Indira Gandhi University, Meerpur, Rewari
Scheme of Studies and Examination
B.Tech. (Civil Engineering)
7th and 8th Semester
Scheme effective from 2021-22

Course code and definitions:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Definitions</th>
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<tbody>
<tr>
<td>L</td>
<td>Lecture</td>
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<tr>
<td>T</td>
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<tr>
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<td>Basic Science Courses</td>
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<td>ESC</td>
<td>Engineering Science Courses</td>
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<tr>
<td>HSMC</td>
<td>Humanities and Social Sciences including Management courses</td>
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<tr>
<td>PCC</td>
<td>Professional Core Courses</td>
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<tr>
<td>LC</td>
<td>Laboratory Courses</td>
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<td>MC</td>
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<td>PT</td>
<td>Practical Training</td>
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<td>TH</td>
<td>Theory</td>
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<td>PROJ</td>
<td>Project</td>
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General Notes:
1. Mandatory courses are non-credit courses in which students will be required passing marks in internal assessments.
2. Students will be allowed to use non programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.
3. Students will be permitted to opt for any elective course run by the department. However, the department shall offer those electives for which they have expertise. The choice of the students for any elective shall not be binding for the department to offer, if the department does not have expertise. To run the elective course a minimum of 1/3rd students of the class should opt for it.
### Scheme of Studies and Examination

**B.Tech. (Civil Engineering) – 7th Semester**

*w.e.f. 2021-22*

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Category</th>
<th>Course Code</th>
<th>Course Title</th>
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<th>Total Contact Hrs. per week</th>
<th>Examination Schedule (Marks)</th>
<th>Duration of Exam (Hours)</th>
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<td>Construction planning and management</td>
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<td>PCC-CE-405</td>
<td>Estimation, Costing and Valuation</td>
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<td>Industrial training viva</td>
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<td>Mandatory courses (non-credit)</td>
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**TOTAL**

22  175  525  0  700

**Note:**

1. The valuation of Industrial training viva (PT-CE-425) will be based on seminar, viva-voce, report submitted by the student. According to performance, the student will be awarded grades A, B, C, F. A student who is awarded ‘F’ grade is required to repeat Industrial training.

   **Excellent:** A; **Good:** B; **Satisfactory:** C; **Not Satisfactory:** F

2. *MC-317* is a mandatory non-credit course in which the student will be awarded grades A, B, C, F as per their performance. A: Excellent, B: Good, C: Satisfactory, F: Not Satisfactory. A student who is awarded ‘F’ grade is required to repeat course.

3. An elective paper will be offered to the students when at least 15 students will choose that subject and the expertise of the same is available in the Department/Institute.
4. *Choose any one subject from **LIST I.**
5. **Choose any one subject from **LIST II.**
6. ***Choose any one subject from **LIST III.**
7. ****Choose any one subject from **LIST IV.**

### ELECTIVE- III (PEC) –LIST I

<table>
<thead>
<tr>
<th>S.no</th>
<th>Name of course</th>
<th>Code</th>
<th>L-T-P</th>
<th>Credits</th>
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<td>Disaster Management and Mitigation</td>
<td>PEC-CEEL – 407</td>
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<td>2.</td>
<td>Environmental Management</td>
<td>PEC-CEEL - 409</td>
<td>3-0-0</td>
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<td>Hydro Power Engineering</td>
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### ELECTIVE- IV(PEC) –LIST II

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<td>1.</td>
<td>Design of Hydraulic Structures</td>
<td>PEC-CEEL - 413</td>
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<td>Watershed Management</td>
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<td>3.</td>
<td>River Engineering</td>
<td>PEC-CEEL - 417</td>
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### ELECTIVE- V(PEC) –LIST III

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<td>Railway and Airport Engineering</td>
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<td>2.</td>
<td>Traffic Engineering</td>
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<td>Bridge Engineering</td>
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### OPEN ELECTIVE COURSES -I (OEC) – LIST IV

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<td>OEC-CE-416</td>
<td>Solid and Hazardous waste management</td>
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<td>OEC-ECE-451</td>
<td>Electronic Principles</td>
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<td>OEC-CSE-430</td>
<td>Computer Communication</td>
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NEW SCHEME OF STUDIES AND EXAMINATION
B-TECH 4th YEAR (CIVIL ENGINEERING) – 8th SEMESTER
(w.e.f. 2021-22)

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<tr>
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<td>INTPR-CE-402</td>
<td>Industrial Training/Institutional Project</td>
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<td>200 0 300</td>
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2 Hours per week per batch for one teacher and batch size will be decided by the HOD/Chairperson of the department.

Procedure for Examination and continuous Assessment

(A) External Exam Marks
1. Project Evaluation 100 Marks
2. Project Seminar 100 Marks
3. Project Viva 100 marks

(B) Continuous Assessment Marks
1. Assessment by Internal Examiner and Viva 150 Marks
   (Before the Committee Constituted by Chairman of the Department)
2. Assessment by Industrial Guide/Chairperson 50 Marks

NOTE: It is Optional. A student can earn at most 6 credits during the duration of the 8th semester subject to the passing of at least two MOOC/NPTEL courses (carrying minimum 2/3 credits). The MOOC/NPTEL chosen by the student should not be on offer/scheme of the degree. These credits will be considered in the Final Mark sheet of the students.
Course code | PCC-CE-401
---|---
Category | Professional Core course
Course title | Construction Planning and Management

<table>
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<tr>
<th>Scheme and Credits</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
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<td>Semester 7th</td>
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Class work | 25 Marks
Exam | 75 Marks
Total | 100 Marks
Duration of Exam | 3 Hours

**Course Objectives:**
At the end of this course, the students should be able:
- To learn the Basic knowledge of construction management, bar/milestone chart,
- To get knowledge of PERT and CPM, CPM (Cost Model).
- To know the construction equipment’s and selection of construction equipment’s.

**Note:**
Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit -I**

**Module 1: Introduction**
Project Management, Project Planning, Scheduling, Controlling, Methods of Planning and Programming, Bar Carts and Milestone Charts and Network Methods/Techniques.

**Module 2: PERT (Programme evolution and review technique)**

**Unit -II**

**Module 3: CPM (Critical path method)**

**Module 4: CPM (Cost model)**
Project Cost, Direct Project Cost, Indirect Project Cost, Total Project Cost and Optimum Duration, Slope of Direct Cost Curve and Steps in Time Cost Optimization.

**Unit -III**

**Module 5: Construction Equipment**
Classification of Major Equipment, Earth Excavating Equipment, Earth Cutting and Hauling Equipment, Earth Compacting and Grading Equipment, Concreting Plant and Equipment.

**Module 6: Selection of construction equipment**
Task Considerations, Cost Considerations, Equipment Engineering Considerations and Equipment Acquisition Options.

**Unit -IV**

**Module 7: CPM (Updating)**

**Module 8: Resources Allocation**
Resource’s usage profiles, Histograms, Resources Smoothing, Resources Levelling and Risk associated in construction project Management.

**Course Outcomes:**

After completing this course, students should be able:

- Proficient enough to apply the concepts of the construction project management with time and cost estimates.
- Different Cost of the Projects with total cost of the Project and selection of construction equipment's

**Recommended Book:**

Course code: PCC-CE- 403

Category: Professional Core course

Course title: Advanced Steel Structure

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<th>Scheme and Credits</th>
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<th>Credits</th>
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<td>75 Marks</td>
<td>100 Marks</td>
<td>3 Hours</td>
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Class work: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Course Objectives
- To impart practical knowledge of advanced steel structures and their application.
- To teach the students advance level design of steel structures.
- To make the students familiar with the relevant IS codes to be used in construction industries.
- To teach the students modern design methods such as design of light gauge steel.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I
Module 1: Eccentric and Moment Connections

Unit-II
Module 2: Industrial Buildings
Loads, general arrangement and stability, design considerations, design of Purlins, design of roof trusses, industrial building frames, bracings and stepped columns.

Module 3: Towers
Transmission line towers, Microwave towers, Design loads, classification, Design and specification.

Unit-III
Module 4: Design of Water Tanks
Types of water tank, permissible stresses, design of circular, rectangular and pressed steel tanks including staging.

Module 5: Design of Steel Stacks
Types of steel stack, various loads consideration of steel stacks, Design of steel stacks including foundation.

Unit-IV
Module 6: Cold Formed Sections
Brief description of various types of cold-formed sections, local buckling, concepts of effective width and effective sections, elements with stiffeners, Design of compression and bending elements.

Course Outcomes
At the end of the course, the students will be able to:
Apply the IS code of practice for the advanced design of steel structural elements.
Design complicated structures like plate girder, Industrial structures and tanks.
Design light gauge structures too.
Use relevant IS code for above structural design.
Students will be able to understand the advanced design of steel structure with practical application.

References:

Course code: PCC-CE- 405
Category: Professional Core course
Course title: Estimation, Costing and Valuation

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Credits: Semester 7th

Class work: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Course Objectives: The objective of this Course is

- To analyze cost/revenue data and carry out make economic analyses in the decision-making process to justify or reject alternatives/projects on an economic basis.
- Prepare engineering students to obtain professional licensure.
- To function in the business and management side of professional engineering practice.
- To preparation estimate of the civil engineering works.
- To preparation specification of construction items.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Module 1: Introduction
Purpose of estimating and valuation, Principle of estimation, unit of measurement, item work, Different kinds of estimates, Different methods of estimation. Introduction to estimates of other Civil engineering structures.

Module 2: Building Estimate

Unit-II

Module 3: Specification
earthworks, cement, concrete, brickwork, flooring, D.P.C, R.C.C, cement plastering, painting and other finishing.

Module 4: Market Survey
Traditional and modular materials, Market survey of construction materials, Wages of labour, Tool’s plant and equipment of construction.

Unit-III

Module 5: Rate Analysis
Prerequisites, factors affecting rate analysis, over head expenses, Procedure for rate analysis: schedule of rates, labour requirement for different works, material requirement for different works, Rate analysis of different Items of work (Earth work, Concrete works, R.C.C works, Reinforce Brick work, plastering, painting, finishing).

Module 6: Abstracting and Billing

Unit-IV

Module 7: Tenders and Contracts
Tender notice and documents, acceptance of tender, Earnest money, security money, retention money, Contract-contractor: terms and conditions of contract, Agreement, Form of Contract, Responsibility of owner, Architect, Contractor and Engineer. Preparation of pay bill, measurement of work for payment of contractors, different types of payment – first & final, running advance and final payment.

Module 8: Valuation
Purpose of valuation, principles of valuation, Types of property, Depreciation, Sinking fund, Lease hold and free hold property, obsolescence, Gross income, Outgoing and Net income, Capitalized value and year’s purchase. valuation of a building – cost method, rental – return method.

Course Outcomes:
At the end of the course, students shall be able:

- To understand the methodology of Cost-driven design optimization.
- To get understanding of contract models, contract plans and specifications.
- The students will learn the purpose and importance of valuation

Referenced Books:
Course code: PEC-CEEL-407
Category: Professional Elective course
Course title: Disaster Management and Mitigation

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</table>

Semester 7th

Class work: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Course Objectives:
- To provide basic conceptual understanding of disasters and its relationships with development.
- Provide an understanding of the social nature of natural hazards and disasters
- Increase awareness of hazards and disasters around the world and the unequal social consequences stemming from disaster events.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I
Introduction: Terminology, Global and Indian scenario, role of engineer, importance of study in human life, long term effects of disaster. Geological Mass Movement and land disasters, Atmospheric disasters, Disaster Mitigation

Unit-II

Unit -III
Damage profile analysis- Uttarkashi/Bhuj/Latur earthquakes, Kerala floods, cyclone Fani and Amphan, Bihar floods, Covid 19, Forest Related disasters, Mining disasters, Atmospheric disasters.

Unit IV
Importance of public awareness, Preparation and execution of emergency management programme. Scope and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India. Use of Internet and software for effective disaster management. Applications of GIS, Remote sensing and GPS in this regard.

Course Outcomes:
After completing this course, students should be able:
- To know natural as well as manmade disaster and their extent and possible effects on the economy.
- To Plan national importance structures based upon the previous history.
- To acquaint with government policies, acts and various organizational structures associated with an emergency.
- To know the simple dos and don’ts in such extreme events and act accordingly.

**Reference Books:**


**Course code**  
PEC-CEEL-409

**Category**  
Professional Elective course

**Course title**  
Environmental Management

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<th>Scheme and Credits</th>
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<td>Semester 7th</td>
<td>3</td>
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</table>

| Class work Marks | 25 |
| Exam Marks       | 75 |
| Total             | 100 |
| Duration of Exam  | 3 Hours |

**Course Objectives:**
The course should enable the students to:

- Global environmental issues and their Management.
- Green technologies for cleaner production.
- Major principles and steps required in environmental impact assessment.
- Causes of land degradation, biodiversity loss and methods of their management.

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**UNIT-I**


**UNIT-II**

Cleaner Production Technologies Need and benefits, cleaner production techniques and options, zero impact manufacturing initiatives CDM and carbon credits/case studies.

**UNIT-III**

Environment Impact Assessment: Importance for environment management, constituents of environment impact assessment, project data for EIA study, prediction of impacts, EIA methodologies, constraints in implementation of EIA, impact prediction on water resources projects and other relevant case studies. Environment pollution.

**UNIT-IV**

Degradation of Land Resources: Deforestation: Forest land, deforestation and its effects on land use and Environmental quality, wetland and their importance in environment, causes and extent of wasteland, Soil degradation problems, erosion, salinization, water logging, land use management & planning.

**Course Outcomes:**

- An ability to understand the major global environmental issues, their causes, sources, management and laws/policies related to these technologies involved in eco-friendly production and mechanism of carbon credits.
- An ability to understand the major principles of environmental impact assessment.
- An ability to understand the implications of current rules and regulations in relation to environmental impact assessment.
- An ability to understand the causes, implications and management of local environmental issues like land degradation, wasteland and water logging.
Recommended Books:

Course code | PEC-CEEL- 411
---|---
Category | Professional Elective course
Course title | Hydro Power Engineering

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**Course Objectives**

The objective of this Course is

- To introduce energy systems and renewable energy resources with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.
- To explore society’s present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternatives, renewable energy sources.
- To introduce basics of turbine and powerhouse.

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Module 1: Introduction to Energy Sources**
Sources of energy, Status of hydropower, thermal vs hydropower, advantages of hydropower, Energy contribution of hydropower in power system.

**Module 2: Basics of Hydropower**
Electrical load on hydropower, load curves, load factor, capacity factors, utility factors and diversity factors, load on hydropower stations, load curves, load duration curves, firm power, secondary power, Prediction of loads.

**Unit-II**

**Module 3: Types of Hydropower Stations**
Elements of Hydro power, classification of hydropower stations, run of river plants, General layout of run of river plants, Valley dam plants, storage and pondage.

**Module 4: Basic features of Pump Storage Plants**
Advantages of pump storage plants, types of pump storage plants, efficiency of pump storage plants, Reversible Turbines.

**Unit-III**

**Module 5: Intakes**
Intake structures: functions and their types, Components of intakes: forebay, trash racks, gates and valves, Force required to operate Gates.

**Module 6: Water Conveyance System**
Classifications of Penstocks, Design criteria of penstocks, anchor blocks, types of valves, water hammer effects, instantaneous closure of power canal, Surge tank and its classification.
Unit-IV

Module 7: Turbines
Type of turbines, criteria for selection, specific speed of turbines, unit power, unit discharge, cavitation in turbines, Design of the draft tube.

Module 8: Power Houses
General layout and arrangements of hydro-power units, number and size of units, substructure, spacing of units, super-structure, underground power stations.

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

● Different energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.
● Explore society’s present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternatives, renewable energy sources.
● Basics of turbine and powerhouse.

References:

1. Water power Engineering by Dandekar and Sharma.
3. Hydro Power Engineering by DrDarde P N, Vayu Education,Delhi.
5. Water Power Engineering, Borrows, H.K.
Course code: PEC-CEEL - 413
Category: Professional Elective course
Course title: Design of Hydraulic Structures

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Semester 7th

Class work: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Course Objectives:
- To understand design processes of hydraulic structures
- To further develop understanding on cross drainage works.
- To further develop understanding on design considerations of Dams
- To develop understanding on seepage conditions.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit- I

Module 1: River training works
Objectives and classifications of river training works, Methods of river training Bends and Meandering rivers, marginal embankments, spurs, cutoffs, bank pitching and launching apron. Design consideration of guide banks.

Module 2: Flood Routing

Unit II

Module 3: Design of Cross Drainage Works
Need of cross drainage works and their suitability, Canal regulation structures and design of cross drainage works, canal drops, operation and maintenance of canals.

Module 4: Hydraulic structure
Blight creep and Khosla theory, stream lines, critical exit gradient, need of weirs and barrage, Factors controlling the design of weirs and barrages and its components. Design of weirs.

Unit III

Module 5: Design of Spillways
Need of spillway, Design consideration of main spillway, Design of ogee spillway, crest of spillway and stilling basins.

Module 6: Design of Fall
Location and Necessity of falls, components of Sarda type fall and its design, characteristics of sloping glacis falls.

Unit-IV

Module 7: Dams
Planning and investigations of reservoir and dam sites, Choice of dams, preparation and protection of foundation and abutments. Dam construction problems, Forces acting on gravity dams, modes of failure.
of failure and design criteria for structural stability of gravity dams, seepage line in a homogenous earth dam, equipotential lines, path lines, kozeny parabola.

Course Outcomes:

After completing this course, students should be able:
1. To identify the design lines of hydraulic structures
2. To being able to read charts for various designing purposes

Reference Books:

- Sharma, S.K., Principles and Practice of Irrigation Engineering, S.Chand& Co., latest edition
Course code: PEC-CEEL-413

Category: Professional elective course

Course title: Ground Water Engineering

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Semester 7th

Class work: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Course Objectives:
1. To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers.
2. To understand the techniques of development and management of groundwater.
3. Some real-world example problems are also been incorporated to give an idea about the complexities and challenges encountered during the management of groundwater processes.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Module 1: Hydrogeological Parameters
Ground water exploration and methods of investigations, Characteristics of ground water, forms of subsurface water, Global distribution of water, groundwater column, Groundwater table fluctuation and its interpretations, Groundwater development and Potential in India, Groundwater balance.

Module 2: Groundwater Management
Database for Groundwater Management, Groundwater budgets, Water bearing formations of Rock and their properties, safe yield, Type of aquifers, Darcy's Law, Aquifer properties.

Unit-II

Module 3: Well Hydraulics
Objectives of Groundwater hydraulics, Governing equation for flow through porous medium - Steady flow, Dupuit assumptions, equilibrium equations for confined and unconfined aquifers, Heim’s equilibrium formula.

Module 4: Unsteady State Flow
Governing equation for flow through porous medium - unsteady state flow – Jacob method – Chow method- Recovery test-pumping tests, Conjunctive use – Collector well and Infiltration gallery, well loss coefficient, Partially penetrating wells - Wells in a leaky confined aquifer, interference of wells.

Unit-III

Module 5: Water Withdrawals and Uses– water for energy production, water for agriculture, water for hydroelectric generation; flood control, analysis of surface water supply, open wells in unconsolidated formations, sanitary protection of open wells.

Module 6: Tube well
Tube wells types, site selection, components, strains and its types, design of tube wells in different aquifers, drilling operation and its different methods, Construction and working of tube wells, verticality and alignment, development of tube wells, gravel packing, well sickness, corrosion and failure of tube wells, silting of tube well, optimum capacity of well.
Unit-IV

Module 7: Groundwater Conservation
Reclaimed wastewater recharge, Soil aquifer treatment, Aquifer Storage and Recovery, Seawater Intrusion and Remediation – Ground water Basin management and Conjunctive use, Contamination source inventory and remediation schemes.

Module 8: Artificial Recharge
Artificial recharge of ground water, recharge techniques induced infiltration, water spreading, flooding, basins, ditching, modification of natural channels, irrigation, recharge pits, shafts, Hydraulics of recharge wells.

Course Outcomes: The students will be able to.
1. Understand aquifer properties and its dynamics.
2. Get an exposure towards well design and practical problems of groundwater aquifers.
3. To understand the importance of artificial recharge and groundwater quality concepts.
4. Gain knowledge on conservation of groundwater.
5. Understand different tube wells and their components.

Recommended Books:
Course code  PEC-CEEL- 415
Category  Professional Elective course
Course title  Watershed Management

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**Course Objectives:**
- To understand different watershed behaviour.
- To be able to interpret runoff data and quantify erosion by using various modelling methods.
- To understand land use classification and impact of land use changes on hydrological cycle parameters.

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**
**Introduction and Basic Concepts:** Concept of watershed, need for watershed management, different stakeholders and their relative importance, watershed management policies and decision making. Sustainable integrated watershed management, natural resources management, agricultural practices, integrated farming, Soil erosion and conservation; Principles of soil erosion- causes and types of soil erosion, estimation of soil erosion from small watersheds. Control of soil erosion, methods of soil conservation-structural and non-structural measures.

**Unit-II**
**Integrated Watershed Management:** Introduction to integrated approach, Integrated water resources management, conjunctive use of water resources, rainwater harvesting; roof catchment system. Watershed Modeling: Standard modeling approaches and classifications, system concept for watershed modeling, overall description of different hydrologic processes, modeling of rainfall-runoff process, subsurface flows and groundwater flow.

**Unit-III**

**Unit-IV**
**Storm Water, Flood and Drought Management:** Storm water management, design of drainage system, flood routing through channels and reservoir, flood control and reservoir operation, case studies on flood damage. Drought Management: Drought assessment and classification, drought analysis techniques, drought mitigation planning.

**Course Outcomes:**
At the end of the course, students shall be able:

1. To identify causes of soil erosion.
2. Plan and design of soil conservation measures in a watershed.
3. Plan and design water harvesting and groundwater recharge structures.
4. Plan measures for reclamation of saline soils.

Reference:

Course code | PEC-CEEL-417
---|---
Category | Professional Elective course
Course title | River Engineering

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Semester 7th

**Course Objectives:**
- Acquaint the students to basic concepts of rivers and their significance.
- To stimulate the students to think systematically and objectively about contemporary river problems.

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**
Introduction: classification of streams, sediment transport and budgets, River morphology and various classification schemes. River basins; erosion from river catchments and its transportation by rivers; Regimes of Flow: Ripple and dune regime, anti-dune regime, importance of regimes of flow, Bed Load Transport: Bedload equations.

**Unit-II**
Behaviour of Rivers: River channel patterns, Straight River channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Delta formation and control.

**Unit-III**
Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration. Bio-engineering techniques, Classification review, Natural channel design analysis, Time series, Analysis of flow, Sediment and channel geometry data.

**Unit IV**
River training and protection works: Classification of River training, Types of training works, Protection for bridges with reduced waterway, Design of guide bank, Embankment and spurs, other river/flood protection work.

**Course Outcomes:**
After completing this course, students should be able:
- To realize the significance of river engineering in today life.
- To understand the processes involved in Bio-engineering Techniques.
- To appreciate the role of River Training and Protection Works

**Recommended Books:**
Course code: PEC-CEEL-419

Category: Professional elective course

Course title: Railway and Airport Engineering

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Course Objectives:
At the end of this course, the student should be able:

- To impart understanding about the various types of railways,
- To classify different tunnels and its techniques of excavation.
- To understand airport engineering.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I
Module–1: Development of railways in India, Permanent way and railway track components, different gauges in India, conning of wheels, function and types of rails, rail sections, defects in rails, creep of rails, rail joints and welding of rails, sleepers – types, spacing and density, rail fixtures and fastenings, ballast, sub-grade and embankment.

Module–2: Geometric design of railway track: gradients, grade compensation, speed of trains on curves, super elevation, cant deficiency, negative super elevation, curves, widening on curves.

Unit-II


Unit-III

Module–6: Tunnels- Site selection, Classification, Size and shape of a tunnels, Methods and techniques of underground excavation in tunnels, Alignment of a Tunnel, Mucking, Lighting and Ventilation in tunnel, Drainage of tunnels, Safety in tunnel construction.

Unit-IV
Module–7: Airport Classification on the basic of community size, types of services, Aircraft Characterizes, selection of site and factors affecting site selection of airport, Airport layout plan.

Module–8: Geometric design of Runways, Airport capacity, factors effecting runway capacity, Airport markings and lightings.
Course Outcomes:

After completing this course, students should be able:

- To realize the significance of Railways and tunnels in today life.
- To understand the processes involved in railway and tunnel maintenance.
- To realize the significance of Airports in today life.
- To understand the processes involved design of airports

Recommended Books:

4. Airport Engineering Planning and design, Subhash C. Saxena
Course code: PEC-CEEL-421

Category: Professional elective course

Course title: Traffic Engineering

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Semester 7th

Class work: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Course Objectives:
- Acquaint the students to basic concepts of Traffic and their significance.
- To stimulate the students to think systematically and objectively about various traffic problems.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Traffic Characteristics: Importance of traffic characteristics. Road user characteristics. Vehicular characteristics. Max dimensions and weights of vehicles allowed in India. Effects of traffic characteristics on various design elements of the road.

Traffic Studies: Traffic volume study, speed study and origin and destination study. Speed and delay study. Use of photographic techniques in traffic surveys.

Unit-II

Traffic Accidents: Accident surveys, Causes of road accidents and preventive measures, Capacity and Level of Service: Fundamental diagram of traffic flow, Relationship between speed, volume and density, Level of service, PCU, Design service volume, Capacity of non-urban roads. IRC recommendations, Brief review of capacity of urban roads.

Unit-III

Traffic Control Devices: Signs, Signals, markings and islands. Types of signs, Types of signals, Design of Signal, Intersections at grade and grade separated intersections. Types of grades separated intersections, Parkingsurveys: On street parking, off street parking.

Unit-IV

Road safety audit, RSA team, RSA Report, Elements of RSA, Detrimental effects of traffic. Vehicular air pollution and Situation in India, Motor vehicle act, Vehicular emission norms in India and abroad. Alternate fuels. Factors affecting fuel consumption.

Course Outcomes:
After completing this course, students should be able:
- To realize the significance of traffic engineering in today life.
- To understand the processes involved in traffic studies.
- To appreciate the role of Traffic regulations.

Recommended Books:

Course code: PEC-CEEL-423

Category: Professional elective course

Course title: Bridge Engineering

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Semester 7th

Class work: 25 Marks

Exam: 75 Marks

Total: 100 Marks

Duration of Exam: 3 Hours

Course Objectives

● To understand the load-carrying capacity of various types of bridges, upon learning the structural responses to different kinds of loads.

● To design short and medium span bridges, with confidence using existing codes of practice, taking into account of the structural strength, service life and durability.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Module 1: Introduction
Component and classification of bridge, Historical bridges (in India and overseas), short history of bridge development, importance of bridge Investigation: Need for investigations, selection of bridge site, preliminary data to be collected, design discharge and its determination, linear waterway, economical span, vertical clearance above HFL, scour depth, choice of bridge type. Site selection-Soil Exploration for site importance of Hydraulic factors in Bridge Design.

Module 2: Planning and layout of bridges

Unit-II

Module 3: Concrete bridges
Bridge deck and approach slabs, Slab design methods, Design of bridge deck systems, Slab-beam systems (Guyon-Massonet and Hendry Jaeger methods), Box girder systems- analysis, design and detailing.

Module 4: Steel and composite bridges
Advantages and disadvantages, Orthotropic decks, Box girders, Composite steel-concrete bridges, Truss bridges- analysis and design.

Unit-III

Module 5: Sub-structure
Piers, Columns and towers,Caissons, Abutments and retaining walls, Analysis and design - Shallow and deep foundations

Module 6: Bridge appurtenances
Expansion joints, Design of joints, Types and functions of bearings, Design of elastomeric bearings, Railings, Drainage system and lighting.

Unit-IV

Module 7: Long span bridges
Design principles of continuous box girders, Curved and skew bridges, Cable stayed and suspension bridges, Seismic resistant design, Seismic isolation and damping devices.

Module 8: Construction techniques
Cast in-situ, Prefabricated, Incremental launching, Free cantilever construction, Inspection, Maintenance and rehabilitation, Current design and construction practices.

**Course Outcomes:**

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

- Understand the fundamentals and codes of practice of bridge design.
- Design the bridge deck and box girder systems using appropriate method.
- Devise the steel truss and composite steel-concrete bridges.
- Propose the sub-structure components such as pier, abutments and bridge bearings.
- Design the various types of long span bridges, curved and skew bridges.

**Referenced Books:**

1. Krishna and Raju “Bridge Engineering”.
Course code: OEC-ME-410  
Category: Open Elective Courses (OEC)  
Course title: QUALITY ENGINEERING  
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Objectives: To understand the concept of Quality Engineering which emphasizes growth, creativity, and analytical thinking.

Class work: 25 Marks  
Exam: 75 Marks  
Total: 100 Marks  
Duration of Exam: 03 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Section A
Basic Concepts of Quality: Definitions of Quality and its importance in industry, Quality function, Quality Characteristics, Quality process, Quality Traits, Applications of Quality Concept, Introduction to quality control, Computer aided quality control, Total quality control (TQC) and its implementation, Elements of TQC, Quality Circle, Objectives of quality circle, Role of management in quality circle, Quality in service organizations, characteristics of a service organization, Important service dimensions, Design of service quality.

Section B
Basic Statistical Concepts: The Concept of variation, Distinction between variables and attributes data, The frequency distribution, graphical representation of frequency distribution, Quantitative description of distribution, the normal curve, concept of probability, laws of probability, probability distributions, hyper geometric distribution, binomial distribution, The Poisson distribution.

Section C
Quality systems: Quality systems, Need for quality System, Need for standardization, History of ISO:9000 series standards and its features, steps to registration, India and ISO:9000, Automated inspection systems technologies, Different forms of Inspection, Industrial inspection,

Section D
Total Quality Management: Introduction TQM, Concepts, Characteristics of TQM, Relevance of TQM, Approaches to TQM Implementation, TQM philosophies, Taguchi Philosophy, JIT, Kaizen, Six Sigma approach, 5-S approach

Course Outcomes: Upon completion of this course the student will be able to:
CO1 - Attain the basic techniques of quality improvement, fundamental knowledge of statistics and probability  
CO2 - Use control charts to analyze for improving the process quality.  
CO3 - Describe different sampling plans  
CO4 - Acquire basic knowledge of total quality management  
CO5 - Understand the modern quality management techniques

Text Books:
1. Quality planning and Analysis, Juran and Gryna, TMH, New Delhi
2. Quality Management, Kanishka Bed, Oxford University Press, New Delhi
3. Introduction to SQC, Montgomery DC, 3e, Wiley, New Delhi

Reference Books:
Course code: OEC-CE-416

Category: Open elective course

Course title: Solid and Hazardous Waste Management

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Semester 7th

Class work: 25 Marks

Exam: 75 Marks

Total: 100 Marks

Duration of Exam: 3 Hours

Course Objectives:

- To understand the sources of solid and hazardous wastes.
- To understand methods of solid and hazardous waste disposal.
- To gain knowledge of E-Waste management.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Module: 1 Sources and Composition of Municipal Solid Waste
Introduction, Sources and Types of solid waste, Composition of Solid Waste and its Determination, Properties of Municipal Solid Waste

Module: 2 Solid Waste Generation and Collection
Quantities of Solid Waste, Measurements and methods to measure solid waste quantities, Solid waste generation and collection, Factors affecting solid waste generation rate, Quantities of materials recovered from MSW.

Unit-II

Module: 3 Handling, Separation and Processing of Solid Waste
Material separation by pick in, screens, float and separator magnets and electromechanical separator and other latest devices at site; Waste handling, separation and processing of solid waste at residence, Commercial and industrial site.

Module: 4 Disposal of Municipal Solid Waste
Landfill: Classification, planning, sitting, permitting, landfill processes, landfill design, landfill operation, use of old landfill.

Unit-III

Module: 5 Hazardous Waste Management

Module: 6 Biological Treatment of Solid and Hazardous Waste
Composting; bioreactors; anaerobic decomposition of solid waste; principles of biodegradation of toxic waste; oxidative and reductive processes.

Unit-IV

Module: 7 Radioactive Waste Management
Fundamentals Sources, measures and health effects; nuclear power plants and fuel production; waste generation from nuclear power plants; disposal options.

Module: 8 Electronic waste management
E waste- Definition, composition; environmental and human health issues, recovery of metals from E waste, E waste management,
Course Outcomes:

After completing this course, students should be able:

- To realize the significance of solid and hazardous waste management in today life
- To understand the processes involved in solid and hazardous waste management
- To comprehend the techniques for various waste management
- To appreciate the role of common/integrated waste management plants

Suggested Books:

Course code | OEC-ECE-451
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Category | Open Elective Course
Course title | Electronic Principles

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Semester 7th

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Course Objective:
1. Study the basic principles of electronic systems.
2. Understand working of Digital electronics.
3. Understand the working of Display devices.

UNIT 1 SEMICONDUCTOR DIODE: P-N junction and its V-I Characteristics, P-N junction as a rectifier, Switching characteristics of Diode. Diode as a circuit element, the load-line concept, half-wave and full wave rectifiers, clipping circuits, clamping circuits, filter circuits, peak to peak detector and voltage multiplier circuits.

UNIT 2 ELECTRONIC DEVICES: LED, Zener Diode as voltage regulator, BJT, UJT, MOSFET, Thyristor, DIAC, TRIAC.

UNIT 3 DISPLAY DEVICES: LED, LCD, Seven Segment, Sixteen Segment.

UNIT 4 DIGITAL ELECTRONICS: Binary, Octal and Hexadecimal number system and conversions, Boolean Algebra, Truth tables of logic gates (AND, OR, NOT) NAND, NOR as universal gates, Difference between combinational circuits and sequential circuits, Introduction to flipflops (S-R & J-K).

TEXT BOOK:
1. Integrated Electronics: Millman&Halkias ;McGrawHill

REFERENCE BOOKS:
1. Electronics Principles: Malvino ;McGrawHill
2. Electronics Circuits: Donald L. Schilling & Charles Belove;McGrawHill

Course Outcomes:
At the end of the course, students will demonstrate the ability to:
1. Understand the working of electronic components.
2. Understand the Digital System and various displays.
Course Objective:
1. To Build an understanding of the fundamental concepts of computer networking and familiarizing the student with the basic taxonomy and terminology of the computer networking and data communication.
2. To outline various models, topologies and devices of Computer Networks.
3. To explain the functions of various layers in Network Reference Model.
4. To apply different network concepts in various network communication protocols.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit 1
Transmission Media: Copper cable, Twisted-Pair Cable, Coaxial Cable, Fiber-Optic Cable. Introduction to Computer Network: applications, benefits and problems, Types of Networks: PAN, LAN, MAN and WAN.

Unit 2
OSI and TCP/IP Model: Layering architecture of networks, OSI model, Functions of each layer, Services and Protocols of each layer

Unit 3
Ethernet: Features and types of LANs, Types of Ethernets- Thicknet, Thinnet, Fast Ethernet and Gigabit and 10G Ethernet etc. Concept of Carrier Sense Multiple Access (CSMA)/CD in Ethernet,
Network addressing: Physical addressing, logical addressing and port addressing, MAC addressing in Ethernet, IP V4 addressing: concept of subnet, network and host address, IP address Classes- A, B, C, D and E classes. Introduction to classless addressing.

Unit 4
LAN interconnecting devices: Repeater, Hubs, Switches, Bridges, Routers, Gateways.
Internet and E-mail: Concept of Internet, Advantages of Internet, Security issues in using internet. Application of Internet in various fields: Scientific, Business, Research, Sports, Medicine & Health Care, Engineering, Teaching. HTTP and FTP

Email: concept, Protocols: SMTP, POP, IMAP.

Text Book:


Reference Books:


Learning Outcomes: By the end of the course the students will be able to:

1. Independently understand basic computer network technology.
2. Understand and explain Data Communications System and its components.
3. Identify the different types of network topologies and protocols.
4. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
5. Identify the different types of network devices and their functions within a network.
Course code | MC-317  
---|---
Category | Mandatory courses (non-credit)  
Course title | Constitution of India  
Scheme and Credits | L | T | P | Credits | Semester 7th  
---|---|---|---|---|---
Class work | - |  |  |  |  
Exam | - |  |  |  |  
Total | - |  |  |  |  
Duration of Exam | - |  |  |  |  

**Course Objectives:**

Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

*Note: 1. MC-317 is a mandatory non-credit course in which the students will be awarded grades A, B, C, F as per their performance. A: Excellent, B: Good, C: Satisfactory, F: Not Satisfactory. A student who is awarded ‘F’ grade is required to repeat course.*

**Module – I**

Philosophy of Indian Constitution: Salient features of Indian Constitution, Preamble, and Nature of Indian Constitution, Procedure for amendment of the Constitution.

**Module – II**

Federal structure and distribution of legislative and financial powers between the Union and the States.

**Module – III**


**Module – IV**

Fundamental Rights: Origin and development of Fundamental rights, Need for fundamental rights, Introduction to Right to equality, Right to freedom, Right against exploitation, Right to freedom of religion, Cultural and Education rights and Fundamental duties.

**Course Outcomes:** Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the concept utilization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct election through adult suffrage in the Indian Constitution.
Discuss the passage of the Hindu Code Bill of 1956.

References:
1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S.N. Busi, Dr. B.R. Ambedkar framing of Indian Constitution, latest Edition