, 2001.
5. Rosenau J A and Wilson DL, "Apparel Merchandising", Amazon, USA, 2001.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	9	15
2	9	15
3	13	20
4	7	10
5	13	20
6	13	20
Total	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
Course Code: TTOE603	Course Title : (Open Elective-II) Financial Management in Textile*
Semester: 6th	Credits:4
Hours per week:4 (L: 4 T: 0 P: 0)	

(*Subject common for textile technology and textile design)

COURSE OBJECTIVE:

The students of textile design should have knowledge and skills in financial management so that they can know the economies of this in textile industry.

COURSE CONTENT

Unit 1

1.1 Introduction: Scope of finance, finance functions, financial manager's role, financial goals and firm's objectives.

1.2 Financial Statements: Accounting system, financial statements, Profit and Loss A/c and Balance Sheet, Use and importance of financial statements, Limitations of Financial statements.

Unit 2

2.1 Ratio Analysis: Meaning and nature of Ratio Analysis, Use and significance of Ratio Analysis Limitations of Ratio Analysis, Classification of ratio, Test for short-term financial position: Current liquid and Absolute liquid ratios, Efficiency and Activity ratios: Stock turnover, Debtor turnover Ratio, Average collection period, creditors turnover ratio, Average Payment Period, Test of solvency: Debt-Equity ratio, Equity ratio, Solvency ratio, and Net Worth ratio, Profitability ratios: Gross profit, Operating Expense, Net profit And operating profit ratios, Return on Investment and Earnings Per Share.

2.2 Statements of changes in Financial Position: Fund flow statement, Cash flow statement.

Unit 3

6.1 Sources of Finance: Classification of sources of finance, Security financing, Ownership securities, Equity Shares, Preference Shares, Deferred Shares, Debentures and Retained Earnings, Depreciation as source of funds, factoring, commercial banks, public deposits, lease financing and mutual funds.

Unit 4

4.1 Working Capital Management: Meaning, concept and classification of working capital, Needs and objectives of working capital, Disadvantages of Inadequate and redundant working capital, Principles of working capital management, Estimation of working capital requirements, Financing of working capital.

4.2 Control of Capital Issues: Securities and Exchange Board of India (SEBI), SEBI Act 1992

4.3 Capital Budgeting: Introduction to investment, types of investment decisions, Factors affecting investment decisions Traditional techniques of capital budgeting: Payback Period and Average Rate of return methods, Modern techniques of capital budgeting: Net Present Value and Internal Rate of Return methods Capital Rationing.

COURSE OUTCOME:

After completion of the course the student be able to:

- make the profit/ loss statement
- utilize expertise in starting their own ventures
- make the organization profitable.

RECOMMENDED BOOKS

1. Kotler Philip, "Marketing Management", Prentice Hall of India, Delhi, 9th Edition, 1998.
2. Bheda R, "Managing Productivity in the apparel Industry", Communications, New Delhi, 2000.
3. Cooklin G, "Introduction to Clothing Manufacture", Om book service, New Delhi, 2002.
4. Mehta P V and Bhardwaj S K, "Managing Quality", New Age International, New Delhi, 2001.
5. Rosenau J A and Wilson D L, "Apparel Merchandising", Amazon, USA, 2001.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	20
2	20	30
3	16	25
4	16	25
Total	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
CourseCode:TTOE604	Course Title : (Open Elective-II) Marketing Management in Textile*
Semester: 6th	Credits:4
Hours per week:4(L: 4T: 0P: 0)	

(*Subject common for textile technology and textile design)

COURSE OBJECTIVE:

The students of textile design should have knowledge and skills in Marketing management in Textile as they have to work in the Textile Industry.

COURSE CONTENT:

1. **Introduction:**
   Need, want, demand, production, product, selling, marketing, and societal concepts of marketing, types of goods. Various Textile Industry marketing practices in fibres, yarns, grey fabrics, finished fabrics, and garments.

2. **Marketing Process:**
   Analyzing marketing opportunities, researching and selecting target markets, positioning the offer, designing marketing strategies, planning marketing programs, organizing, implementing, and controlling marketing efforts.

3. **Consumer Behavior:**
   Factors affecting consumer behavior, Buyer black box, stages in purchasing, buying roles.

4. **Marketing Research:**
   Basic concepts, Marketing research process, market segmentation, target market selection, product research, Advertisement Research.

5. **Organizational Buying:**
   Salient features, factors affecting organizational purchase marketing mix, product, product levels, product hierarchy, product line, product mix, product life cycle, procedure for new product development, branding, and packaging.

6. **Price:**
   Pricing objectives, price elasticity of demand, methods of pricing, discounts, discriminatory pricing.

7. **Distribution:**
   Need for middleman and their functions, vertical marketing system. Types of distributions, Channel management decisions, Framework of Retailing in Textiles, career in retailing, types of retailers, and trends in retailing.

8. Promotion Mix:

Advertising, media selection, frequency and timing of advertisements, steps in developing effective communication, sales promotion, personal selling, publicity, Recruitment, training and motivating sales representatives, controlling and evaluating.

COURSE OUTCOME

After completion of the course the student be able to:

- Perform in Human resource section of Textile Industry
- Work as a marketing officer in the Textile Industry
- Increase the profitability of an organization.

RECOMMENDED BOOKS

1. Kotler Philip, "Marketing Management", Prentice Hall of India, Delhi, 9th Edition, 1998.
2. Bheda R, "Managing Productivity in the Apparel Industry", Communications, New Delhi, 2000.
3. Cooklin G, "Introduction to Clothing Manufacture", Om book service, New Delhi, 2002.
4. Mehta PV and Bhardwaj SK, "Managing Quality", New Age International, New Delhi, 2001.
5. Rosenau J A and Wilson DL, "Apparel Merchandising", Amazon, USA, 2001.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	9	14
2	9	13
3	7	12
4	6	10
5	9	13
6	7	12
7	8	13
8	9	13
Total	**64**	**100**

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
CourseCode:TTOE605	Course Title : (Open Elective-II) Textile Marketing and Merchandising*
Semester: 6th	Credits:4
Hours per week:4(L: 4T: 0P: 0)	

(*Subject common for textile technology and textile design)

COURSE OBJECTIVE:

The students of textile design should have knowledge and skills in Textile marketing and merchandising as they have to work in the Textile Industry.

COURSE CONTENT

1. **Textile Industry Profile:**
   Current Indian export and India's position in the world textile market Organizational structure of export house, buying houses and domestic companies and export procedures, Buyer classification and buying network in exports

2. **Marketing:**
   Domestic and International marketing, challenges for international marketing, Development of a product line, design, costing, developing a sample, specifications, market research, identification of markets, promotion mix, advertising, sale promotion, promotion budget, coordination between sales and production

3. **Merchandising:**
   Export houses, start trading export houses, Outsourcing, Merchandise buying and handling process, Merchandise plans, determining merchandise sources, demand analysis, evaluating merchandise, merchandise forecasting and budgeting, planning inventory levels, development of relationship between the textile and retailing industry, setting up the dealers and merchandisers.

COURSE OUTCOME

After completion of the course the student be able to:

- Perform as merchandiser.
- Work as a marketing officer in the Textile Industry
- Increase the profitability of an organization.

RECOMMENDED BOOKS

1. Kotler Philip, "Marketing Management", Prentice Hall of India, Delhi, 9th Edition, 1998.
2. Bheda R, "Managing Productivity in the Apparel Industry", Communications, New Delhi, 2000.
3. Cooklin G, "Introduction to Clothing Manufacture", Om book service, New Delhi, 2002.
4. Mehta PV and Bhardwaj SK, "Managing Quality", New Age International, New Delhi, 2001.
5. Rosenau J. A. and Wilson D. L., "Apparel Merchandising", Amazon, USA, 2001.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

INSTRUCTIONAL STRATEGY

The students may be asked to learn the marketing concept by visiting different organization.

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No	Time Allotted (Hrs)	Marks Allotted
1	16	25
2	16	25
3	32	50
Total	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
Course Code: TDPC 607	Course Title : Employability Skills
Semester: 6th	Credits:4
Hours per week:4 (L: 4 T: 0 P: 0)	

COURSE OBJECTIVE:

The students of the present day world require professionals who are not only well qualified and competent but also possess good communication skills. The objective of this subject is to prepare students for employability in job market and survive in cut throat competition among professionals.

COURSE CONTENT

1 Writing skills
- 1.1 Official and business correspondence
- 1.2 Job application - covering letter and resume
- 1.3 Report writing - key features and kinds

2 Oral Communication Skills
- 2.1 Giving advice
- 2.2 Making comparisons
- 2.3 Agreeing and disagreeing
- 2.4 Taking turns in conversation
- 2.5 Fixing and cancelling appointments

3 Oral Practice
- 3.1 Mock interview
- 3.2 Group discussion
- 3.3 Group discussion
- 3.4 Seminar presentation
- 3.5 Making a presentation
  - 3.5.1 Elements of good presentation
  - 3.5.2 Structure and tools of presentation
  - 3.5.3 Paper reading
  - 3.5.4 Power point presentation

COURSE OUTCOME

After completion of the course the student be able to:
- Develop effective writing skills
- Develop effective oral communication skills
- Develop effective presentation skills.

RECOMMENDED BOOKS

1. Kotler Philip, "Marketing Management", Prentice Hall of India, Delhi, 9th Edition, 1998.
2. Bheda R, "Managing Productivity in the Apparel Industry", Communications, New Delhi, 2000.
3. Cooklin G, "Introduction to Clothing Manufacture", Om book service, New Delhi, 2002.
4. Mehta PV and Bhardwaj SK, "Managing Quality", New Age International, New Delhi, 2001.
5. Rosenau J. A. and Wilson D. L., "Apparel Merchandising", Amazon, USA, 2001.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Alloted (%)
1	14	20
2	25	40
3	25	40
Total	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE DESIGNING	
Course Code: **TTBS609**	Course Title: Constitution of India*
Semester: **4th**	Credits: **00**
Periods Per Week: 02 **(L: 02, T: 00 P: 00)**	

(*Subject common for textile technology and textile design)

COURSE OBJECTIVES:

This course aims to deepen students' awareness of the Indian Constitution's relevance across diverse backgrounds, facilitating comprehension of its core principles. Participants will recognize the significance of fundamental rights and duties and grasp the operations of India's federal structure involving Union, State, and Local Governments. The course further focuses on educating students about emergency procedures, the election commission's role, and the process of constitutional amendments, fostering a holistic understanding of India's governance and legal framework.

COURSE CONTENTS:

1. Introduction to Constitution

1.1. Meaning and importance of the Constitution, salient features of Indian Constitution. Preamble of the Constitution. Fundamental rights- meaning and limitations. Directive principles of state policy and Fundamental duties -their enforcement and their relevance.

2. Union Government

2.1. Union Executive- President, Vice-president, Prime Minister, Council of Ministers. Union Legislature- Parliament and Parliamentary proceedings. Union Judiciary-Supreme Court of India – composition and powers and functions.

3. State and Local Governments

3.1. State Executive- Governor, Chief Minister, Council of Ministers. State Legislature-State Legislative Assembly and State Legislative Council. State Judiciary-High court. Local Government-Panchayat raj system with special reference to 73rd and Urban Local Self Govt. with special reference to74th Amendment.

4. Election provisions, Emergency provisions, Amendment of the constitution

4.1. Election Commission of India-composition, powers and functions and electoral process. Types of emergency-grounds, procedure, duration and effects. Amendment of the constitution- meaning, procedure and limitations.

RECOMMENDED BOOKS

1. M.V. Pylee, "Introduction to the Constitution of India", 4th Edition, Vikas publication,2005
2. Durga Das Basu (DD Basu), "Introduction to the constitution of India", (Student Edition), 19th edition, Prentice-Hall EEE, 2008.
3. "Introduction to the Constitution of India" by Durga Das Basu Publisher: LexisNexis
4. "Our Constitution: An Introduction to India's Constitution and Constitutional Law" by Subhash C. Kashyap Publisher: National Book Trust, India
5. "Indian Polity" by M. Laxmikanth Publisher: McGraw-Hill Education
6. "The Framing of India's Constitution: Select Documents" by B. R. Ambedkar Publisher: Oxford University Press
7. "Constitutional Law of India" by Dr. J. N. Pandey Publisher: Central Law Agency

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Understand and explain the significance of Indian Constitution as the fundamental law of the land
- Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building
- Analyse the Indian political system, the powers and functions of the Union, State and Local Governments in detail
- Understand Electoral Process, Emergency provisions and Amendment procedure.

CURRICULUM
FOR
SIXTH SEMESTER
OF
THREE-YEAR DIPLOMA COURSE
IN
TEXTILE TECHNOLOGY

STUDY SCHEME FOR 6TH SEMESTER

Code	Subjects	Periods Per Week			Total Hours L+T+P	Credits			Total Credits L+T+P
		L	T	P		L	T	P	
TDPC601	Fundamentals of Knitting	4	0	0	4	4	0	0	4
TDPC602	Fundamentals of Knitting Lab	0	0	2	2	0	0	1	1
TDPC603	Quality Control in Textiles	4	0	0	4	4	0	0	4
*	Elective -I	4	0	0	4	4	0	0	4
*	Elective –I Lab	0	0	2	2	0	0	1	1
**	Elective -II	3	0	0	3	3	0	0	3
**	Elective –II Lab	0	0	2	2	0	0	1	1
***	Open Elective - II	4	0	0	4	4	0	0	4
TTBS609	Constitution of India	2	0	0	2	0	0	0	0
TOTAL		**21**	**0**	**06**	**27^**	**19**	**0**	**03**	**22**

^The remaining hours per week should be utilized for conducting extracurricular/ extra academic activates

***Programme Elective –I Subjects**

Course Code	Subject Name	L-T-P-C
TTPE601	Intelligent and Functional Textile	4-0-0-4
TTPE602	Intelligent and Functional Textile Lab	0-0-2-1
TTPE603	High Performance Fibres	4-0-0-4
TTPE604	High Performance Fibres Lab	0-0-2-1
TTPE605	Bio processing of Textiles	4-0-0-4
TTPE606	Bio processing of Textiles Lab	0-0-2-1
TTPE607	Garment Manufacturing Technology	4-0-0-4
TTPE608	Garment Manufacturing Technology Lab	0-0-2-1

****Programme Elective -II Subjects**

Course Code	Subject Name	L-T-P-C
TTPE609	Non-Conventional Spinning	3-0-0-3
TTPE610	Non-Conventional Spinning lab	0-0-2-1
TTPE611	Non-Conventional Weaving	3-0-0-3
TTPE612	Non-Conventional Weaving Lab	0-0-2-1
TTPE613	Woollen Technology	3-0-0-3
TTPE614	Woollen Technology Lab	0-0-2-1
TTPE615	Silk Technology	3-0-0-3
TTPE616	Silk Technology Lab	0-0-2-1

Note: Student has to opt theory and lab course of same subject for Elective subjects

*****Open Elective Subjects**

Course Code	Subject Name	L-T-P-C
TTOE601	Apparel marketing & Merchandising	4-0-0-4
TTOE602	Costing and its application in Textiles	4-0-0-4
TTOE603	Financial Management in Textiles	4-0-0-4
TTOE604	Marketing Management in Textiles	4-0-0-4
TTOE605	Textile marketing & Merchandising	4-0-0-4

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TDPC 601	Course Title : Fundamental of Knitting *
Semester: 6th	Credits:4
Hours per week: 4(L: 4 T: 0 P: 0)	

(*Subject common for textile technology and textile design)

COURSE OBJECTIVE:

The aim of this subject is to impart knowledge and skills to the students regarding various types of knits and their use in the textile design as they may have to work in knitting industry and import and export houses as well.

COURSE CONTENT

1. **Unit 1**
   Comparison between knitted and woven fabrics, warp and weft knitting - Types of knitting needles, their knitting cycle, advantages and disadvantages of each
2. **Unit 2**
   Weft Knitting - Types of stitches: Knit, tuck, float, lay their representation, effects, methods of formation, and their end uses. Preparation of knit, tuck, and float stitches.
3. **Unit 3**
   Weft knit structures: Plain, Rib, Interlock and Purl, their characteristics, representation, derivatives, end uses and knitting cycles. Passage of yarn through Flat Bed and Circular Weft Knitting Machines. Design of plain, rib, inter lock and purl knits.
4. **Unit 4**
   Fabric defect in weft knitting, cover factor/tightness factor, Robbing back
5. **Unit 5**
   Warp Knitting: Introduction to underlap and overlap, closed lap and open lap. Brief description of Tricot and Raschel machines and fabrics, lapping movement, design of warp knitting.

COURSE OUTCOME

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

- Construct different types of knitting design
- Control the Knitting parameters
- Operate the weft and warp knitting machine

RECOMMENDED BOOKS:

1. Knitting technologies by D.B.Ajgaonkar
2. Knitting technology by David J.Spencer
3. Textile Mathematics Vol III by J. E. Booth

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Alloted(%)
1	15	26
2	10	16
3	15	26
4	10	12
5	14	20
Total	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TDPC 602	Course Title : Fundamental of Knitting Lab *
Semester: 6th	Credits:1
Hours per week: 2(L: 0 T: 0 P: 2)	

(***Subject common for textile technology and textile design)**

LISTOFPRACTIALS

1. To study different types of knitting needle
2. To study different types of Knitting Stitches.
3. To study passage of yarn through flatbed knitting machine
4. To study passage of yarn through circular weft machine
5. Identification of fabric defects of weft knitted fabrics
6. To study knitting cycle of latch needle
7. To study knitting cycle of needle
8. To study knitting cycle of Compound needle
9. To study knitting cycle of Purl needle
10. To study lapping movement of warp knitting

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TDPC 603	Course Title : Quality Control in Textile*
Semester: 6th	Credits:4
Hours per week:4 (L: 4 T: 0 P: 0)	

(***Subject common for textile technology and textile design)**

COURSE OBJECTIVE:

The students of Textile Technology have to learn the quality control parameters of various sections in Textile industry so that the competence of the students can be utilized to improvise the product.

COURSE CONTENT

1. Unit 1

1.1 System of Quality control in spinning: Role and scope, key variables, establishing norms or standards, Collection and interpretation of data and corrective action.
1.2 Mixing quality and Cost: Instrumental evaluation of cotton, control of mixing quality through fiber characteristics, control of mixing cost and quality, linear programming for cotton mixing and its formulation and approach.
1.3 Yarn realization: Records and estimation of yarn realization and waste in spinning mill, norms for yarn realization.
1.4 Waste and cleaning in Blowroom and carding: Calculation of Trash content and cleaning efficiency, Norms for waste and cleaning efficiency, assessing the performance of Blowroom and card.
1.5 Comber waste control: Technological conditions, optimization of comber waste extraction, norms and procedures for control of comber waste.
1.6 Control of yarn quality: Measurement, assessment and control of count, strength, unevenness, and imperfections of yarn.

2. Unit 2

2.1 System of Quality control in weaving: Scope and approach to process control in weaving. Establishing and standards schedule of checks and machinery audit.
2.2 Quality Control in winding, warping, and sizing: Approach, scope, control, and optimization.
2.3 Control of Quality in Loom shed: scope and approach, control of loom speed, efficiency, and stops. Expected loom efficiency, loom allocation.
2.4 Fabrics Quality in Weaving: Scope and approach, control of some specific fabric defects, grey fabric imperfection.

3. Unit 3

3.1 System of Process Control in Chemical Processing: Scope and approach, norms and standards.
3.2 Quality control and Productivity: Quality control and productivity in Bleaching, dyeing, printing, and finishing. Control of damages in chemical processing.

COURSE OUTCOME

After completion of the course the student be able to:

- Work in the Quality Control Cell in the Industry
- Control the quality of the end product
- Work in the R & D section

RECOMMENDED BOOKS

1. GardeARandSubramanianTA,"ProcessControlinCottonSpinning,"ATIRA,Ahmedabad, 2nd Ed., 1978.
2. PaliwalMCandKimothiPD,"ProcessControlinweaving",ATIRA,Ahmedabad2ndEd, 1978.
3. GokhaleSVandModiJR,"ProcessandQualityControlinChemicalProcessingof Textiles", ATIRA, Ahmedabad, 1992
4. RatanamTV,"Qualitycontrolinspinning",SITRA,Coimbatore,1994.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Alloted (%)
1	25	40
2	22	35
3	17	25
Total	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TTPE 601	Course Title: **(Elective –I)** Intelligent and functional Textile
Semester:6th	Credits:4
Hours per week:4(L:4T:0P:2)	

COURSE OBJECTIVE:

The students of Textile Technology must have competence in Intelligent and functional Textiles as they may have to work in specialty sector of Intelligent and functional Textile

COURSE CONTENT:

1. Unit1

1.1 Definition of smart and intelligent textiles

2. Unit2

2.1 Passive and active functionality
2.2 Textile with high protection and comfort properties,
2.3 Extreme winter clothing with low heat transmission, heat absorbing, heat storing systems.
2.4 Phase change materials, incorporation of PCMs in fibres and fabrics. Breathable textile.

3. Unit3

3.1 Multifunctional textiles with incorporated electronics for integrated communication, music, health monitoring, defense support functions, wearable computers.
3.2 Environmentally sensitive textiles - photochromic and thermochromic (chameleonic) fabrics, camouflage (radar shielding) fabrics, variable heat absorption surfaces, stimulus sensitive polymers such as temperature, pH, ionic, magnetic sensitive materials, design and their applications to textile.
3.3 Fibres as solar cells.

COURSE OUTCOME

After completion of the course the student be able to:

- Study the Intelligent and functional textile
- Application of different Intelligent and functional textiles

RECOMMENDED BOOKS

1. X. Tao, Xiaoming Tao, "Smart Fibres, Fabrics, and Clothing", Woodhead Publishing (2001).
2. Jinlian Hu, "Adaptive and Functional Polymers, Textiles and Their Applications", Imperial College Press (2011).
3. Tao Xiaoming, "Wearable Electronics and Photonics", Woodhead Publishing Limited (2005).
4. H. Mattila, H. Mattila, "Intelligent Textiles and Clothing", CRC Press (2006).
5. Vincenzini, "Smart Textiles", Trans Tech Pub Ltd (2009).

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNITWISETIMEANDMARKSDISTRIBUTION

Unit No.	Time Allotted(Hrs)	Marks Allotted(%)
01	8	10
02	28	40
03	28	40
TOTAL	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TTPE 602	Course Title: **(Elective –I)** Intelligent and functional Textile Lab
Semester:6th	Credits:1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

The students of Textile Technology must have competence in Intelligent and functional Textiles as they may have to work in specialty sector of Intelligent and functional Textile

LIST OF PRACTICALS:

1. Study and analysis of phase changing material
2. Study and analysis of Breathable Textile
3. Study and analysis of photochromic Textile
4. Study and analysis of thermochromic Textile
5. Study and analysis of camouflage Textile
6. Study and analysis of fibres as solar cells.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TTPE 603	Course Title: **(Elective –I)** High Performance Fibre
Semester:6th	Credits:4
Hours per week: 4(L:4 T: 0 P:0)	

COURSEOBJECTIVE:

The students of Textile Technology must have competence in high performance fibres as they may have to work in the specialty sector of performance wear.

COURSE CONTENT

1. Unit 1

1.1 Basic concept of high performance fibres;

2. Unit 2

2.1 Hi-Performance Gelspun Polyethylene fibres - Manufacture, fibres characteristics, properties, and applications;
2.2 Aramids - Introduction, polymer preparation, Spinning, Structure and properties, applications.
2.3 Carbon Fibres - Introduction, production, Physical properties of Rayon based, PAN based and Pitch based Carbon fibres.

3. Unit 3

3.1 Applications: Glass Fibres - Fibre manufacture, fibre finish, fibre properties and application.
3.2 Vectran (Melt spun wholly aromatic polyester fibre) - Fibre production; properties and application,
3.3 PBO (Polyphenylene benzobisoxazole) fibres - Fibre production, properties and application.
3.4 PEEK Fibres - Fibre production, properties and application.

COURSE OUTCOME:

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

- Work on structural features of high performance fibres
- Effectively increase the applicability of high performance fibres

RECOMMENDED BOOKS:

1. T. Hongu, "New Fibres," Ellis Horwood, New York, 1990.
2. Lewis E. M. Pearce, J. Preston, "Handbook of Fibre Science and Technology Vol-4," Marcel Dekker, New York, 1989.
3. Donnet J. B., Bansal R. C., "Carbon Fibres," Marcel Dekker, New York, 1990.
4. Hearle J. W. S., "High Performance Fibres," Textile Institute, Woodhead Publishing, 2001.
5. Mukhopadyay S. K., "High Performance Fibres," Textile Progress Vol. 25, Textile Institute, Manchester, 1993.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted(Hrs)	Marks Allotted(%)
01	8	10
02	28	40
03	28	40
TOTAL	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TTPE604	Course Title: **(Elective –I)** High Performance Fibre Lab
Semester:6th	Credits:1
Hours per week: 2 (L: 0 T: 0 P: 2)	

COURSE OBJECTIVE:

The students of Textile Technology must have competence in high performance fibres as they may have to work in the specialty sector of performance wear.

LIST OF PRACTICALS:

1. Study and analysis of Gelspun Polyethylene fibre
2. Study and analysis of Aramid fibre
3. Study and analysis of carbon fibre
4. Study and analysis of Glass fibre
5. Study and analysis of Vectran fibre
6. Application of High Performance fibre

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TTPE 605	Course Title: **(Elective –I)** Bioprocessing of Textile
Semester: 6th	Credits:4
Hours per week: 4 (L: 4 T: 0 P: 0)	

COURSE OBJECTIVE:

The students of Textile Technology must have competence in Bioprocessing of Textile as they may have to work in specialty sector of textile.

COURSE CONTENT:

1. **Unit 1**
   - 1.1 Introduction: Environmental problems caused by conventional processing of textiles, viz. singeing, desizing, scouring, bleaching, dyeing, and finishing.
   - 1.2 Chemistry of Enzymes: Concept and classification of enzymes. Chemistry of different enzymes, and their mechanism of working in textile processes and fibres.
2. **Unit 2**
   - 2.1 Biopolishing of textiles: Significance, process, and influencing parameters. Bio-processing of cotton fabric using different varieties of cellulases and their comparative performance. Bio-washing of denim, related problems and precautionary measures to reduce it. Biopolishing of wool using proteolytic enzymes.
   - 2.2 Bio-desizing: Enzymatic desizing with amylase. Mechanism of removal of starch with amylase, enzyme inactivation.
   - 2.3 Bio-scouring: Application of different enzymes in scouring and their working on various impurities during scouring. Assessment of bio-scouring efficiency, viz. absorption, copper number, methylene blue absorption, fluidity etc.
   - 2.4 Bio-bleaching: A review of peroxide and peracetic acid bleaching. Influence of catalase on peroxide stability. Evaluation of bleaching efficiency.
3. **Unit 3**
   - 3.1 Colouration with enzymes: Properties of enzymes towards influencing dye bath activity. Enzymatic reduction of vat and sulphur dyes. Concept of reduction potential of bath and its influence on reduction of dye and dye uptake. Dyeing of denim with indigo using enzyme as reduction catalyst. Acid dyeing of wool with protease, problem of degradation and recovery using trans-glutaminase.
   - 3.2 Bio-Finish: Finishing of textiles with natural herbs, materials, and products. Aloe vera, neem, etc. extract finishing.
   - 3.3 Anti-shrink finish on wool: Action of proteolytic enzymes on anti-felting property of wool, degradation of wool and recovery using trans-glutaminase.

COURSE OUTCOME

After completion of the course the student be able to::

- Perform bio washing of denim
- Do bio finishing of textile
- Reduce harmful chemical wastages
- Use the application of natural finishes on textile

RECOMMENDED BOOKS:

1. Cavaco-Paulo and Gubitz GM, Textile processing with enzymes, Woodhead Publishing,

Cambridge, UK. (2003),
2. Nierstrasz VA and Cavaco-Paulo, Advances in textile Bio-technology, Woodhead Publishing, Cambridge, UK (2010)

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted(Hrs)	Marks Allotted(%)
01	10	25
02	24	35
03	30	40
TOTAL	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TTPE 606	Course Title: **(Elective –I)** Bioprocessing of Textile Lab
Semester: 6th	Credits:1
Hours per week: 2 (L: 0 T: 0 P: 2)	

COURSE OBJECTIVE:

The students of Textile Technology must have competence in Bioprocessing of Textile as they may have to work in specialty sector of textile.

LIST OF PRACTICALS:

1. Bio-desizing of Cotton
2. Bio-Scouring of Cotton
3. Bio-Bleaching of Cotton
4. Dyeing of denim with enzymes
5. To study enzymatic reduction of vat and sulphur dyes.
6. To study application of enzymes on anti-shrinkage of wool
7. To perform bio washing of denim.
8. To find out the seam strength of a Garment.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TTPE607	Course Title: **(Elective –I)** Garment Manufacturing Technology
Semester: 6th	Credits:4
Hours per week: (L:4 T:0 P:0)	

COURSE OBJECTIVE:

The students of textile technology should have knowledge and skills in cutting, sewing, pressing, etc., so that they are able to employ the knowledge in making a better product.

COURSE CONTENT:

1. **Garment Manufacturing:**
   Introduction, present scenario, and future of the Indian apparel industry.
2. **Raw Material:**
   Woven and knitted fabrics with their characteristics and applications for different uses, Garment manufacturing from woven and knitted fabrics.
3. **Designing and Pattern Making:**
   Introduction to designing, Pattern making – draft construction, advanced Pattern making, grading of pattern, marker planning, fabric spreading, laying methods, Factors affecting spreading, fabric cutting, computerized cutting machines, automatic ticketing and bundling, garment size and size charts.
4. **Garment Sewing:**
   Introduction to sewing machines and their parts and working details, Different types of sewing machines, driving system of sewing machines, Various attachments of sewing machines, high-speed sewing, and sewing room planning, Preparation of seamless garments and its applications.
5. **Stitches and Seams Types:**
   Stitch formation, types of stitches, seam classification, seam geometry, seam strength and slippage, seam puckering. Thread calculation and its consumption, seam quality.
6. **Sewing Needles and Threads:**
   Needle – functions, special needles, Needle size, Needle points; sewing thread – construction, material, thread size, and packages.
7. **Trimming and Garment Accessories:**
   Linings, interlinings, wadding, lace, braid, elastic, hook and loop fastenings, shoulder pads, eyelets and laces, Zip fasteners and buttons.
8. **Garment Finishing:**
   Fasteners, thread tucking, care and size labeling system, checking, pressing, folding and packing, packaging standards for domestic and export markets.

COURSE OUTCOME

After completion of the course the student be able to:

- Perform operation of Semi-automatic and automatic loom.
- Control the warp protecting mechanism on the loom.
- Control the weft stop motions on the loom.

RECOMMENDED BOOKS

1. Garment Finishing and Care Labelling by S. S. Satsangi, M/s Usha Publications, Delhi.

2. Textiles - Fibres and Fabrics by Bernard Polytechnic Corbman, M/s McGraw Hill, International Edition.
3. Garment Design by Armstrong.
4. The Technology of Clothing Manufacture by Harold Carr & Barbara Latham.
5. Fashion Production Terms by Debbie Ann Gioello & Berke.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	15
2	10	15
3	8	12
4	10	15
5	8	12
6	6	10
7	5	10
8	7	11
Total	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAMINTEXTILETECHNOLOGY	
Course Code: TTPE608	Course Title: **(Elective –I)** Garment Manufacturing Technology Lab
Semester: 6th	Credits:1
Hours per week: (L:0 T:0 P:2)	

COURSE OBJECTIVE:

The students of textile technology should have knowledge and skills in cutting, sewing, pressing, etc., so that they are able to employ the knowledge in making a better product.

LIST OF PRACTICALS:

1. To study tools and equipment used in clothing/garment construction.
2. To demonstrate the sewing machine, functions, and working of various parts.
3. To use different sewing equipment used in the Garment design.
4. To demonstrate various sewing aids used in garment design lab.
5. To make simple stitches on cloth like circular, straight lines, etc.
6. To make different types of pleats and gathers.
7. To study and prepare different necklines.
8. Appliances required for pressing and finishing and pressing of textiles and finishes (mill visits only).

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TTPE609	Course Title: **(Elective-II)** Non-Conventional Spinning
Semester:6th	Credits:3
Hours per week:(L:3 T: 0 P:0)	

COURSE OBJECTIVE:

The students of textile technology should have knowledge and skills in non-conventional spinning as they have to work in the Textile Industry.

COURSE CONTENT:

1. **Unit 1**

1.1 Brief review of conventional spinning systems.
1.2 Fibre characteristics requirements for different leading spinning technologies.
1.3 Role of fibre friction characteristics at different stages of spinning.
1.4 Possibilities and limitations of different spinning technologies.
1.5 Principle and raw material preparation for rotor spinning.
1.6 Process and machine parameters affecting product quality.

2. Unit 2

2.1 Principle of vortex yarn manufacture.
2.2 Difference between air jet spun and vortex spun yarn structure.
2.3 Principle and raw material preparation for friction spinning, process and machine parameters affecting product quality.
2.4 Assessment of DREF-II and DREF-III yarn structures and properties.
2.5 Principle and raw material preparation for compact spinning and Eli-Twist spinning.

3. Unit 3

3.1 Comparative assessment of the structure and performance of the yarns with respect to ring yarn.

3.2 Self-twist, twistless, and warp spinning, electrostatic spinning, core spinning, Siro spinning, Bobtex yarn manufacture, solo spun yarn manufacture. Basic principles of textured yarn manufacture.

COURSE OUTCOME:

After completion of the course the student be able to::

- Operate rotor spinning machine
- Operate DREF spinning machine
- Select the right product for specific end use.

RECOMMENDEDBOOKS

1. Salhotra K. R. and Ishtiaque S. M., "Rotor Spinning: Its advantages, limitations and prospects in India," 1st Ed.; National Information Centre for Textile and Allied Subjects, 1995.
2. Klein W., "Manual of Textile Technology: New Spinning Systems," 1st Ed.; The Textile Institute, Manchester, UK, 1993.
3. Lawrence C. A., "Fundamentals of Spun Yarn Technology," 1st Ed.; CRC Press LLC, Florida, USA (2003).
4. Chattopadhyay R. and Ishtiaque S. M., "Advances in Yarn Manufacturing Process," Department of Textile Technology, IIT Delhi, 1991.
5. Hearle J. W. S., Hollick L. and Wilson D. K., "Yarn Texturing Technology," Woodhead Publishing Ltd., UK, 2002.

SUGGESTEDWEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted(Hrs)	Marks Allotted(%)
1	**14**	30
2	**20**	40
3	**14**	30
Total	**48**	**100**

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TTPE610	Course Title: **(Elective-II)** Non-Conventional Spinning Lab
Semester:6th	Credits:1
Hours per week: 2 (L: 0 T: 0 P:2)	

COURSE OBJECTIVE:

The students of textile technology should have knowledge and skills in non-conventional spinning as they have to work in the Textile Industry.

LIST OF PRACTICALS:

1. To study and analyze rotor spun yarn
2. To study and analyze friction spun yarn
3. To study and analyze air jet yarn
4. To study and analyze Bobtex yarn
5. To study and analyze vortex yarn
6. To study and analyze siro spinning yarn
7. To study and analyze electrostatic spinning yarn
8. To study and analyze core spun yarn

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TTPE611	Course Title: **(Elective-II)** Non-Conventional weaving
Semester: 6th	Credits:3
Hours per week: (L:3 T: 0 P:0)	

COURSE OBJECTIVE:

The students of textile technology should have knowledge and skills in non-conventional weaving as they have to work in the Textile Industry.

COURSE CONTENT:

1. **Unit 1**

   1.1 Preparation of Yarn for shuttle-less weaving: Winding, warping, sizing, and weft preparation and drawing of warp yarn.

   1.2 Problems of shuttle loom: Maximum speed of shuttle loom, design problem of shuttle loom, basic concept of increasing the weft insertion rate in weaving machine.

2. **Unit 2**

   2.1 Weft feeding in shuttle-less weaving: Different methods

   2.2 Projectile Weaving Machine: Basic principle of projectile loom, sequence of weft insertion, beat-up, torsion bar picking, loom timing, let-off and take-up motion, selvedge formation.

   2.3 Air jet weaving machine: Problem in air jet weft insertion, Sequence of weft insertion in air jet loom.

   2.4 Water-jet Weaving machine: Weft insertion mechanism, quality of warp required for water jet, selvedge formation, environmental problem, quality of water, problem of water-jet loom.

   2.5 Rapier Weaving Machine: Different types of rapier weaving machines, weft insertion sequence in rapier weaving process.

3. **Unit 3**

   3.1 Multiphase Weaving Machine: Basic concept of multiphase weaving. Shedding operation in warp way and weft way multiphase loom. Advantages and disadvantages of multiphase weaving process.

   3.2 Narrow Fabric Loom: Different type of narrow fabrics. Mechanism of weft insertion and fabric formation in narrow fabric weaving machine.

   3.3 Multi Axial Warp knitted Fabric: Fabric Structure, Properties, and end uses.

COURSE OUTCOME:

After completion of the course the student be able to::

- Operate shuttleless weaving machine
- Use as per suitability of yarn
- Make good quality fabric

RECOMMENDED BOOKS

1. Marks R. and Robinsons A. T. C., "Principles of Weaving," Textile Institute, UK, 1986.
2. Lord P. R. and Mohamad M. H., "Weaving: Conversion of Yarn to Fabric," Merrow Technical

Library, UK, 1988.
3. Ormerod A., "Modern Preparations and Weaving Machinery," Butterworth and Co., UK, 1983.
4. Talavasek O. and Svaty V., "Shuttleless Weaving Machines," Elsevier Scientific Publishing Co., Amsterdam, 1981.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted(Hrs)	Marks Allotted(%)
1	16	35
2	20	40
3	12	25
Total	**48**	**100**

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TTPE612	Course Title: **(Elective-II)** Non-Conventional weaving Lab
Semester: 6th	Credits:1
Hours per week: (L:0 T: 0 P:2)	

COURSE OBJECTIVE:

The students of textile technology should have knowledge and skills in non-conventional weaving as they have to work in the Textile Industry.

LIST OF PRACTICALS

1. To study weft insertion mechanism in projectile loom
2. To study weft insertion mechanism in air jet loom
3. To study weft insertion mechanism in water jet loom
4. To study weft insertion mechanism in rapier loom
5. To study weft insertion mechanism in multi-phase weaving
6. To study weft insertion mechanism in narrow fabric loom
7. To study weft insertion mechanism in multi axial loom

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code:TTPE613	Course Title: **(Elective-II)** Woolen Technology
Semester:6th	Credits:3
Hours per week:(L:3 T:0 P:0)	

COURSE OBJECTIVE:

The students of textile technology should have knowledge and skills in woolen technology as they have to work in the Textile Industry.

COURSE CONTENT:

1. **Unit 1**
   - 1.1 **Wool fibre and its properties**: Morphological structure, components of fibre, fibre diameter, crimp, length, specific gravity moisture relations, wet ability, gross composition of raw wool.
   - 1.2 **Manufacturing wastes**: Noils, soft wastes, hard wastes, finishing wastes, and recovered wool.

2. **Unit 2**
   - 2.1 **Wool blends with man-made fibers**: Purpose of blending, effect of blend composition on performance of fabrics.
   - 2.2 **Woollen or carded Yarns:** Preliminary processes, blending or mixing, oiling of the stock, woollen carding, woollen spinning.
   - 2.3 **Worsted top making and spinning of worsted yarn:** Worsted carding, backwashing, oiling, gilling or preparing, worsted combing, tow-to-top conversion systems, worsted drawing, worsted yarn spinning.
   - 2.4 **Manufacture of woolen fabrics:** Woven Fabrics produced by projectile and rapier weaving machines, knitted and nonwoven woolen fabrics.

3. **Unit 3**
   - 3.1 **Chemical Processing of wool:** Objectives. Carbonization of wool in batch and continuous methods of scouring fiber, yarn and fabric; peroxide and per-acetic acid bleach of wool; production of anti-shrink wool.
   - 3.2 **Wool Dyeing:** Chemistry of dyeing wool and blend with acid, mordant, metal-complex, and reactive dyes.
   - 3.3 **Wool Finishing:** damping, decatizing, and paper pressing of wool.

COURSE OUTCOME:

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

- Work in the woolen and worsted industry
- Use the properties to develop new fabrics
- Enhance the usability by his expertise.

RECOMMENDED BOOKS:

1. Blended Textiles, Textile Association (India), 1981.
2. Lepenkov Y, "Wool Spinning," Vol. 1 and 2, 1st Ed. Mir Publisher, Moscow, 1983.
3. Bergen W. V., "Wool Handbook," vol. 1 and 2, 3rd Ed., Interscience Publisher, London.
4. Teasdale D. C., "The Wool Handbook," 4th Ed., 1996.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	14	30
2	20	40
3	14	30
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code:TTPE614	Course Title: **(Elective-II)** Woolen Technology Lab
Semester:6th	Credits:1
Hours per week: (L:0 T:0 P:2)	

COURSE OBJECTIVE:

The students of textile technology should have knowledge and skills in woolen technology as they have to work in the Textile Industry.

LIST OF PRACTICALS:

1. To study carbonization of wool
2. To study scouring of wool fibre
3. To study bleaching of wool fibre
4. To study woolen spinning system
5. To study worsted spinning system
6. To study dyeing of wool in yarn form
7. To study dyeing of wool in fabric form
8. To study anti-shrink finish on wool fibre.

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TTPE615	Course Title: **(Elective-II)** Silk Technology
Semester:6th	Credits:3
Hours per week: (L:3 T: 0 P:0)	

COURSE OBJECTIVE:

The students of textile technology updating the knowledge in the field of Silk fiber technology as they have to work in the Silk Textile Industry.

COURSE CONTENT:

1. **Unit 1**

   Introduction to Sericulture and silk industry, Status of sericulture and silk industry in India and abroad. Mulberry cultivation practices, environmental conditions, types of mulberry, Silkworm rearing, and Environmental conditions for silkworm rearing, various methods.

2. **Unit 2**

   Different types of cocoons, Physical and commercial characteristics, sorting and testing of cocoons. Stifling of cocoons, objects, various methods: open pan, three pan, Conveyor cooking etc. Merits & Demerits of silk reeling, systems of reeling, charka, Cottage basin, multi end filature, automatic reeling machine, Re-reeling.

3. **Unit 3**

   3.1 Silk throwing, Objects, Winding, doubling, Rewinding, and twisting, Manufacture of silk yarns for ordinary Chiffon, Crape, Georgette fabrics.

   3.2 Silk weaving preparatory for warp & weft yarns, handloom & power looms special features, modifications required to weave silk fabrics.

4. **Unit 4**

   Introduction to spun silk industry, Different source of waste, Sequence of operations in spun silk production, end uses of spun silk yarns. Noil yarns. Testing & grading of silk yarns. Chemical processing of silk: degumming of silk fabrics.

5. **Unit 5**

   Dyeing of silk fabrics. Printing & finishing of silk fabrics. Recent developments in wet processing of silk fabrics, silk by-products, properties, and application. Introduction to non-mulberry silks and their applications.

COURSE OUTCOME

After completion of the course the student be able to:

- Take the projects and research work in Silk Technology
- Become entrepreneurs in silk industries like Reeling, Twisting, Silk weaving
- Realize silk potential in India and abroad

RECOMMENDED BOOKS:

1. Hand Book of Practical Sericulture - S. R. Ullal and M. N. Narasimhanna, 1987
2. Silk Manual - FAO Publication
3. Hand Book of Silk Technology - T. N. Sonwalkar
4. Mulberry Silk Reeling Technology - D. Mahadevappa, V. G. Halliyal, D. G. Shankar, Ravindra Bhandiwad, Oxford and IBH Publishing Company Pvt. Ltd, 4000

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted(Hrs)	Marks Allotted(%)
1	**10**	20
2	**10**	20
3	**10**	20
4	**9**	20
5	**9**	20
Total	**48**	**100**

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TTPE616	Course Title: **(Elective-II)** Silk Technology Lab
Semester:6th	Credits:1
Hours per week: (L:0 T: 0 P:2)	

COURSE OBJECTIVE:

The students of textile technology updating the knowledge in the field of Silk fiber technology as they have to work in the Silk Textile Industry.

LIST OF PRACTICALS:

1. To study and analyze domestic and wild cocoons.
2. To study and analyze Stifling of cocoons.
3. To study conventional reeling machine.
4. To study automatic reeling machine.
5. To study silk throwing system.
6. To study and analyze degumming of silk.
7. To study and analyze grading of silk filament yarn.
8. To study and analyze grading of spun silk yarn.
9. To study and analyze weaving of silk.
10. To study the dyeing of silk with acid dye.
11. To study and analyze finishes of silk fabric.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE TEACHNOLOGY	
CourseCode:TTOE601	Course Title : **(Open Elective)** Apparel Marketing and Merchandising
Semester: 6th	Credits:4
Hours per week:4(L: 4T: 0P: 0)	

COURSE OBJECTIVE:

The students of textile technology should have knowledge and skills in Apparel Marketing and Merchandising so that they are able to work in this section of the textile industry.

COURSE CONTENT

1. **Apparel Industry Profile:**

   Current Indian export and India's position in the world apparel market Organizational structure of export house, buying houses and domestic companies and export procedures, Buyer classification and buying network in exports

2. **Marketing:**

   Domestic and International marketing, challenges for international marketing, Development of a product line, design, costing, developing a sample, specifications, market research, identification of markets, promotion mix, advertising, sale promotion, promotion budget, coordination between sales and production

3. **Merchandising:**

   Exporthouses,startradingexporthouses,Outsourcing,Merchandisebuyingandhandlingprocess,Merchandiseplans,determiningmerchandisesources,demandanalysis,evaluating merchandise, merchandise forecasting and budgeting, planning inventory levels, development of relationship between the textile and retailing industry, setting up the dealers and merchandisers

COURSE OUTCOME

After completion of the course the student be able to:

- Perform as marketing and merchandiser.
- Work in export house
- Set up dealership and retail outlet.

RECOMMENDED BOOKS

1. Kotler Philip, "Marketing Management", Prentice Hall of India, Delhi, 9th Edition, 1998.
2. Bheda R, "Managing Productivity in the apparel Industry", Communications, New Delhi, 2000.
3. Cooklin G, "Introduction to Clothing Manufacture", Om book service, New Delhi, 2002.
4. Mehta PV and Bhardwaj SK, "Managing Quality", New Age International, New Delhi, 2001.
5. Rosenau J A and Wilson DL, "Apparel Merchandising", Amazon, USA, 2001.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No	Time Allotted(Hrs)	Marks Allotted(%)
1	16	25
2	16	25
3	32	50
Total	**64**	**100**

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
CourseCode:TTOE602	Course Title : **(Open Elective)** Costing and its application in Textile
Semester: 6th	Credits:4
Hours per week:4 (L: 4 T: 0 P: 0)	

COURSE OBJECTIVE:

The students of textile technology should have knowledge and skills in costing and its application in textile as they have to work in the textile industry.

COURSE CONTENT:

1. **Costing as an aid to management**
   Elements of cost, treatment of stock, Cost terms related to income measurement, profit planning and cost control for textile industry.
2. **Material cost**
   Costing of materials, Methods of valuing materials: FIFO, LIFO, Average cost method, Inflated price method, identification method, base stock method, HIFO, Market price method, Techniques of material control: Economic order quantity, Just in Time inventory system, stock control through ABC Analysis.
3. **Labour cost**
   Types of labour, control of labour cost, labour turnover and turnover cost, Time and motion study, job analysis and job evaluation, Remuneration and Incentives.
4. **Overheads**
   Importance and classification of overheads.
5. **Methods of costing**
   Job, Batch and contract costing, Process costing; waste cost and its control in a textile mill, Joint and by-product costing, Unit cost; costs of yarns and fabrics, fabric processing cost.
6. **Techniques of cost analysis and control**
   Absorption and marginal costing, cost-volume-profit-analysis, break-even point, contribution margin, margin of safety, standard costing, budgetary control, productivity and value analysis.

COURSE OUTCOME

After completion of the course the student be able to:

- make the profit/ loss statement
- utilize expertise in starting their own ventures
- make the organization profitable.

RECOMMENDED BOOKS

1. Kotler Philip, "Marketing Management", Prentice Hall of India, Delhi, 9th Edition, 1998.
2. Bheda R, "Managing Productivity in the Apparel Industry", Communications, New Delhi, 2000.
3. Cooklin G, "Introduction to Clothing Manufacture", Om book service, New Delhi, 2002.
4. Mehta PV and Bhardwaj SK, "Managing Quality", New Age International, New Delhi, 2001.
5. Rosenau J A and Wilson DL, "Apparel Merchandising", Amazon, USA, 2001.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	9	15
2	9	15
3	13	20
4	7	10
5	13	20
6	13	20
Total	**64**	**100**

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: TTOE603	Course Title : **(Open Elective**) Financial Management in Textile
Semester: 6th	Credits:4
Hours per week:4 (L: 4 T: 0 P: 0)	

COURSE OBJECTIVE:

The students of textile technology should have knowledge and skills in financial management so that they can know the economies of this in textile industry.

COURSE CONTENT

Unit 1

1.1 Introduction: Scope of finance, finance functions, financial manager's role, financial goals and firm's objectives.

1.2 Financial Statements: Accounting system, financial statements, Profit and Loss A/c and Balance Sheet, Use and importance of financial statements, Limitations of Financial statements.

Unit 2

2.1 Ratio Analysis: Meaning and nature of Ratio Analysis, Use and significance of Ratio Analysis Limitations of Ratio Analysis, Classification of ratio, Test for short-term financial position: Current liquid and Absolute liquid ratios, Efficiency and Activity ratios: Stock turnover, Debtor turnover Ratio, Average collection period, creditors turnover ratio, Average Payment Period, Test of solvency: Debt-Equity ratio, Equity ratio, Solvency ratio, and Net Worth ratio, Profitability ratios: Gross profit, Operating Expense, Net profit And operating profit ratios, Return on Investment and Earnings Per Share.

2.2 Statements of changes in Financial Position: Fund flow statement, Cash flow statement.

Unit 3

6.1 Sources of Finance: Classification of sources of finance, Security financing, Ownership securities, Equity Shares, Preference Shares, Deferred Shares, Debentures and Retained Earnings, Depreciation as source of funds, factoring, commercial banks, public deposits, lease financing and mutual funds.

Unit 4

4.1 Working Capital Management: Meaning, concept and classification of working capital, Needs and objectives of working capital, Disadvantages of Inadequate and redundant working capital, Principles of working capital management, Estimation of working capital requirements, Financing of working capital.

4.2 Control of Capital Issues: Securities and Exchange Board of India (SEBI), SEBI Act 1992

4.3 Capital Budgeting: Introduction to investment, types of investment decisions, Factors affecting investment decisions Traditional techniques of capital budgeting: Payback Period and Average Rate of return methods, Modern techniques of capital budgeting: Net Present Value and Internal Rate of Return methods Capital Rationing.

COURSE OUTCOME:

After completion of the course the student be able to:

- make the profit/ loss statement
- utilize expertise in starting their own ventures
- make the organization profitable.

RECOMMENDED BOOKS

1. Kotler Philip, "Marketing Management", Prentice Hall of India, Delhi, 9th Edition, 1998.
2. Bheda R, "Managing Productivity in the apparel Industry", Communications, New Delhi, 2000.
3. Cooklin G, "Introduction to Clothing Manufacture", Om book service, New Delhi, 2002.
4. Mehta P V and Bhardwaj S K, "Managing Quality", New Age International, New Delhi, 2001.
5. Rosenau J A and Wilson D L, "Apparel Merchandising", Amazon, USA, 2001.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	20
2	20	30
3	16	25
4	16	25
Total	**64**	**100**

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
CourseCode:TTOE604	Course Title : **(Open Elective)** Marketing Management in Textile
Semester: 6th	Credits:4
Hours per week:4(L: 4T: 0P: 0)	

COURSE OBJECTIVE:

The students of textile technology should have knowledge and skills in Marketing management in Textile as they have to work in the Textile Industry.

COURSE CONTENT:

1. **Introduction:**
   Need, want, demand, production, product, selling, marketing, and societal concepts of marketing, types of goods. Various Textile Industry marketing practices in fibres, yarns, grey fabrics, finished fabrics, and garments.
2. **Marketing Process:**
   Analyzing marketing opportunities, researching and selecting target markets, positioning the offer, designing marketing strategies, planning marketing programs, organizing, implementing, and controlling marketing efforts.
3. **Consumer Behavior:**
   Factors affecting consumer behavior, Buyer black box, stages in purchasing, buying roles.
4. **Marketing Research:**
   Basic concepts, Marketing research process, market segmentation, target market selection, product research, Advertisement Research.
5. **Organizational Buying:**
   Salient features, factors affecting organizational purchase marketing mix, product, product levels, product hierarchy, product line, product mix, product life cycle, procedure for new product development, branding, and packaging.
6. **Price:**
   Pricing objectives, price elasticity of demand, methods of pricing, discounts, discriminatory pricing.
7. **Distribution:**
   Need for middleman and their functions, vertical marketing system. Types of distributions, Channel management decisions, Framework of Retailing in Textiles, career in retailing, types of retailers, and trends in retailing.
8. **Promotion Mix:**
   Advertising, media selection, frequency and timing of advertisements, steps in developing effective communication, sales promotion, personal selling, publicity, Recruitment, training and motivating sales representatives, controlling and evaluating.

COURSE OUTCOME

After completion of the course the student be able to:

- Perform in Human resource section of Textile Industry
- Work as a marketing officer in the Textile Industry
- Increase the profitability of an organization.

RECOMMENDED BOOKS

1. Kotler Philip, "Marketing Management", Prentice Hall of India, Delhi, 9th Edition, 1998.
2. Bheda R, "Managing Productivity in the Apparel Industry", Communications, New Delhi, 2000.
3. Cooklin G, "Introduction to Clothing Manufacture", Om book service, New Delhi, 2002.
4. Mehta PV and Bhardwaj SK, "Managing Quality", New Age International, New Delhi, 2001.
5. Rosenau J A and Wilson DL, "Apparel Merchandising", Amazon, USA, 2001.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	9	14
2	9	13
3	7	12
4	6	10
5	9	13
6	7	12
7	8	13
8	9	13
Total	**64**	**100**

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
CourseCode:TTOE605	Course Title : **(Open Elective)** Textile Marketing and Merchandising
Semester: 6th	Credits:4
Hours per week:4(L: 4T: 0P: 0)	

COURSE OBJECTIVE:

The students of textile technology should have knowledge and skills in Textile marketing and merchandising as they have to work in the Textile Industry.

COURSE CONTENT

1. **Textile Industry Profile:**
   Current Indian export and India's position in the world textile market Organizational structure of export house, buying houses and domestic companies and export procedures, Buyer classification and buying network in exports

2. **Marketing:**
   Domestic and International marketing, challenges for international marketing, Development of a product line, design, costing, developing a sample, specifications, market research, identification of markets, promotion mix, advertising, sale promotion, promotion budget, coordination between sales and production

3. **Merchandising:**
   Export houses, start trading export houses, Outsourcing, Merchandise buying and handling process, Merchandise plans, determining merchandise sources, demand analysis, evaluating merchandise, merchandise forecasting and budgeting, planning inventory levels, development of relationship between the textile and retailing industry, setting up the dealers and merchandisers.

COURSE OUTCOME

After completion of the course the student be able to:

- Perform as merchandiser.
- Work as a marketing officer in the Textile Industry
- Increase the profitability of an organization.

RECOMMENDED BOOKS

1. Kotler Philip, "Marketing Management", Prentice Hall of India, Delhi, 9th Edition, 1998.
2. Bheda R, "Managing Productivity in the Apparel Industry", Communications, New Delhi, 2000.
3. Cooklin G, "Introduction to Clothing Manufacture", Om book service, New Delhi, 2002.
4. Mehta PV and Bhardwaj SK, "Managing Quality", New Age International, New Delhi, 2001.
5. Rosenau J. A. and Wilson D. L., "Apparel Merchandising", Amazon, USA, 2001.

SUGGESTED WEBSITES

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

INSTRUCTIONAL STRATEGY

The students may be asked to learn the marketing concept by visiting different organization.

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No	Time Allotted (Hrs)	Marks Allotted
1	16	25
2	16	25
3	32	50
Total	**64**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN TEXTILE TECHNOLOGY	
Course Code: **TTBS609**	Course Title: Constitution of India
Semester: **4th**	Credits: **00**
Periods Per Week: 03 **(L: 03, T: 00 P: 00)**	

COURSE OBJECTIVES:

This course aims to deepen students' awareness of the Indian Constitution's relevance across diverse backgrounds, facilitating comprehension of its core principles. Participants will recognize the significance of fundamental rights and duties and grasp the operations of India's federal structure involving Union, State, and Local Governments. The course further focuses on educating students about emergency procedures, the election commission's role, and the process of constitutional amendments, fostering a holistic understanding of India's governance and legal framework.

COURSE CONTENTS:

1. Introduction to Constitution

1.1. Meaning and importance of the Constitution, salient features of Indian Constitution. Preamble of the Constitution. Fundamental rights- meaning and limitations. Directive principles of state policy and Fundamental duties -their enforcement and their relevance.

2. Union Government

2.1. Union Executive- President, Vice-president, Prime Minister, Council of Ministers. Union Legislature- Parliament and Parliamentary proceedings. Union Judiciary-Supreme Court of India – composition and powers and functions.

3. State and Local Governments

3.1. State Executive- Governor, Chief Minister, Council of Ministers. State Legislature-State Legislative Assembly and State Legislative Council. State Judiciary-High court. Local Government-Panchayat raj system with special reference to 73rd and Urban Local Self Govt. with special reference to74th Amendment.

4. Election provisions, Emergency provisions, Amendment of the constitution

4.1. Election Commission of India-composition, powers and functions and electoral process. Types of emergency-grounds, procedure, duration and effects. Amendment of the constitution- meaning, procedure and limitations.

RECOMMENDED BOOKS

1. M.V. Pylee, "Introduction to the Constitution of India", 4th Edition, Vikas publication,2005
2. Durga Das Basu (DD Basu), "Introduction to the constitution of India", (Student Edition), 19th edition, Prentice-Hall EEE, 2008.
3. "Introduction to the Constitution of India" by Durga Das Basu Publisher: LexisNexis
4. "Our Constitution: An Introduction to India's Constitution and Constitutional Law" by Subhash C. Kashyap Publisher: National Book Trust, India
5. "Indian Polity" by M. Laxmikanth Publisher: McGraw-Hill Education
6. "The Framing of India's Constitution: Select Documents" by B. R. Ambedkar Publisher: Oxford University Press
7. "Constitutional Law of India" by Dr. J. N. Pandey Publisher: Central Law Agency

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Understand and explain the significance of Indian Constitution as the fundamental law of the land
- Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building
- Analyse the Indian political system, the powers and functions of the Union, State and Local Governments in detail
- Understand Electoral Process, Emergency provisions and Amendment procedure.

CURRICULUM

FOR

SIXTH SEMESTER

DIPLOMA IN

TRAVEL AND TOURISM

STUDY AND EVALUATION SCHEME FOR DIP LOMA PROGRAMME IN TRAVEL & TOURISM

6th Semester

Course Code	Subjects	Time In Hours				Credits		
		Th	**Tu**	**Pr**	**Total**	**Th**	**Pr**	**Total**
TTRMPC601	On the Job Training	--	--	24	24	--	12	12
TTRMPC602	Project	--	--	18	18	--	9	9
TTRMPC603	Self Learning	--	--	2	2	--	1	1
	Total	**--**	**--**	**42**	**42**	**--**	**22**	**22**

- specialization programme in mountaineering, skiing, photography, paragliding to be offered in self-learning.

PROGRAM: THREE YEAR DIPLOMA IN TRAVEL AND TOURISM	
Course Code**: TTRMPC601**	Course Title**: On The Job Training And Training Report**
Semester**:6TH**	Credits**: 12**
Periods per Week**: 24(L:0 T:0 P:24)**	

All the Students shall undergo 03 to 04 months On Job Training in any sector/company/organization of their choice. This On Job Training not only bridges the gap between theoretical and practical applications but also enhances the skill sets and knowledge required to thrive in the tourism sector. Students will also get an opportunity to understand the tourism scenario better, be a good team player, understand what their customers and clients require from them in addition to prepare them for better placement opportunity. Based on this On Job Training, the students shall be required to write a report and submit it to the Department immediately after the completion of the training.

The On Job Training shall be appraised by the company supervisor and evaluated by the internal examiner followed by report viva-voce conducted by the panel of experts (External examiner). The evaluation of Training and Training Report shall consist of three parts. Firstly, evaluation shall be done by the company supervisor where student is placed and shall have weightage of 03 credits. Secondly, evaluation shall also be done by the Internal evaluator, to be appointed by the Head of the Department and shall have weightage of 03 credits. Lastly, evaluation shall be made by the following panel of experts through Viva-Voce of the students and shall have weightage of 06 credits: 1) Head of Department as Chairman; 2) One External Examiner from the panel submitted by Head of the Department and approved by the principal; 3) Two teachers of the department to be nominated by the Head of the Department. The On-the-Job Report shall also consist of 08 credits.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN TRAVEL AND TOURISM	
Course Code: **TTRMPC602**	Course Title: Major Project
Semester: 6th	Credits: 9
Periods Per Week:	

The Major Project in Travel and Tourism for the 6th Semester Diploma aims to provide students with an opportunity to apply the knowledge and skills acquired throughout their course in a real-world or simulated environment. This project is designed to foster creativity, innovation, and analytical thinking, encouraging students to develop comprehensive solutions to industry-related challenges. The project will also help students enhance their research abilities, project management skills, and professional competencies, preparing them for successful careers in the travel and tourism sector.

Course Content:

1. **Project Proposal Development:**
   - Identifying and defining a project topic relevant to the travel and tourism industry.
   - Conducting preliminary research to understand the scope and feasibility of the project.
   - Preparing a detailed project proposal, including objectives, methodology, expected outcomes, and timelines.
2. **Industry Analysis:**
   - Analyzing current trends, challenges, and opportunities in the travel and tourism sector.
   - Evaluating the impact of factors such as technology, consumer behavior, and global events on the industry.
   - Conducting SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis relevant to the project.
3. **Project Planning and Management:**
   - Developing a project plan that outlines the tasks, resources, and timelines.
   - Assigning roles and responsibilities within the project team (if applicable).
   - Implementing project management tools and techniques to monitor progress and ensure timely completion.
4. **Research and Data Collection:**
   - Conducting primary and secondary research to gather relevant data.
   - Utilizing tools such as surveys, interviews, and observational studies to collect insights.
   - Analyzing data to draw meaningful conclusions that support the project objectives.
5. **Solution Development:**
   - Designing innovative solutions or strategies to address the identified problem or opportunity in the travel and tourism sector.
   - Integrating sustainable practices, digital technologies, or customer experience enhancements into the project.
   - Developing prototypes, models, or plans that demonstrate the proposed solution.
6. **Report Writing and Documentation:**
   - Compiling a comprehensive project report that includes the project background, methodology, findings, and recommendations.

- Documenting all stages of the project, including research, analysis, and solution development.
- Ensuring clarity, coherence, and professionalism in the report presentation.

7. **Presentation and Defense:**
   - Preparing a visual and verbal presentation of the project findings and recommendations.
   - Defending the project in front of a panel of examiners, addressing questions and feedback.
   - Demonstrating a deep understanding of the project topic and the ability to articulate the value of the proposed solution.

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN TRAVEL AND TOURISM	
Course Code: **TTRMPC603**	Course Title: **Self Learning**
Semester: **6RD**	Credits: 01
Periods Per Week: 02	

COURSE OBJECTIVE:

The realm of tourism extends far beyond the confines of a classroom, making it a subject that defies restriction and demands experiential learning. In a deliberate effort to provide students with an authentic taste of outdoor tourism pursuits, a diverse array of courses is set to be offered. These encompass thrilling activities such as mountaineering, skiing, paragliding, river rafting, photography, and an assortment of other engaging options.

By partaking in these specialized courses, students are poised to cultivate proficiency in various practical dimensions of the dynamic tourism industry. Furthermore, these acquired skills have the potential to empower students to establish their very own entrepreneurial ventures within the field.

As a systematic practice, each academic semester will witness the department or institution's Head making a thoughtful selection from the below mentioned activities. This chosen activity, along with its corresponding course, will be meticulously chosen and students will be enrolled in well-recognized institutes offering the course. Upon successful completion of the course, students will be granted official certification, attesting to their acquired expertise. Throughout this entire process, the vigilant supervision of the respective Heads will be a constant, ensuring the seamless execution of this holistic experiential learning approach.

List of Course/ Activities:

- Mountaineering.
- Skiing.
- River-Rafting.
- Paragliding.
- Photography.

IMPLEMENTATION:

To facilitate the effective implementation of the aforementioned courses, it is imperative for the relevant department heads to establish a Memorandum of Understanding (MoU) with accredited institutes well in advance. This strategic partnership serves as a critical foundation to ensure the seamless training and education of the participating students. By formalizing this agreement, both parties commit to a collaborative framework that outlines the responsibilities, expectations, and resources needed to execute the courses successfully.

By signing the MoU well in advance, any potential challenges or logistical issues

can be identified and addressed ahead of time, ensuring a smoother training process for the students. This proactive approach not only enhances the learning experience but also underscores the commitment of both the educational institution and the training provider to the students' development and success.

CURRICULUM
FOR
SIXTH SEMESTER
OF
THREE-YEAR DIPLOMA COURSE
IN
WOOD TECHNOLOGY

Code	Subjects	Study scheme Periods per week			Total hours L+T+P	Credits			Total credits L+T+P
		L	T	P		L	T	P	
WTPR601	Major Project	0	0	20	20	0	0	10	10
HS603	Basics of Management	3	0	0	3	3	0	0	3
Program Elective-IV		3	0	0	3	3	0	0	3
WTPE601	Wood Working Cost Estimation, Accounting, and Project Management								
WTPE602	Advanced CAD & CNC								
WTPE603	Modular Furniture								
Program Elective-V		0	0	2	2	0	0	1	1
WTPE604	Wood Working Cost Estimation, Accounting, and Project Management Lab								
WTPE605	Advanced CAD & CNC Lab								
WTPE606	Modular Furniture Lab								
OPEN Elective		**3**	**0**	**0**	**3**	**3**	**0**	**0**	**3**
WTOE601	Internet of Things								
WTOE602	Professional Ethics								
WTSE602	Seminar	**0**	**0**	**4**	**4**	**0**	**0**	**2**	**2**
Total		**9**	**0**	**26**	**35***	**9**	**0**	**13**	**22**

The Extra Hours shall be managed from Project Work/Extra Time

PROGRAM: THREE YEAR DIPLOMA IN WOOD TECHNOLOGY	
Course Code:WT**PR601**	Course Title: **MAJOR PROJECT**
Semester:**6th**	Credit: **10**
Periods Per Week:**20 (L: 00, T: 00, P: 20)**	

COURSE OBJECTIVE

Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course in the solution of particular problem or undertaking a project. The students have various aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments. The project assignment can be individual assignment or a group assignment. The students should identify the project at least two to three months in advance. The project work identified in collaboration with industry may be preferred. Each teacher is expected to guide the project work of 5-6 students.

- Projects related to increasing productivity
- Projects related to quality assurance
- Projects related to estimation and economics of production
- Projects connected with repair and maintenance of plant and equipment
- Projects related to identification of raw material thereby reducing the wastage
- A suggestive criteria for assessing student performance by the external (personnel from industry) and internal (teacher) examiner is given in table below:

The Scheme of Examination for the Project shall be same as that given in general guidelines.

PROGRAM: THREE YEAR DIPLOMA IN WOOD TECHNOLOGY	
Course Code: **HS603**	Course Title: **Basics of Management**
Semester: **6th**	Credit: **03**
Periods Per Week:**03 (L: 03, T: 00, P: 00)**	

COURSE OBJECTIVE:

The diploma holders are generally expected to take up middle level managerial positions, their exposure to basic management principles is very essential. Topics like Structure of Organization, Leadership, Motivation, Ethics and Values, Customer Relationship Management (CRM), Legal Aspects of Business, Total Quality Management (TQM), Intellectual Property Rights (IPR) etc. have been included in the subject to provide elementary knowledge about these management areas.

COURSE CONTENTS

1. Principles of Management

1.1. Introduction, definition and importance of management.
1.2. Functions of Management Planning, Organizing, Staffing, Coordinating, Directing, Motivating and Controlling.
1.3. Concept and Structure of an organization
Types of industrial organization: a) Line organization b) Functional organization c) Line and Functional organization
1.4. Hierarchical Management Structure Top, middle and lower level management
1.5. Departmentalization Introduction and its advantages.

2. **Work Culture**

2.1. Introduction and importance of Healthy Work Culture in organization
2.2. Components of Culture
2.3. Importance of attitude, values and behavior Behavioral Science – Individual and group behavior
2.4. Professional ethics – Concept and need of Professional Ethics

3. Leadership and Motivation

3.1. Leadership:
a) Definition and Need of Leadership
b) Qualities of a good leader
c) Manager vs. leader
3.2. Motivation:
a) Definition and characteristics of motivation
b) Factors affecting motivation
c) Maslow's Need Hierarchy Theory of Motivation
3.3. Job Satisfaction

4. Legal Aspects of Business: Introduction and need

4.1. Labor Welfare Schemes
a) Wage payment: Definition and types
b) Incentives: Definition need and types
4.2. Factory Act 1948
4.3. Minimum Wages Act 1948

5. Management Scope in different Areas

5.1. Human Resource Development
- a) Introduction and objective
- b) Manpower Planning, recruitment and selection
- c) Performance appraisal methods

5.2. Material and Store Management
- a) Introduction, functions and objectives of material management
- b) Purchasing: definition and procedure
- c) Just in time (JIT)

5.3. Marketing and Sales
- a) Introduction, importance and its functions
- b) Difference between marketing and selling
- c) Advertisement- print media and electronic media
- d) Market-Survey and Sales promotion.

5.4. Financial Management – Introduction
- a) Concept of NPV, IRR, Cost-benefit analysis
- b) Elementary knowledge of Income Tax, Sale Tax, Excise duty, Custom duty, Provident Fund

5.5 Maintenance Management
- a) Concept
- b) Preventive Maintenance

6. Miscellaneous topics

6.1. Customer Relationship Management (CRM)
- a) Definition and Need
- b) Types of CRM
- c) Customer satisfaction

6.2. Total Quality Management (TQM)
- a) Inspection and Quality Control
- b) Concept of Quality Assurance
- c) TQM

6.3. Intellectual Property Rights (IPR)
- a) Introduction, definition and its importance
- b) Infringements related to patents, copyright, trade mark

INSTRUCTIONAL STRATEGY

It is observed that the diploma holders generally take up middle level managerial positions, therefore, their exposure to basic management principles is very essential. Accordingly, students may be given conceptual understanding of different functions related to management. Some of the topics may be taught using question answer, assignment or seminar method. The teacher will discuss success stories and case studies with students, which in turn, will develop appropriate managerial qualities in the students. In addition, expert lectures may also be arranged from within the institutions or from management organizations. Appropriate extracted reading material and handouts may be provided.

COURSE OUTCOME

By the end of the course, students should be able to

- Understand the principles of management, including the definition and significance of management
- Recognize the importance of cultivating a healthy work culture within organizations, including an understanding of its components and the significance of attitudes, values, and behaviors.
- Develop an understanding of leadership and motivation, including the definition, need, and qualities of effective leadership, as well as the distinction between managers and leaders.
- Gain knowledge of the legal aspects of business, including labor welfare schemes such as wage payment and incentives, and the regulatory frameworks established by acts such as the Factory Act 1948 and the Minimum Wages Act 1948.

RECOMMENDED BOOKS

1. Principles of Management by Philip Kotler TEE Publication
2. Principles and Practice of Management by ShyamalBannerjee: Oxford and IBM Publishing Co, New Delhi.
3. Financial Management by MY Khan and PK Jain, Tata McGraw Hill Publishing Co., 7, West Patel Nagar , New Delhi.
4. Modern Management Techniques by SL Goel: Deep and Deep Publications Pvt Limited, Rajouri Garden, New Delhi.
5. Management by James AF Stoner, R Edward Freeman and Daniel R Gilbert Jr.: Prentice Hall of India Pvt Ltd, New Delhi.
6. Essentials of Management by H Koontz, C O' Daniel , McGraw Hill Book Company, New Delhi.
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by DD Sharma, Sultan Chand and Sons, New Delhi.
9. Intellectual Property Rights and the Law by Dr. GB Reddy.
10. Service Quality Standards, Sales & Marketing Department, MarutiUdyog Ltd.
11. Customer Relationship Management: A step-by-step approach, Mohamed &Sagadevan Oscar Publication, Delhi
    Customer Relation Management, Sugandhi RK, Oscar Publication, Delhi.

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	06	15
2	06	10
3	06	15
4	06	10
5	12	25
6	12	25
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN WOOD TECHNOLOGY	
Course Code: **WTPE601**	Course Title: **Wood Working Cost Estimation, Accounting, and Project Management**
Semester: **6th**	Credit: **03**
Periods Per Week:**03 (L: 03, T: 00, P: 00)**	**Elective IV**

COURSE OBJECTIVE:

The course aims to equip students with comprehensive skills in cost estimation, financial record-keeping, and project management. By the end of the course, students will be proficient in identifying and analysing various cost elements, including direct, indirect, fixed, and variable costs. They will learn to calculate depreciation using multiple methods, understand the allocation of overhead expenses, and compare the costs of different materials, specifically focusing on woodworking projects. The course also covers practical aspects of maintaining financial records, such as cash books and journals, and managing store accounts to ensure accurate inventory tracking and stock valuation.

In addition, students will gain hands-on experience in project management techniques, including the creation and analysis of PERT (Program Evaluation and Review Technique) and CPM (Critical Path Method) charts. These tools will help students plan and optimize project timelines and identify critical activities that impact project completion. Through a combination of theoretical knowledge and practical exercises, the course prepares students to make informed financial decisions, optimize resource allocation, and effectively manage projects from inception to completion, fostering a holistic understanding of cost management and project planning in a professional setting.

COURSE CONTENTS

1. **Cost Estimation**
    - 1.1 **Elements of Cost and Ladders of Cost**
        - 1.1.1 Definition and components of cost
        - 1.1.2 Classification of costs (fixed, variable, direct, indirect)
        - 1.1.3 Understanding cost hierarchies
    - 1.2 **Depreciation: Methods of Calculation**
        - 1.2.1 Concept of depreciation and its importance
        - 1.2.2 Methods of calculating depreciation:
            - 1.2.2.1 Straight-line method
            - 1.2.2.2 Reducing balance method
            - 1.2.2.3 Sum-of-the-years'-digits method
        - 1.2.3 Practical exercises in depreciation calculation
    - 1.3 **Overhead Expenses and Distribution**
        - 1.3.1 Types of overheads (manufacturing, administrative, selling)
        - 1.3.2 Methods for allocating overheads to products
        - 1.3.3 Techniques for distributing overhead expenses
    - 1.4 **Cost Estimation for Woodworking Projects**
        - 1.4.1 Identifying cost elements specific to woodworking (materials, labor, equipment)

1.4.2 Estimation techniques for project costing
1.4.3 Case studies and practical exercises

1.5 **Comparative Cost Estimation: Imported vs. Local Wood Species**
1.5.1 Factors influencing cost differences (quality, availability, market prices)
1.5.2 Comparative analysis techniques
1.5.3 Practical exercises and case studies

1.6 **Profit and Loss Estimation**
1.6.1 Basics of profit and loss calculation
1.6.2 Impact of cost estimation on profitability
1.6.3 Exercises in profit and loss forecasting

2.

2. **Accounting**

2.1 **Cash Book Management**
2.1.1 Types of cash books (single-column, double-column, triple-column)
2.1.2 Recording transactions and balancing accounts
2.1.3 Cash book reconciliation practices

2.2 **Journal Maintenance**
2.2.1 Purpose and importance of journals
2.2.2 Steps in journalizing transactions
2.2.3 Preparing journal entries for various financial events

2.3 **Store Accounts Management**
2.3.1 Basics of inventory management and store accounting
2.3.2 Methods for tracking inventory and stock valuation
2.3.3 Recording and managing store transactions

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3. PERT & CPM

3.1 **Introduction to Project Management Techniques**
3.1.1 Overview of PERT (Program Evaluation and Review Technique)
3.1.2 Overview of CPM (Critical Path Method)
3.1.3 Differences and similarities between PERT and CPM

3.2 **Creating PERT and CPM Charts**
3.2.1 Steps in developing PERT and CPM charts
3.2.2 Identifying critical activities and project timelines
3.2.3 Practical exercises in chart creation and analysis

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4. Input and Output Planning

4.1 Input Planning for Projects
4.1.1 Estimating material requirements
4.1.2 Planning labor hours and equipment usage
4.1.3 Techniques for efficient resource allocation

4.2 Output Planning and Analysis
4.2.1 Defining project deliverables and milestones
4.2.2 Monitoring progress and adjusting plans

4.2.3 Practical exercises in output planning and control

COURSE OUTCOME

After the completion of the course, student will be able to

- Master **Cost Analysis Techniques**: Students will be able to identify and classify different cost elements and apply various methods for cost estimation, including understanding depreciation and overhead allocation.
- Execute **Practical Depreciation Calculations**: Learners will demonstrate the ability to calculate depreciation using different methods such as straight-line and reducing balance, enhancing their understanding of asset value over time.
- Conduct **Comprehensive Cost Comparisons**: Students will gain the skills to compare the costs of imported and local wood species, considering factors like quality and market conditions, and make informed decisions.
- Maintain **Accurate Financial Records**: Participants will develop proficiency in maintaining cash books and journals, ensuring accurate recording and reconciliation of financial transactions.
- Manage **Store Accounts Effectively**: Students will learn to manage store accounts, including inventory tracking, stock valuation, and transaction recording, to support efficient resource management.
- Apply **PERT and CPM in Project Planning**: Learners will be able to create PERT and CPM charts to schedule projects, identify critical activities, and optimize project timelines.
- Optimize **Input and Output Planning**: Students will develop the ability to estimate material, labour, and equipment needs accurately, and plan project outputs to achieve project goals efficiently.

RECOMMENDED BOOKS

1. **"Cost Accounting: A Managerial Emphasis" by Charles T. Horngren, Srikant M. Datar, and Madhav V. Rajan**
2. **"Fundamentals of Financial Accounting" by Fred Phillips, Robert Libby, and Patricia A. Libby**
3. **"Project Management: A Systems Approach to Planning, Scheduling, and Controlling" by Harold Kerzner**
4. **"Introduction to Cost Accounting" by T.P. Ghosh**
5. **"Cost Estimation: Methods and Tools" by Gregory K. Mislick and Daniel A. Nussbaum**
6. **"Accounting Made Simple: Accounting Explained in 100 Pages or Less" by Mike Piper**
7. **"Inventory Management Explained: A Focus on Forecasting, Lot Sizing, Safety Stock, and Ordering Systems" by David J. Piasecki**

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	20	50
2	10	15
3	12	25
4	06	10
Total	48	100

PROGRAM: THREE YEAR DIPLOMA IN WOOD TECHNOLOGY	
Course Code: **WTPE604**	Course Title: **Wood Working Cost Estimation, Accounting, and Project Management Lab**
Semester: **6th**	Credit: **01**
Periods Per Week:**02 (L: 00, T: 00, P: 02)**	**Elective V**

COURSE OBJECTIVE:

The course aims to equip students with comprehensive skills in cost estimation, financial record-keeping, and project management. By the end of the course, students will be proficient in identifying and analyzing various cost elements, including direct, indirect, fixed, and variable costs. They will learn to calculate depreciation using multiple methods, understand the allocation of overhead expenses, and compare the costs of different materials, specifically focusing on woodworking projects. The course also covers practical aspects of maintaining financial records, such as cash books and journals, and managing store accounts to ensure accurate inventory tracking and stock valuation.

In addition, students will gain hands-on experience in project management techniques, including the creation and analysis of PERT (Program Evaluation and Review Technique) and CPM (Critical Path Method) charts. These tools will help students plan and optimize project timelines and identify critical activities that impact project completion. Through a combination of theoretical knowledge and practical exercises, the course prepares students to make informed financial decisions, optimize resource allocation, and effectively manage projects from inception to completion, fostering a holistic understanding of cost management and project planning in a professional setting.

LIST OF PRACTICALS TO BE PERFORMED:

1. Breakdown of cost elements and understanding the ladder of cost.
2. Calculation of depreciation using different methods such as straight-line and reducing balance methods.
3. Allocation and distribution of overhead expenses in cost estimation.
4. Practical exercises on estimating the cost for woodworking projects, including materials, labor, and overheads.
5. Comparison of cost estimation between imported and local wood species, considering factors such as quality, availability, and market prices.
6. Profit and loss estimation exercises to understand the financial implications of cost estimates.
7. Hands-on practice in maintaining a cash book, including recording transactions, balancing accounts, and reconciling cash flow.
8. Practical exercises on journal maintenance, including posting individual transactions and preparing journal entries.
9. Introduction to store accounts management, including inventory tracking, stock valuation, and recording store transactions.
10. Application of Program Evaluation and Review Technique (PERT) and Critical Path Method (CPM) in project planning and scheduling.

11. Practical exercises on creating PERT and CPM charts for woodworking projects to determine project timelines and identify critical activities.
12. Practical exercises on input planning, including estimating material requirements, labor hours, and equipment usage for woodworking projects.

PROGRAM: THREE YEAR DIPLOMA IN WOOD TECHNOLOGY	
Course Code: WT**PE602**	Course Title: **Advanced CAD & CNC**
Semester: **6th**	Credit: **03**
Periods Per Week:**03 (L: 03, T: 00,P: 00)**	**Elective Iv**

COURSE OBJECTIVE:

Diploma holders are required to supervise and handle specialized machines and equipment like CNC machines. For this purpose, knowledge and skills about NC machines, part programming in NC machines and tooling for CNC machines are required to be imparted for enabling them to perform above functions. This subject aims at development of knowledge and skills about CNC machines, tools, equipment and use of high tech machines for increased productivity and quality.

COURSE CONTENTS

1. Introduction

1.1 Study of interface.
1.2 Drawing tools- understanding and worki9ng of commands related to:-
  i. draw tools
  ii. Modify tool
  iii. Annotative tool
  iv. Dimension tool
1.3 Preparation of plan, elevation and section for a single story two room building with verandah(2D)
1.4 Preparation of plan, elevation and section of a dog legged staircase (2D)
1.5 Preparation of plan, elevation and section of a septic tank and soak pit. (2D)

2. INTRODUCTION

2.1 Introduction to NC, CNC & DNC, their advantages, disadvantages and applications
2.2 Machine Control Unit, input devices, selection of components to be machined on CNC machines
2.3 Problems with conventional NC, New developments in NC
2.4 Axis identification, PLC Control and its components. Its advantages and disadvantages

3. Construction and Tooling

3.1 Design features, specification Chart of CNC machines,
3.2 Use of sideways, balls, rollers and coatings, motor and lead screw, swarm removal, safety and guarding devices,
3.3 Various cutting tools for CNC machines, overview of tool holder,
3.4 Different pallet systems and automatic tool changer system, management of a tool room.

4. Part Programming

4.1 Part programming and basic concepts of part programming, NC words, part programming formats

4.2 Simple programming for rational components, part programming using conned cycles,

4.3 Subroutines and do loops, tool off sets, cutter radius compensation and wear compensation.

5. System Devices

5.1 Actuators, Transducers and Sensors, Tachometer,

5.2 LVDT, opto-interrupters, potentiometers for linear and angular position encoder and decoder

5.3 Axis drives, open loop system, close loop system

6. Problems in CNC Machines

6.1 Common problems in mechanical, electrical, pneumatic, electronic and PC components of NC machines,

6.2 Diagnostic study of common problems and remedies

6.3 Use of on-time fault finding diagnosis tools in CNC machines.

7. Automation and NC system

7.1 Role of computer in automation, emerging trends in automation, automatic assembly,

7.2 manufacture of magnetic tape, manufacture of printed circuit boards, manufacture of integrated Circuits,

7.3 Overview of FMS,

7.4 Group technology, CAD/CAM and CIM

INSTRUCTIONAL STRATEGY

This is highly practice-based course. Efforts should be made to develop programming skills amongst the students. During practice work, it should be ensured that students get opportunity to individually perform practical tasks.

COURSE OUTCOME

By the end of the course, students should be able to

- Demonstrate proficiency in utilizing drawing tools, including draw tools, modify tools, annotative tools, and dimension tools, to create accurate plans, elevations, and sections for architectural designs.
- Understand the concepts of Numerical Control (NC), Computer Numerical Control (CNC), and Direct Numerical Control (DNC), including their advantages, disadvantages.
- Gain proficiency in the construction and tooling aspects of CNC machines, including the design features, specifications, and safety considerations, as well as the use of cutting tools, tool holders, pallet systems, and automatic tool

changer systems, facilitating effective management of tool rooms and operation of CNC machines.

- Develop programming skills for CNC machines, including understanding part programming concepts, NC words, part programming formats.
- Understand the functioning of system devices in CNC machines, including actuators, transducers, sensors, tachometers, LVDTs, opto-interrupters, potentiometers, axis drives, and control systems, distinguishing between open-loop and closed-loop systems and their applications.
- Identify and troubleshoot common problems in mechanical, electrical, pneumatic, electronic, and PC components of NC machines, and utilize diagnostic tools for fault finding and diagnosis in CNC machines, ensuring efficient operation and maintenance of CNC systems.

RECOMMENDED BOOKS

1. CNC Machines – Programming and Applications by M Adithan and BS Pabla; New Age International (P) Ltd., Delhi.
2. Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata McGraw Hill, New Delhi.
3. CNC Machine by Bharaj; Satya Publications, New Delhi.

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO.	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	11	20
2	06	15
3	06	15
4	08	15
5	07	15
6	04	10
7	06	10
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN WOOD TECHNOLOGY	
Course Code: WTPE605	Course Title: **Advanced CAD& CNC LAB**
Semester: **6th**	Credit: **01**
Periods Per Week:**02 (L: 00, T: 00,P: 02)**	**Elective v**

COURSE OBJECTIVE:

Diploma holders are required to supervise and handle specialized machines and equipment like CNC machines. For this purpose, knowledge and skills about NC machines, part programming in NC machines and tooling for CNC machines are required to be imparted for enabling them to perform above functions. This subject aims at development of knowledge and skills about CNC machines, tools, equipment and use of high tech machines for increased productivity and quality.

LIST OF PRACTICALS

1. Study the constructional details of CNC lathe.
2. Study the constructional details of CNC milling machine.
3. Study the constructional details and working of: - Automatic tool changer and tool setter - Multiple pallets - Swarf removal - Safety devices
4. Develop a part programme for following lathe operations and make the job on CNC lathe and CNC turning center. Plain turning and facing operations - Taper turning operations - Operation along contour using circular interpolation.
5. Develop a part programme for the following milling operations and make the job on CNC milling Plain milling - Slot milling - Contouring - Pocket milling
6. Preparation of work instruction for machine operator
7. Preparation of preventive maintenance schedule for CNC machine.
8. Demonstration through industrial visit for awareness of actual working of FMS in production.
9. Use of software for turning operations on CNC turning center.
10. Use of software for milling operations on machine centers.

PROGRAM: THREE YEAR DIPLOMA IN WOOD TECHNOLOGY	
Course Code: **WTPE603**	Course Title: **MODULAR FURNITURE**
Semester: **6th**	Credit: **03**
Periods Per Week:**03 (L: 03, T: 00, P: 00)**	**Elective IV**

COURSE OBJECTIVE:

Working in wood to create high quality furniture and units, showing skill and an aesthetic understanding of design and finish. The course covers the manufacture of free-standing and built-in furniture and units, using wood at the sole or main material. It may include the design of furniture, but normally comprises the creation of furniture and units from designs prepared by others.

COURSE CONTENTS

1. Introduction, Safety, and serviceability, Measurements & Marking

1.1 Introduction to trade: Introduction to modular furniture, analyzing the need and criteria for selection,
1.2 Materials used and constructional details. Woodworking, Identification of Timber (Natural & Synthetic Wood; Boards & Sheets),
1.3 Wood Characteristics (Structure & Grain Distortion); Safety and serviceability: The importance of safety, the standard precautions for maintaining personal and tool safety, different PPE equipment's used in woodworking;
1.4 Marking Tools: Scriber, try square, marking gauge, punches, etc.; Measuring tools: Foot rule, Steel Tape, fourfold rule, etc.;
1.5 Cutting Tools: Saws, planes, Chisels, Files, Drills, etc.; Setting, Maintenance & Sharpening of Tool

2. Jigs, Fixtures & Fasteners

2.1 Work holding devices: Carpentry vice, Workbench, C-clamp, Bar clamp, Bench hook, Bench stop, etc.;
2.2 Location & Clamping: Various Methods with description;
2.3 Fasteners: Nails and their uses, different types of screws and their uses,
2.4 Hinges, Nut & Bolt, Natural adhesives, binders and matrices for wood.

3. Basic Operations

3.1 Sawing Practice: Use of different types of the saw (Ripping, Crosscutting, etc.);
3.2 Planning Practice: Use of jack plane, trying plane, smoothing planes, etc.
3.3 Others: Chipping, Filling, Drilling, Sanding, Staining & Polishing

4. Advanced Woodworking Machines

4.1 Function, common operations and safety precautions, Care and maintenance of the machines, in brief, like- Panel Saw, Band Saw, Sander, Molder, Mortiser, CNC machine, Bander, Planer, etc.

5. Wood Joints and Structural Assemblies

5.1 Marking and Making- Mortise-tenon Joint (bridle joints, oblique double bareface, double hunched etc.),
5.2 Dovetail Joints, Broadening joints (Lap Joints, Simple butt, glue butt, doweled rebutted, secret screw butt joint, tongued and grooved, butt feather, tongued and grooved joints etc.,

5.3 Lengthening joints: Simple scarf, beveled scarf, table scarf, sloping scarf with wedged, etc.

6. Product Development

6.1 Study the drawing and make a plan for making desired Cabinet.

6.2 Select proper material and tool for making Cabinet Perform Structuring the cabinet with Plywood material and finally finishing with the sun mica and hardware.

COURSE OUTCOME

By the end of the course, students should be able to

- Demonstrate a comprehensive understanding of modular furniture design and construction, including the selection criteria and materials used in woodworking, with a focus on identifying and analyzing timber characteristics, grain distortion, and structural considerations.
- Employ various marking tools and measuring instruments effectively in woodworking tasks, demonstrating proficiency in accurate measurement and marking techniques.
- Utilize work holding devices and clamping methods to secure work pieces during woodworking operations, while also demonstrating competence in selecting and using fasteners such as nails, screws, hinges, nuts, and bolts, as well as natural adhesives, binders, and matrices for wood bonding.
- Execute basic woodworking operations including sawing, planing, chipping, filing, drilling, sanding, staining, and polishing, demonstrating precision and attention to detail in each task.

RECOMMENDED BOOKS

1. CNC Machines – Programming and Applications by M Adithan and BS Pabla; New Age International (P) Ltd., Delhi.
2. Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata McGraw Hill, New Delhi.
3. CNC Machine by Bharaj; Satya Publications, New Delhi. . Garg S. K., "Comprehensive Workshop Technology (Manufacturing Processes)", Laxmi Publishers.
4. Feirer J.L., "Furniture and Cabinet Making", Bennett Publishing Company.

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	10	20
2	08	16
3	06	12
4	08	20
5	06	12
6	10	20
TOTAL	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN WOOD TECHNOLOGY	
Course Code: **WTPE606**	Course Title: **MODULAR FURNITURE LAB**
Semester: **6th**	Credit: **01**
Periods Per Week:**02 (L: 00, T: 00, P: 02)**	**Elective V**

COURSE OBJECTIVE:

Working in wood to create high quality furniture and units, showing skill and an aesthetic understanding of design and finish. The course covers the manufacture of free-standing and built-in furniture and units, using wood at the sole or main material. It may include the design of furniture, but normally comprises the creation of furniture and units from designs prepared by others.

LIST OF PRACTICALS

1. Simple furniture like plain notice board, mini stool (straight legged)
2. Chalk box, Tea tray, or office tray
3. Book rack, Stool (Standard height, taper legged) Taper frame, plain table
4. Modern Cabinet
5. TV Stand & Unit

Open electives

PROGRAM: THREE YEARS DIPLOMA PROGRAMME IN WOOD TECHNOLOGY	
Course **WTOE601**	Course Title: **INTERNET OF THINGS**
Semester: **6th**	Credits: **3**
Periods Per Week: **(L: 3, T: 0, P: 0)**	OPEN ELECTIVE-II

COURSE OBJECTIVE:

The objective of the course is to develop skill set and domain knowledge in students of the field of Internet of Things, which is considered as one among the advancements in Computer Engineering and to further provide them with the knowledge for classification of Real World IoT applications in various Domains. The course focuses on hands-on IoT Concepts such as Sensing, Actuation and Communication

COURSE CONTENT:

1. **C-Programming**
   - 1.1. Introduction- Hello World Program
   - 1.2. Data Types and Variable Declaration
   - 1.3. If-else
   - 1.4. Loops (for, while, do-while)
2. **Introduction to Internet of Things (IoT)**
   - 2.1. Definition and characteristics of IoT
   - 2.2. Physical design of IoT
   - 2.3. IoT Protocols (M2M vs IOT)
   - 2.4. Logical Design of IoT
   - 2.5. IoT functional blocks
   - 2.6. IoT communication Models
3. **Introduction to Arduino**
   - 3.1. Arduino Uno Architecture and its setup
   - 3.2. Interfacing LED , push button and buzzer with Arduino
4. **Sensors and Actuators working**
   - 4.1. Overview of Sensors Working
   - 4.2. Analog and Digital Sensors
   - 4.3. Interfacing of
     - 4.3.1. Temperature Sensor
     - 4.3.2. Humidity Sensor
     - 4.3.3. Motion Sensor
     - 4.3.4. Light Sensor
   - 4.4. Interfacing of Actuators
   - 4.5. Interfacing of Servo Switch and Servo Motor with Arduino
5. **Applications of IOT**
   - 5.1. Applications of IoT
   - 5.2. IoT Wearables

5.3. Smart Home Applications

COURSE OUTCOME:

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

- Write basic c-programs and illustrate the use of C-Programming using basic concepts like data types, loops etc,
- Interpret the vision of IoT from a global context.
- Understand the differences and Similarities between IoT and M2M.
- Develop real time applications using Sensors/Actuators/Arduino Uno
- Explain the concept of Wi fi module functionalities and its applications.
- Implement IOT using Raspberry Pi
- Enumerate and illustrate the applications of IOT in various domains

RECOMMENDED BOOKS:

1. C-Programming by Balagursamy (for Unit 1)
2. Internet of Things – A Hands on Approach, By Arshdeep Bahga and Vijay Madisetti Universities Press
3. Internet of Things by Michael Miller, Pearson
4. Arduino Programming: The Ultimate Intermediate Guide to Learn Arduino Programming Step by Step, Ryan Turner
5. IOT for Beginners, Vibha Soni
6. Getting Started with Arduino" by Massimo Banzi, Michael Shiloh
7. The ESP8266 Wi-Fi Module for Dummies" by Cefn Hoile
8. Building the Internet of Things" by Maciej Kranz

UNIT WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1	15	30
2	07	15
3	10	20
4	12	25
5	06	10
Total	**48**	**100**

Open elective-II

PROGRAM: **THREE YEARS DIPLOMA PROGRAMME IN WOOD TECHNOLOGY**	
Course WTOE602	Course Title: **PROFESSIONAL ETHICS**
Semester: 6th	Credits: 3
Periods Per Week: (L: 3, T: 0, P: 0)	OPEN ELECTIVE-II

COURSE OBJECTIVES:

To create an awareness on Engineering Ethics and Human Values and to instill Moral and Social Values and Loyalty. Also to Create awareness among engineers about their social responsibilities and appreciate the Ethical issues .The engineers should Know the Human rights and concept of women empowerment.

1. HUMAN VALUES

1.1 Professional Ethics-Objectives of study of professional ethics-Human values-Definition of Morals and Ethics-Difference between Morality and Ethics-Values-Definition-Types of values Definition of Integrity-

1.2 Concept of Work Ethic- Service Learning- Definition Virtues-Definition Civic Virtue-Duties and Rights - Respect for Others – Attitude and values, opinions-changing attitude-beliefs-Reliability-Living Peacefully-Means to be adopted for leaving peacefully- Caring Sharing- Honesty –Valuing Time- Co-operation-Commitment-Empathy-Self-Confidence Spirituality.

2. ENGINEERING ETHICS

2.1 Engineering ethics-Definition-Approach-Senses of Engineering Ethics-variety of moral issues–

2.2 Inquiry-Types-Moral dilemmas-Steps to solve dilemma-Moral autonomy – Definition-consensus & controversy –

2.3 Profession-Definition–Ethical theories-Theories about right action Personality–Self control- Self-interest –Self respect.

3. RESPONSIBILITIES OF ENGINEERS

3.1 Safety and risk-definition- - assessment of safety and risk - risk benefit analysis and reducing risk –Personal risk-Public risk-Reducing risk-Voluntary Risk-Collegiality and loyalty–

3.2 Authority Types- collective bargaining -occupational crime –Responsibility of engineers–Types-Social responsibility-Professional responsibility-confidentiality-conflicts of interest-liability

4. ETHICAL ISSUES IN ENGINEERING PRACTICE

4.1 Ethical issues–Industrial standards-Environmental ethics –Plastic waste disposal-E-Waste Disposal-Semi conductor waste Disposal-Industrial waste disposal-Human centered environmental ethics- computer ethics –

4.2 Types of issues-Computer as the Instrument and Object of Unethical Acts - Engineers as managers-Codes of ethics-Sample code of Ethics like -Institution of Engineers (India)-Institute of Electrical &Electronics engineers- Institute of Electronics & Telecommunication Engineers - Indian Institute of Materials Management.

5. HUMAN RIGHTS

5.1 Human Rights-Definition-constitutional provisions-right to life and liberty-Human Rights of Women-Discrimination against women- steps that are to be taken to eliminate discrimination against women in Education, employment, health care, Economic and social life,

5.2 Women in rural areas- Status of Women in India - Constitutional Safeguards - Dowry Prohibition act 1961-

5.3 Domestic violence act 2005- Sexual harassment at work place bill 2006-Human Rights of Children- Who is a child- list the Rights of the Child- Right to education--Protection of Children from Sexual Offences Act(POCSO)-2012-

5.4 National Human Rights Commission- Constitution Powers and function of the Commission-Employee rights- Provisions made-Contractual-Non contractual employee rights-Whistle blowing-definition-Aspects-Intellectual Property Rights (IPR)–Meaning-Need for protection- Briefly description of concept of patents, Copy right, Trade mark

COURSE OUTCOME

After the completion of the course , the student will be able to

- Define Professional Ethics
- Show Good Work Ethic
- Solve Simple Engineering Dilemmas
- Identify and Manage Risks
- Understand Engineering Ethics Issues
- Know Basic Human Rights
- Understand Basic Intellectual Property and Employee Rights

RECOMMENDED BOOKS:

1. Ethics for the Real World: Creating a Personal Code to Guide Decisions in Work and Life by Ronald A. Howard and Clinton D. Korver
2. Engineering Ethics: Concepts and Cases by Charles E. Harris Jr., Michael S. Pritchard, and Michael J. Rabins
3. Engineering Ethics: Balancing Cost, Schedule, and Risk - Lessons Learned from the Space Shuttle by George L. Catalano

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT NO	TIME ALLOTTED (HRS)	MARKS ALLOTTED (%)
1	10	20
2	10	20
3	08	15
4	08	15
5	12	30
Total	**48**	**100**

PROGRAM: THREE YEAR DIPLOMA IN WOOD TECHNOLOGY	
Course Code: WTSE602	Course Title: **SEMINAR**
Semester: **6th**	Credit: **02**
Periods Per Week:**04 (L:00, T: 00, P: 04)**	

COURSE OBJECTIVES: Students will have the opportunity to deliver one or two seminars aimed at enhancing their presentation skills, deepening their understanding of specific topics, and fostering collaboration between academia and industry. These seminars will provide a platform for students to showcase their knowledge, research abilities, and innovative thinking to industry professionals and fellow students. The seminars will be structured as follows:

1. **Seminar Topic Selection:**
   - Students will choose topics relevant to current trends, emerging technologies, or challenges in the field of Wood Technology.
2. **Preparation Phase:**
   - Students will conduct in-depth research on their chosen topic, gathering information from academic journals, industry reports, and reputable online sources.
   - They will create comprehensive presentation materials, including slides, diagrams, and multimedia content to support their seminar.
3. **Practice Sessions:**
   - Prior to the seminar, students will participate in practice sessions to refine their presentation skills, receive feedback from peers and instructors, and ensure clarity and coherence in their delivery.
4. **Seminar Delivery:**
   - On the designated day, students will deliver their seminars in front of an audience comprising industry professionals, faculty members, and fellow students.
   - Each seminar will typically last 20-30 minutes, followed by a question-and-answer session to facilitate discussion and exchange of ideas.
5. **Feedback and Evaluation:**
   - Following each seminar, participants will provide constructive feedback to the presenter, highlighting strengths and areas for improvement.
   - Faculty members and industry experts will evaluate the content, delivery, and overall effectiveness of the seminar, providing valuable insights for student development.
6. **Reflection and Learning:**

   After completing their seminars, students will reflect on their experiences, identifying lessons learned, challenges overcome, and areas for future growth. They will document their reflections in their industrial training reports, integrating insights gained from the seminar experience into their overall learning journey.

By participating in these seminars, students will not only enhance their communication and presentation skills but also deepen their understanding of key concepts and issues in computer engineering. Moreover, the interaction with industry professionals will provide valuable networking opportunities and industry insights, enriching their overall educational experience.