# MUTHAYAMMAL ENGINEERING COLLEGE

## An Autonomous Institution

(Approved by AICTE | Accredited by NAAC | Affiliated to Anna University)
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

# Curriculum/Syllabus

**Programme Code : CE**

**Programme Name : B.E-Civil Engineering**

**Regulation : 2023**


# MUTHAYAMMAL ENGINEERING COLLEGE

(Approved by AICTE | Accredited by NAAC | Affiliated to Anna University)
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.


Ph. No.: 04287-220837
Email: info@mec.ac.in

# MUTHAYAMMAL ENGINEERING COLLEGE

## An Autonomous Institution

(Approved by AICTE | Accredited by NAAC | Affiliated to Anna University)
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

Estd. 2000

## Institution Vision & Mission

### Institution Vision

- To be a Centre of Excellence in Engineering, Technology and Management on par with International Standards.

### Institution Mission

- To prepare the students with high professional skills and ethical values.
- To impart knowledge through best practices.
- To instill a spirit of innovation through Training, Research and Development.
- To undertake continuous assessment and remedial measures.
- To achieve academic excellence through intellectual, emotional and social stimulation.

CHAIRMAN,
BOARD OF STUDIES,
DEPARTMENT OF CIVIL ENGINEERING,
MUTHAYAMMAL ENGINEERING COLLEGE,
RASIPURAM - 637 408.

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Estd. 2000

## Department Vision & Mission

### Department Vision

- To produce Engineers with competent knowledge to serve with ethics in Civil Engineering.

### Department Mission

- To impart quality Education through effective teaching learning methods.
- To prepare students through periodical in-plant training and field projects.
- To imbibe with human and moral values to practice in day to day activities with professional ethics.

### Program Educational Objectives

**PEO1** : Graduate should be able to apply professional knowledge to employ cost-effective and safe solutions to societal issues.

**PEO2** : Graduate should be able to be self-motivated towards lifelong learning and entrepreneurship.

**PEO3** : Graduate should be able to inculcate professional ethics with a commitment to the society and environment.

### Program Specific Outcomes

**PSO1** : The graduates will be able to plan, analyze, design and prepare technical reports for civil engineering.

**PSO2** : The graduates will organize, generate detailed design, compose specifications and calculate cost estimates.

**PSO3** : The graduates will analyze and design regular and complex structures having acquired the knowledge of building analysis software packages.

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RASIPURAM - 637 408.

## Program Outcomes

**PO1** : **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2** : **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.

**PO3** : **Design/Development solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4** : **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5** : **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6** : **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7** : **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

**PO8** : **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9** : **Individual and team work:** Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10** : **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11** : **Project management and finance:** Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12** : **Lifelong learning:** Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

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Estd. 2000

**B.E. - CIVIL ENGINEERING**

**Grouping of Courses**

### I. Humanities and Social Sciences Courses (HS)

| Sl.No. | Course Code | Course Title | Category | Contact Hours | Instruction Hours/Week/ Credit | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | C |
| 1. | 23HSS01 | Technical and Communicative English - I | HS | 4 | 3 | 0 | 3 | 3 |
| 2. | 23HSS02 | Technical and Communicative English – Ii | HS | 4 | 3 | 0 | 0 | 3 |
| 3. | 23HSS03 | Technical English for Engineers | HS | 3 | 2 | 0 | 0 | 2 |
| 4. | 23HSS04 | Communicative English for Engineers | HS | 3 | 2 | 0 | 0 | 2 |
| 5. | 23HSS05 | Commercial English | HS | 3 | 2 | 0 | 0 | 2 |
| 6. | 23HSS06 | Basics of Japanese Language | HS | 3 | 2 | 0 | 0 | 2 |
| 7. | 23HSS07 | Basics of French | HS | 3 | 2 | 0 | 0 | 2 |
| 8. | 23HSS08 | Heritage of Tamils | HS | 2 | 1 | 0 | 0 | 1 |
| 9. | 23HSS09 | Tamils and Technology | HS | 2 | 1 | 0 | 0 | 1 |

### II. Basic Sciences (BS)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. | 21BSS01 | Engineering Physics | BS | 4 | 3 | 0 | 0 | 3 |
| 2. | 21BSS02 | Physics Laboratory | BS | 4 | 0 | 0 | 4 | 2 |
| 3. | 21BSS03 | Bio and Nanomaterial Sciences | BS | 4 | 3 | 0 | 0 | 3 |
| 4. | 21BSS04 | Materials Science | BS | 4 | 3 | 0 | 0 | 3 |
| 5. | 21BSS05 | Applied Physics | BS | 4 | 3 | 0 | 0 | 3 |
| 6. | 21BSS11 | Engineering Chemistry | BS | 4 | 3 | 0 | 0 | 3 |
| 7. | 21BSS12 | Chemistry Laboratory | BS | 4 | 0 | 0 | 4 | 2 |
| 8. | 21BSS13 | Applied Chemistry | BS | 4 | 3 | 0 | 0 | 3 |
| 9. | 23BSS21 | Algebra and Calculus | BS | 5 | 3 | 1 | 0 | 4 |
| 10. | 23BSS22 | Advanced Calculus and Complex Analysis | BS | 5 | 3 | 1 | 0 | 4 |
| 11. | 23BSS23 | Differential Equations and Vector Analysis | BS | 5 | 3 | 1 | 0 | 4 |
| 12. | 23BSS24 | Transforms and Partial Differential Equations | BS | 5 | 3 | 1 | 0 | 4 |
| 13. | 23BSS25 | Discrete Mathematics | BS | 5 | 3 | 1 | 0 | 4 |
| 14. | 23BSS26 | Statistics and Queuing Model | BS | 5 | 3 | 1 | 0 | 4 |
| 15. | 23BSS27 | Statistics and Numerical Methods | BS | 5 | 3 | 1 | 0 | 4 |
| 16. | 23BSS28 | Numerical Methods | BS | 5 | 3 | 1 | 0 | 4 |
| 17. | 23BSS29 | Probability and Random Processes | BS | 5 | 3 | 1 | 0 | 4 |

## III. General Engineering Science (GES)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. | 23GES01 | Programming for Problem Solving Using C | GES | 4 | 3 | 0 | 0 | 3 |
| 2. | 23GES02 | Programming in C Laboratory | GES | 3 | 0 | 0 | 2 | 1 |
| 3. | 23GES03 | Python Programming | GES | 4 | 3 | 0 | 0 | 3 |
| 4. | 23GES04 | Computer Peripherals and Programming Essentials | GES | 4 | 3 | 0 | 0 | 3 |
| 5. | 23GES05 | Python Programming Laboratory | GES | 3 | 0 | 0 | 2 | 1 |
| 6. | 23GES06 | Electrical and Electronics Sciences | GES | 4 | 3 | 0 | 0 | 3 |
| 7. | 23GES07 | CAD Laboratory | GES | 4 | 0 | 0 | 4 | 2 |
| 8. | 23GES08 | Electric Circuits | GES | 4 | 3 | 0 | 0 | 3 |
| 9. | 23GES09 | Engineering Mechanics for Electrical Engineers | GES | 4 | 3 | 0 | 0 | 3 |
| 10. | 23GES10 | Engineering Graphics | GES | 4 | 3 | 0 | 0 | 3 |
| 11. | 23GES11 | Engineering Drawing | GES | 4 | 3 | 0 | 0 | 3 |
| 12. | 23GES12 | Mechanical and Building Sciences | GES | 4 | 3 | 0 | 0 | 3 |
| 13. | 23GES13 | Data Structures using Python | GES | 4 | 3 | 0 | 0 | 3 |
| 14. | 23GES14 | Electronics Product Design | GES | 4 | 3 | 0 | 0 | 3 |
| 15. | 23GES15 | Manufacturing Processes | GES | 4 | 3 | 0 | 0 | 3 |
| 16. | 23GES16 | Fundamentals of Civil Engineering | GES | 4 | 3 | 0 | 0 | 3 |
| 17. | 23GES17 | Bioorganic Chemistry | GES | 4 | 3 | 0 | 0 | 3 |
| 18. | 23GES18 | Basics Electrical and Electronics Engineering | GES | 4 | 3 | 0 | 0 | 3 |
| 19. | 23GES19 | Engineering Mechanics | GES | 4 | 3 | 0 | 0 | 3 |
| 20. | 23GES20 | Basics of Human Anatomy | GES | 4 | 3 | 0 | 0 | 3 |
| 21. | 23GES21 | Engineering Practices Laboratory | GES | 4 | 0 | 0 | 4 | 2 |
| 22. | 23GES22 | Computer Aided Building Drawing Laboratory | GES | 4 | 0 | 0 | 4 | 2 |
| 23. | 23GES23 | Bioorganic Chemistry Laboratory | GES | 4 | 0 | 0 | 4 | 2 |
| 24. | 23GES24 | Electric Circuits Laboratory | GES | 3 | 0 | 0 | 2 | 1 |
| 25. | 23GES25 | Data Structures using Python Laboratory | GES | 3 | 0 | 0 | 2 | 1 |
| 26. | 23GES26 | Construction Techniques and Practices | GES | 3 | 3 | 0 | 0 | 3 |
| 27. | 23GES27 | Engineering Geology | GES | 3 | 3 | 0 | 0 | 3 |
| 28. | 23GES28 | Renewable Energy Resources | GES | 3 | 3 | 0 | 0 | 3 |

## IV. Professional Core (PC)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. | 23CEC01 | Mechanics of Solids | PC | 3 | 3 | 0 | 0 | 3 |
| 2. | 23CEC02 | Strength of Materials | PC | 3 | 3 | 0 | 0 | 3 |
| 3. | 23CEC03 | Structural Analysis | PC | 5 | 3 | 1 | 0 | 4 |
| 4. | 23CEC04 | Design of Steel Structures | PC | 5 | 3 | 1 | 0 | 4 |
| 5. | 23CEC05 | Estimation Costing and Valuation | PC | 3 | 3 | 0 | 0 | 3 |
| 6. | 23CEC06 | Mechanics of Fluids | PC | 3 | 3 | 0 | 0 | 3 |
| 7. | 23CEC07 | Survey and Geomatics | PC | 5 | 3 | 1 | 0 | 4 |
| 8. | 23CEC08 | Geotechnical Engineering | PC | 3 | 3 | 0 | 0 | 3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9. | 23CEC09 | Design of Reinforced Concrete Elements | PC | 5 | 3 | 1 | 0 | 4 |
| 10. | 23CEC10 | Water Supply and Waste Water Engineering | PC | 3 | 3 | 0 | 0 | 3 |
| 11. | 23CEC11 | Highway Engineering | PC | 3 | 3 | 0 | 0 | 3 |
| 12. | 23CEC12 | Railways, Airports and Harbour Engineering | PC | 3 | 3 | 0 | 0 | 3 |
| 13. | 23CEC13 | Construction Management and Safety | PC | 3 | 3 | 0 | 0 | 3 |
| 14. | 23CEC14 | Concrete Technology | PC | 3 | 3 | 0 | 0 | 3 |
| 15. | 23CEC15 | Surveying Laboratory | PC | 2 | 0 | 0 | 2 | 1 |
| 16. | 23CEC16 | Strength of Materials Laboratory | PC | 2 | 0 | 0 | 2 | 1 |
| 17. | 23CEC17 | Hydraulic Engineering Laboratory | PC | 2 | 0 | 0 | 2 | 1 |
| 18. | 23CEC18 | Geotechnical Engineering Laboratory | PC | 2 | 0 | 0 | 2 | 1 |
| 19. | 23CEC19 | Concrete and Highway Engineering Laboratory | PC | 2 | 0 | 0 | 2 | 1 |
| 20. | 23CEC20 | Survey Camp | PC | 2 | 0 | 0 | 2 | 1 |
| 21. | 23CEC21 | Computer Aided Structural Detailing Laboratory | PC | 0 | 0 | 0 | 0 | 1 |
| 22. | 23CEC22 | Environmental Engineering Laboratory | PC | 2 | 0 | 0 | 2 | 1 |

## V. Professional Elective (PE)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. | 23CEE01 | Advanced Structural Analysis | PE | 3 | 3 | 0 | 0 | 3 |
| 2. | 23CEE02 | Design of Reinforced Concrete Structures | PE | 3 | 3 | 0 | 0 | 3 |
| 3. | 23CEE03 | Construction Technology | PE | 3 | 3 | 0 | 0 | 3 |
| 4. | 23CEE04 | Industrial Structures | PE | 3 | 3 | 0 | 0 | 3 |
| 5. | 23CEE05 | Health Monitoring of Structures | PE | 3 | 3 | 0 | 0 | 3 |
| 6. | 23CEE06 | Building Services | PE | 3 | 3 | 0 | 0 | 3 |
| 7. | 23CEE07 | Smart Materials and Smart Structures | PE | 3 | 3 | 0 | 0 | 3 |
| 8. | 23CEE08 | Masonry Structures | PE | 3 | 3 | 0 | 0 | 3 |
| 9. | 23CEE09 | Seismic Design of Structures | PE | 3 | 3 | 0 | 0 | 3 |
| 10. | 23CEE10 | Prefabricated Structures | PE | 3 | 3 | 0 | 0 | 3 |
| 11. | 23CEE11 | Prestressed Concrete Structures | PE | 3 | 3 | 0 | 0 | 3 |
| 12. | 23CEE12 | Foundation Engineering | PE | 3 | 3 | 0 | 0 | 3 |
| 13. | 23CEE13 | Ground Improvement Techniques | PE | 3 | 3 | 0 | 0 | 3 |
| 14. | 23CEE14 | Environmental Impact Assessment in Civil Engineering Project | PE | 3 | 3 | 0 | 0 | 3 |
| 15. | 23CEE15 | Waste Water Engineering | PE | 3 | 3 | 0 | 0 | 3 |
| 16. | 23CEE16 | Municipal Solid Waste Management | PE | 3 | 3 | 0 | 0 | 3 |
| 17. | 23CEE17 | Industrial Waste Management | PE | 3 | 3 | 0 | 0 | 3 |
| 18. | 23CEE18 | Air Pollution and Management | PE | 3 | 3 | 0 | 0 | 3 |
| 19. | 23CEE19 | Public Health and Irrigation Engineering Drawing | PE | 3 | 3 | 0 | 0 | 3 |
| 20. | 23CEE20 | Hydrology | PE | 3 | 3 | 0 | 0 | 3 |
| 21. | 23CEE21 | Water Resources Engineering | PE | 3 | 3 | 0 | 0 | 3 |
| 22. | 23CEE22 | Ground Water Engineering | PE | 3 | 3 | 0 | 0 | 3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 23. | 23CEE23 | Irrigation Engineering | PE | 3 | 3 | 0 | 0 | 3 |
| 24. | 23CEE24 | Applied Hydraulic Engineering | PE | 3 | 3 | 0 | 0 | 3 |
| 25. | 23CEE25 | Pavement Engineering | PE | 3 | 3 | 0 | 0 | 3 |
| 26. | 23CEE26 | Traffic Engineering and Safety Transport | PE | 3 | 3 | 0 | 0 | 3 |
| 27. | 23CEE27 | Green Building Concepts | PE | 3 | 3 | 0 | 0 | 3 |
| 28. | 23CEE28 | Construction Planning and Management | PE | 3 | 3 | 0 | 0 | 3 |
| 29. | 23CEE29 | Housing Planning and Management | PE | 3 | 3 | 0 | 0 | 3 |
| 30. | 23CEE30 | Engineering Economics and Cost Analysis | PE | 3 | 3 | 0 | 0 | 3 |
| 31. | 23CEE31 | Watershed Conservation and Management | PE | 3 | 3 | 0 | 0 | 3 |
| 32. | 23CEE32 | Coastal Engineering | PE | 3 | 3 | 0 | 0 | 3 |
| 33. | 23CEE33 | Drone Surveying | PE | 3 | 3 | 0 | 0 | 3 |
| 34. | 23CEE34 | Laws For Civil Engineers | PE | 3 | 3 | 0 | 0 | 3 |
| 35. | 23CEE35 | Fundamentals of Fire Safety Engineering | PE | 3 | 3 | 0 | 0 | 3 |
| 36. | 23CEE36 | Basics of Interior Design | PC | 3 | 3 | 0 | 3 | 3 |

## VI. Open Elective (OE)

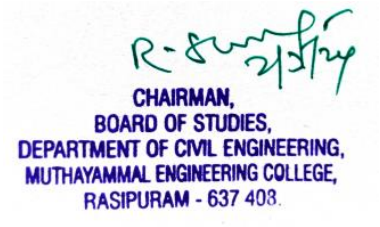
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. | 23EEE09 | Total Quality Management | EE | 3 | 3 | 0 | 0 | 3 |
| 2. | 23EEE15 | Wind and Solar Energy Systems | EE | 3 | 3 | 0 | 0 | 3 |
| 3. | 23MEE18 | Power Plant Engineering | ME | 3 | 3 | 0 | 0 | 3 |
| 4. | 23MEE10 | Composite Materials | ME | 3 | 3 | 0 | 0 | 3 |
| 5. | 23MEE02 | Principles of Management | ME | 3 | 3 | 0 | 0 | 3 |
| 6. | 23MEF10 | Maintenance of Engineering | ME | 3 | 3 | 0 | 0 | 3 |
| 7. | 23MEE12 | Energy Conservation in Engineering | ME | 3 | 3 | 0 | 0 | 3 |
| 8. | 23BTC17 | Disaster Management | BT | 3 | 3 | 0 | 0 | 3 |
| 9. | 23ECE25 | Internet of Things | EC | 3 | 3 | 0 | 0 | 3 |
| 10. | 23CSE18 | Soft Computing Techniques | CS | 3 | 3 | 0 | 0 | 3 |
| 11. | 23CEF14 | Electrical Wiring Estimation and Costing | EE | 3 | 2 | 1 | 0 | 3 |
| 12. | 23MBA11 | Professional Ethics | MBA | 3 | 3 | 0 | 0 | 3 |
| 13. | 23MBC12 | Professional Ethics and Human Values | MBA | 3 | 3 | 0 | 0 | 3 |

## VII. Employability Enhancement Courses (EEC)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. | 23CEG01 | Design comprehensive Project | EEC | 4 | 0 | 0 | 4 | 2 |
| 2. | 23CEG02 | Project work Phase - I | EEC | 6 | 0 | 0 | 6 | 3 |
| 3. | 23CEG03 | Project work Phase - II | EEC | 18 | 0 | 0 | 18 | 9 |
| 4. | 23CEG04 | Value Added Course | EEC | 2 | 0 | 0 | 2 | 1 |
| 5. | 23CEG05 | Inplant Training (Four Weeks in VI Sem Summer) | EEC | 0 | 0 | 0 | 0 | 1 |
| 6. | 23CEG06 | Comprehension | EEC | 2 | 0 | 0 | 2 | 1 |
| 7. | 23CEG07 | Technical Seminar | EEC | 2 | 0 | 0 | 2 | 1 |

## VIII. Mandatory Courses (MC)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. | 23CEH01 | Organizational Behaviour | MC | 3 | 3 | 0 | 0 | 0 |
| 2. | 23CEH02 | India Constitution<br>(Common to All Branches) | MC | 3 | 3 | 0 | 0 | 0 |
| 3. | 23CEH03 | Essence of Indian Traditional Knowledge | MC | 3 | 3 | 0 | 0 | 0 |



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Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

**B.E. - Civil Engineering**
**Curriculum | UG - R2023**
**Semester -I**

| Sl.No. | Course Code | Course Title | Category | Contact Hours | Instruction Hours/Week/ Credit | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | C |
| **Theory** | | | | | | | | |
| 1. | 23HSS01 | Technical and Communicative English - I | HS | 3 | 3 | 0 | 3 | 3 |
| 2. | 23BSS21 | Algebra & Calculus | BS | 5 | 3 | 0 | 0 | 3 |
| 3. | 23BSS11 | Engineering Chemistry | BS | 3 | 3 | 2 | 0 | 4 |
| 4. | 23GES01 | Programming for Problem Solving Using C | ES | 3 | 3 | 0 | 0 | 3 |
| 5. | 23GES11 | Engineering Drawing | ES | 3 | 3 | 0 | 0 | 3 |
| 6. | 23HSS08 | Heritage of Tamils | ES | 1 | 3 | 0 | 0 | 3 |
| **Practical** | | | | | | | | |
| 7. | 23BSS12 | Chemistry Laboratory | BS | 4 | 0 | 0 | 4 | 2 |
| 8. | 23GES02 | Programming in C Laboratory | ES | 3 | 0 | 0 | 2 | 1 |
| | | | | | | | **Total Credit** | **20** |


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**B.E. - Civil Engineering**
**Curriculum | UG - R2023**

**Semester -II**

| Sl.No. | Course Code | Course Title | Category | Contact Hours | Instruction Hours/Week/ Credit | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | C |
| **Theory** | | | | | | | | |
| 1. | 23HSS02 | Technical and Communicative English II | HS | 4 | 2 | 0 | 2 | 3 |
| 2. | 23BSS22 | Advanced Calculus and Complex Analysis | BS | 5 | 3 | 2 | 0 | 4 |
| 3. | 23BSS01 | Engineering Physics | BS | 3 | 3 | 0 | 0 | 3 |
| 4. | 23GES16 | Fundamentals of Civil Engineering | ES | 3 | 3 | 0 | 0 | 3 |
| 5. | 23GES19 | Engineering Mechanics | ES | 3 | 3 | 0 | 0 | 3 |
| 6. | 23HSS09 | Tamils and Technology | HS | 1 | 1 | 0 | 0 | 1 |
| **Practical** | | | | | | | | |
| 7. | 23BSS02 | Physics Laboratory | BS | 4 | 0 | 0 | 4 | 2 |
| 8. | 23GES22 | Computer Aided Building Drawing Laboratory | ES | 4 | 0 | 0 | 4 | 2 |
| | | | | | | | **Total Credit** | **21** |

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**B.E. - Civil Engineering**
**Curriculum | UG - R2023**
**Semester -III**

| Sl.No. | Course Code | Course Title | Category | Contact Hours | Instruction Hours/Week/ Credit | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | C |
| **Theory** | | | | | | | | |
| 1. | 23BSS24 | Transforms and Boundary Value Problems | BS | 4 | 3 | 1 | 0 | 4 |
| 2. | 23GES26 | Construction Techniques and Practices | ES | 3 | 3 | 0 | 0 | 3 |
| 3. | 23CEC01 | Mechanics of Solids | PC | 3 | 3 | 0 | 0 | 3 |
| 4. | 23CEC06 | Mechanics of Fluids | PC | 3 | 3 | 0 | 0 | 3 |
| 5. | 23CEC07 | Survey and Geomatics | PC | 5 | 3 | 1 | 0 | 4 |
| 6. | 23CEC10 | Water Supply and Waste Water Engineering | PC | 3 | 3 | 0 | 0 | 3 |
| **Practical** | | | | | | | | |
| 7. | 23CEC15 | Surveying Laboratory | PC | 2 | 0 | 0 | 2 | 1 |
| 8. | 23CEC17 | Hydraulic Engineering Laboratory | PC | 2 | 0 | 0 | 2 | 1 |
| 9. | 23CEC22 | Environmental Engineering laboratory | PC | 2 | 0 | 0 | 2 | 1 |
| | | | | | | | **Total Credit** | **23** |


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**B.E. - Civil Engineering**
**Curriculum | UG - R2023**

**Semester -IV**

| Sl.No. | Course Code | Course Title | Category | Contact Hours | Instruction Hours/Week/ Credit | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | C |
| **Theory** | | | | | | | | |
| 1. | 23BSS27 | Statistics and Numerical Methods | BS | 4 | 3 | 1 | 0 | 4 |
| 2. | 23GES28 | Renewable Energy Resources | ES | 3 | 3 | 0 | 0 | 3 |
| 3. | 23CEC02 | Strength of Materials | PC | 3 | 3 | 0 | 0 | 3 |
| 4. | 23CEC08 | Geotechnical Engineering | PC | 3 | 3 | 0 | 0 | 3 |
| 5. | 23CEC11 | Highway Engineering | PC | 3 | 3 | 0 | 0 | 3 |
| 6. | 23CEC14 | Concrete Technology | PC | 3 | 3 | 0 | 0 | 3 |
| **Practical** | | | | | | | | |
| 7. | 23CEC16 | Strength of Materials Laboratory | PC | 2 | 0 | 0 | 2 | 1 |
| 8. | 23CEC19 | Concrete and Highway Engineering Laboratory | PC | 2 | 0 | 0 | 2 | 1 |
| | | | | | | | **Total Credit** | **21** |

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**B.E. - Civil Engineering**
**Curriculum | UG - R2023**
**Semester -V**

| Sl.No. | Course Code | Course Title | Category | Contact Hours | Instruction Hours/Week/ Credit | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | C |
| **Theory** | | | | | | | | |
| 1. | 23CEC03 | Structural Analysis | PC | 5 | 3 | 2 | 0 | 4 |
| 2. | 23CEC09 | Design of Reinforced Concrete Elements | PC | 5 | 3 | 1 | 0 | 4 |
| 3. | 23CEC12 | Railways, Airports and Harbour Engineering | PC | 3 | 3 | 0 | 0 | 3 |
| 4. | 23CEE** | Professional Elective – I | PE | 3 | 3 | 0 | 0 | 3 |
| 5. | 23CEE** | Professional Elective – II | PE | 3 | 3 | 0 | 0 | 3 |
| 6. | 23CEE** | Professional Elective – III | PE | 3 | 3 | 0 | 0 | 3 |
| 7. | 23***** | Open Elective - I | OE | 3 | 3 | 0 | 0 | 3 |
| **Practical** | | | | | | | | |
| 8. | 23CEC18 | Geotechnical Engineering Laboratory | PC | 2 | 0 | 0 | 2 | 1 |
| 9. | 23CEC20 | Survey Camp (During IV Sem vacation) | PC | 0 | 0 | 0 | 0 | 1 |
| **Mandatory Course** | | | | | | | | |
| 10. | 23CEH03 | Essence of Indian Traditional Knowledge | MC | 3 | 3 | 0 | 0 | 0 |
| | | | | | | | **Total Credit** | **25** |


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## An Autonomous Institution

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Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.


**B.E. - Civil Engineering**
**Curriculum | UG - R2023**
**Semester -VI**

| Sl.No. | Course Code | Course Title | Category | Contact Hours | Instruction Hours/Week/ Credit | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | C |
| **Theory** | | | | | | | | |
| 1. | 23CEC04 | Design of Steel Structures | PC | 5 | 3 | 1 | 0 | 4 |
| 2. | 23CEE** | Professional Elective - IV | PE | 3 | 3 | 0 | 0 | 3 |
| 3. | 23CEE** | Professional Elective – V | PE | 3 | 3 | 0 | 0 | 3 |
| 4. | 23CEE** | Professional Elective - VI | PE | 3 | 3 | 0 | 0 | 3 |
| 5. | 23***** | Open Elective – II | OE | 3 | 3 | 0 | 0 | 3 |
| 6. | 23***** | Open Elective - III | OE | 3 | 3 | 0 | 0 | 3 |
| **Practical** | | | | | | | | |
| 7. | 23CEC21 | Computer Aided Structural Detailing | PC | 2 | 0 | 0 | 2 | 1 |
| 8. | 23CEG01 | Design comprehensive project | EEC | 4 | 0 | 0 | 4 | 2 |
| 9. | 23CEG04 | Inplant Training (4 Weeks during VI Sem summer) | EEC | 0 | 0 | 0 | 0 | 1 |
| | | | | | | | **Total Credit** | **23** |

# MUTHAYAMMAL ENGINEERING COLLEGE

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**B.E. - Civil Engineering**
**Curriculum | UG - R2023**
**Semester -VII**

| Sl.No. | Course Code | Course Title | Category | Contact Hours | Instruction Hours/Week/ Credit | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | C |
| **Theory** | | | | | | | | |
| 1. | 23CEC05 | Estimation, Costing and valuation | PC | 3 | 3 | 0 | 0 | 3 |
| 2. | 23GES27 | Engineering Geology | ES | 3 | 3 | 0 | 0 | 3 |
| 3. | 23CEE** | Professional Elective – VII | PE | 3 | 3 | 0 | 0 | 3 |
| 4. | 23CEE** | Professional Elective – VIII | PE | 3 | 3 | 0 | 0 | 3 |
| 5. | 23CEE** | Professional Elective – IX | PE | 3 | 3 | 0 | 0 | 3 |
| 6. | 23***** | Open Elective – IV | OE | 3 | 3 | 0 | 0 | 3 |
| **Practical** | | | | | | | | |
| 7. | 23CEG02 | Project work Phase - I | EEC | 6 | 0 | 0 | 6 | 3 |
| | | | | | | | | |
| 8. | 23CEH01 | Organizational Behavior | MC | 3 | 3 | 0 | 0 | 0 |
| | | | | | | | **Total Credit** | **21** |


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**B.E. - Civil Engineering**
**Curriculum | UG - R2023**
**Semester -VIII**

| Sl.No. | Course Code | Course Title | Category | Contact Hours | Instruction Hours/Week/ Credit | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | C |
| **Theory** | | | | | | | | |
| 1. | 23CEG03 | Project Work Phase - II | EEC | 18 | 0 | 0 | 18 | 9 |
| **Practical** | | | | | | | | |
| | | | | | | | **Total Credit** | **9** |

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**B.E. - Civil Engineering**
**Curriculum | UG - R2023**

### Summary of Course Component

| Sl.No. | Course Area | Semesters | | | | | | | | Total Credits | % of Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | VII | VIII | | |
| 1. | HS | 4 | 4 | - | - | - | - | - | - | 8 | 4.907 |
| 2. | BS | 9 | 9 | 4 | 4 | - | - | - | - | 26 | 15.950 |
| 3. | GES | 7 | 8 | 3 | 3 | - | - | 3 | - | 24 | 14.723 |
| 4. | PC | - | - | 16 | 14 | 13 | 5 | 3 | - | 51 | 31.288 |
| 5. | PE | - | - | - | - | 9 | 9 | 9 | - | 27 | 16.564 |
| 6. | OE | - | - | - | - | 3 | 6 | 3 | - | 12 | 7.361 |
| 7. | EEC | - | - | - | - | - | 3 | 3 | 9 | 15 | 9.202 |
| 8. | MC | - | - | - | - | 0 | - | 0 | - | 0 | 0 |
| 9. | NPTEL | - | - | - | - | - | - | - | - | - | 0 |
| **Total** | | **20** | **21** | **23** | **21** | **25** | **23** | **21** | **9** | **163** | **100.00** |

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| 23GES16 | FUNDAMENTALS OF CIVIL ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- Learn the fundamentals of civil engineering and unit conversion.
- Gain knowledge about the properties and uses of various materials for constructions.
- To develop a better understanding of aesthetic materials.
- Understand the building sub-structure components.
- Learn the building super-structure elements.

**Course Outcomes:**

23GES16.CO1 Understand the scope and importance of civil engineering.

23GES16.CO2 Understand the composition, properties and classification of building materials.

23GES16.CO3 Analyze the properties of timber, and other building materials used in construction.

23GES16.CO4 Explain the various building components and their functions.

23GES16.CO5 Differentiate the types of masonry and also enumerate the functions of super-structure.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23GES16.CO1 | X | - | X | - | X | X | X | - | - | - | - | - | X | - | - |
| 23GES16.CO2 | X | - | X | X | - | - | - | - | - | - | - | X | - | - | - |
| 23GES16.CO3 | X | - | - | X | X | - | - | - | - | - | - | - | X | - | - |
| 23GES16.CO4 | X | - | X | - | - | - | X | - | - | - | - | X | - | - | - |
| 23GES16.CO5 | X | - | X | - | X | - | X | - | - | - | - | - | X | - | - |

**Unit-I SCOPE OF CIVIL ENGINEERING 9**

Scope of Civil Engineering- Functions of a Civil Engineer - Types of Building: Residential- Commercial- Industrial & Institutional buildings- Site selection- Units & Unit conversions- Room dimensions as per NBC.

**Unit-II PRIMARY BUILDING MATERIALS 9**

Bricks: Manufacturing of bricks-Types- Characteristics of Bricks. Stone: Characteristics of Stones- Coarse aggregate- Characteristics of good building stone. Concrete: Definition-Cement-Types. Fine aggregate- M-sand-Manufacturing of M-Sand. Ferrous metals: Iron and steel, basic metallurgy, composition and grades, market forms-Steel as reinforcement – Corrosion of metals and protection.

**Unit-III OTHER BUILDING MATERIALS 9**

Timber: Types of Timber - Seasoning of Timber- Applications. PVC, UPVC, Aluminium, copper, brass, polymers, Glass & Stainlesssteel types- Applications in construction. Paints: Composition of oil paints- Purpose of paints-Applications. Enamels- Varnishes- Plaster of Paris- Purpose- Applications.

**Unit-IV BUILDING COMPONENTS (SUB-STRUCTURE) 9**

Components of Building- Sub structures- Foundation and its Types- Construction sequence in Building- Design sequence in Building- Ground level- Basement- Plinth level- Sill level- Lintel level- Roof level- Parapet level.

**Unit-V BUILDING COMPONENTS (SUPER-STRUCTURE) 9**

Super-structure - Walls: Types of Stone masonry and Brick masonry walls- Brick bonds- Slab- Beam- Column-Roof- Floor- Door- Windows- Lintel- Parapet.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1. | S. S. Bhavikatti | Fundamentals of Civil Engineering | Vikas Publishing House | 2014 |
| 2. | S. K. Duggal | Basic Civil Engineering | McGraw Hill Education | 2018 |
| 3. | James Ambrose and James Tripen | Introduction to Civil Engineering | Prentice-Hall | 1994 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1. | Sushil Kumar | Building Construction | Standard Publishers | 2014 |
| 2. | J.L. Meriam and L.G. Kraige | Engineering Mechanics | Wiley | 2015 |

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| 23GES19 | ENGINEERING MECHANICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To generalize the scalar and vector representation of forces and moments.
- To explore truss, beam, frame and cable problems and respond to the distributed force systems.
- To predict Centroid and Moment of Inertia.
- To realize the Laws of Motion, Principle of Work and Energy, Kinematics & Kinetics of Motion and the interrelationship.
- To comprehend the effect of friction on equilibrium.

**Course Outcomes:**

| | |
|---|---|
| 23GES19.CO1 | Generalize the scalar and vector representation of forces and moments. |
| 23GES19.CO2 | Explore truss, beam, frame and cable problems and respond to the distributed force systems. |
| 23GES19.CO3 | Predict Centroid and Moment of Inertia. |
| 23GES19.CO4 | Realize the Laws of Motion, Principle of Work and Energy, Kinematics & Kinetics of Motion and the interrelationship. |
| 23GES19.CO5 | Comprehend the effect of friction on equilibrium. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23GES19.CO1 | X | X | X | X | - | X | - | - | - | - | - | X | X | - | - |
| 23GES19.CO2 | X | X | X | X | - | X | - | - | - | - | - | X | X | - | - |
| 23GES19.CO3 | X | X | X | X | - | X | - | - | - | - | - | X | X | - | - |
| 23GES19.CO4 | X | X | X | X | - | X | - | - | - | - | - | X | X | - | - |
| 23GES19.CO5 | X | X | X | X | - | X | - | - | - | - | - | X | X | - | - |

**Unit-I BASICS AND STATICS OF PARTICLES 9**

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectorial representation of forces – Vector operations of forces – additions, subtraction, dot product, cross product – Coplanar Forces – Rectangular components – Equilibrium of a particle – Equivalent systems of forces – Principle of transmissibility.

**Unit-II EQUILIBRIUM OF RIGID BODIES 9**

Free body diagram – Types of supports – Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions.

**Unit-III PROPERTIES OF SURFACES AND SOLIDS 9**

Centroids and centre of mass – Centroids of lines and areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Theorems of Pappus –Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem –Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia.

**Unit-IV DYNAMICS OF PARTICLES 9**

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's laws of motion – Work Energy Equation – Impulse and Momentum – Impact of elastic bodies.

**Unit-V FRICTION** **9**

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction –wedge friction – Rolling – resistance.

**Total Periods: 45**

| **Text Books:** | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Beer, F.P and Johnston. E.R., | Vector Mechanics for Engineers: Statics and Dynamics | Tata McGraw-Hill Publishing company, New Delhi | 2013 |
| 2 | S. Timoshenko, D.H. Young, J.V. Rao and Sukumar Pati | Engineering Mechanics | McGraw Hill Education; 5 edition | 2013 |

| **Reference Books:** | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Hibbeller, R.C and Ashok Gupta | Engineering Mechanics: Statics and Dynamics | Pearson Education | 2010 |
| 2 | Irving H. Shames and Krishna Mohana Rao. G | Engineering Mechanics – Statics and Dynamics | Pearson Education | 2006 |
| 3 | Meriam J.L. and Kraige L.G | Engineering Mechanics | John Wiley & Sons | 2013 |
| 4 | Rajasekaran S and Sankarasubramanian G | Engineering Mechanics | Vikas Publishing House Pvt. Ltd | 2005 |
| 5 | Bhavikatti, S.S | Engineering Mechanics | New Age International (P) Limited Publishers | 2015 |

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| 23GES22 | COMPUTER AIDED BUILDING DRAWING LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 4 | 2 |

**Course Objective:**

- To make the students understand and learn various elements of Residential / Institutional / Workshop buildings.
- To impart fundamental knowledge on AutoCAD to make the students draw truss structures, the plan, elevation and sectional view of a building.

**Course Outcomes:**

| | |
|---|---|
| 23GES22.CO1 | To know the basic commands for CAD software. |
| 23GES22.CO2 | To acquire knowledge of Building components like doors and windows. |
| 23GES22.CO3 | To acquire knowledge of minimum size of the various elements of a building. |
| 23GES22.CO4 | To draw a building plan for a given area. |
| 23GES22.CO5 | To prepare an elevation and a sectional view of the given plan. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23GES22.CO1 | X | X | X | X | X | X | X | - | - | - | - | X | X | - | - |
| 23GES22.CO2 | X | X | X | X | X | X | X | - | - | - | - | X | X | - | - |
| 23GES22.CO3 | X | X | X | X | X | X | X | - | - | - | - | X | X | - | - |
| 23GES22.CO4 | X | X | X | X | X | X | X | - | - | - | - | X | X | - | - |
| 23GES22.CO5 | X | X | X | X | X | X | X | - | - | - | - | X | X | - | - |

| Sl.No. | List of Experiments |
|---|---|
| 1. | Develop a model of a Brick wall using basic commands<br>• Flemish Bond<br>• English Bond<br>• Header Bond<br>• Stretcher Bond<br>• Raking Bond<br>• Zigzag Bond |
| 2. | Create a model of a hexagonal, triangular shaped paver blocks for a given floor area. |
| 3. | Joinery details for doors and windows. |
| 4. | Plan, Elevation and Cross section of a Single and Multi-storied residential buildings for a given plan. |
| 5. | Steel Truss. |
| 6. | Develop a 3 Dimensional model of a single storey single bay residential building for a given plan of mini project. |

**Total Periods: 30**

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| 23GES26 | CONSTRUCTION TECHNIQUES AND PRACTICES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To know about the various different construction techniques
- To guide & know about the masonry & Wall in Buildings.
- To identify the types of roofs, floors and scaffolding for the construction activity.
- To know about the various Construction practices.
- To select the construction equipments as per requirements of construction.

**Course Outcomes:**

| | |
|---|---|
| 23GES26.CO1 | Know the different construction techniques and structural systems |
| 23GES26.CO2 | Understand various techniques and practices on masonry construction, flooring, and roofing. |
| 23GES26.CO3 | Plan the requirements for substructure construction. |
| 23GES26.CO4 | Know the methods and techniques involved in the construction of various types of super structures |
| 23GES26.CO5 | Select, maintain and operate hand and power tools and equipment used in the building construction sites. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23GES26.CO1 | x | x | x | - | - | - | - | - | - | - | - | - | x | - | - |
| 23GES26.CO2 | x | x | x | - | - | - | - | - | - | - | - | - | x | x | - |
| 23GES26.CO3 | x | x | x | - | - | - | - | - | - | - | - | - | x | - | - |
| 23GES26.CO4 | x | x | x | - | - | - | - | - | - | - | - | - | x | - | - |
| 23GES26.CO5 | x | - | - | - | x | - | - | - | - | - | - | - | - | x | - |

**Unit-I CONSTRUCTION TECHNIQUES 9**

Structural systems — Load Bearing Structure — Framed Structure — Load transfer mechanism — floor system — Development of construction techniques — High rise Building Technology — Seismic effect — Environmental impact of materials — responsible sourcing — Eco Building (Green Building) — Material used — Construction methods — Natural Buildings — Passive buildings — Intelligent(Smart) buildings — Meaning — Building automation — Energy efficient buildings for various zones-Case studies of residential, office buildings and other buildings in each zones.

**Unit-II CONSTRUCTION PRACTICES 9**

Specifications, details and sequence of activities and construction co-ordination — Site Clearance — Marking — Earthwork — masonry — stone masonry — Bond in masonry — concrete hollow block masonry — flooring — damp proof courses — construction joints — movement and expansion joints — pre cast pavements —Building foundations — basements — temporary shed — centering and shuttering — slip forms — scaffoldings — de-shuttering forms — Fabrication and erection of steel trusses — frames — braced domes — laying brick —- weather and water proof — roof finishes — acoustic and fire protection.

**Unit-III SUB STRUCTURE CONSTRUCTION 9**

Techniques of Box jacking — Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques — Piling techniques — well and caisson — sinking cofferdam — cable anchoring and grouting— driving diaphragm walls, sheet piles — shoring for deep cutting — well points -Dewatering and stand by Plant equipment for underground open excavation.

**Unit-IV SUPER STRUCTURE CONSTRUCTION 9**

Launching girders, bridge decks, off shore platforms — special forms for shells — techniques for heavy decks— in-situ pre-stressing in high rise structures, Material handling — erecting light weight components on tall structures— Support structure for heavy Equipment and conveyors — Erection of articulated structures, braced domes and space decks.

**Unit-V CONSTRUCTION EQUIPMENT 9**

Selection of equipment for earth work - earth moving operations - types of earthwork equipment tractors, motor graders, scrapers, front end waders, earth movers - equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures – Equipment for dredging, trenching and tunneling.

**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Peurifoy, R.L., Ledbetter | Construction Planning, Equipment and Methods | 5th Edition, McGraw Hill, Singapore | 1995 |
| 2 | Varghese, P.C. | Building Construction | Prentice Hall of India Pvt. Ltd, | 2007 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Jha J and Sinha S.K | Construction and Foundation Engineering | Khanna Publishers | 1999 |
| 2 | Varghese. P.C | Building Construction | Prentice Hall of India Pvt. Ltd, New Delhi | 2015 |
| 3 | G.S.Birdie, T.D.Ahuja | Building Construction and construction materials | Dhanpat Rai publishing company, New Delhi. | 2012 |
| 4 | Sharma S.C | Construction equipment and Management | Khanna Publishers, New Delhi. | 2013 |
| 5 | Peurifoy,R.L., Ledbetter, W.B.and Schexnayder.C | Construction Planning Equipment and Methods | 5th Edition, McGraw Hill, Singapore | 2017 |

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| 23GES27 | ENGINEERING GEOLOGY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To impart the concepts of geological agents and their processes.
- To provide knowledge on various properties of minerals and their engineering significance.
- To give knowledge on various classifications of rocks.
- To understand the importance of geological investigations and mapping.
- To understand the applications of geological surveys in civil engineering structures.

**Course Outcomes:**

| | |
|---|---|
| 23GES27.CO1 | Understand the application of geology knowledge to Civil Engineering construction. |
| 23GES27.CO2 | Understand the concepts of various geological materials. |
| 23GES27.CO3 | Understand the properties, behaviour and engineering significance of different type of rocks and minerals. |
| 23GES27.CO4 | Learned the interpretation skills of geological maps having different type of geological features. |
| 23GES27.CO5 | Learned consideration and importance of geological aspects in civil engineering related infrastructure projects. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23GES27.CO1 | x | - | - | - | - | - | - | x | - | x | - | - | - | - | - |
| 23GES27.CO2 | x | - | - | x | x | x | - | - | - | - | - | - | x | - | - |
| 23GES27.CO3 | x | x | x | x | - | x | - | - | - | - | - | - | - | - | x |
| 23GES27.CO4 | - | x | - | x | x | - | - | x | x | x | x | x | x | x | - |
| 23GES27.CO5 | - | x | x | x | - | x | x | x | x | x | x | x | x | x | x |

**Unit-I PHYSICAL GEOLOGY 9**

Role of Geology in civil engineering – Branches of geology – Earth structures and composition – Elementary knowledge on continental drift and plate tectonics – Earth processes – weathering – soils – Geological work of river, wind and sea – Engineering importance – Earthquake belts in India – Ground water – Mode of occurrence –Prospecting.

**Unit-II MINEROLOGY 9**

Elementary knowledge on symmetry elements of important crystallographic systems – Physical properties of minerals – Study of the rock forming minerals – Quartz family – Feldspar family – Mica – Pyroxene family minerals –Fundamentals of process of formation of ore minerals – Properties, behaviour and engineering significance of clay minerals – Coal and petroleum – Their origin and occurrence in India.

**Unit-III PETROLOGY 9**

Classification of rocks – Distinction between igneous, sedimentary and metamorphic rocks – Occurrence, Engineering properties and distribution – Igneous rocks – Granite, syenite, diorite, gabbro, pegmatite, dolerite and basalt – sedimentary rocks – Sandstone, limestone, shale, conglomerate and breccias – Metamorphic rocks – Quartzite, marble, slate, phyllite, gneiss and schist.

**Unit-IV STRUCTURAL GEOLOGY AND MAP 9**

Attitude of beds – Outcrops – Contours – Introduction to geological maps – Folds – Faults and joints – Their bearing on engineering construction – Seismic and electrical methods for civil engineering investigations.Study of structures.

**Unit-V GEOLOGICAL INVESTIGATION 9**

Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels, and Road cuttings. Causes and preventions – Sea erosion and Coastal protection.

**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Parbin Singh. | A Text book of Engineering and General Geology | Katson publishing house, Ludhiana. | 2010 |
| 2 | Varghese, P.C | Engineering Geology for Civil Engineering | PHI Learning Private Limited, New Delhi | 2012 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Muthiayya, V.D | A Text of Geology | Oxford IBH Publications, Calcutta. | 2010 |
| 2 | Blyth F.G.H. and De Freitas M.H | Geology for Engineers | Edward Arnold, London | 2010 |
| 3 | F.G.Bell. | Fundamentals of Engineering Geology | B.S. Publications. Hyderabad | 2011 |
| 4 | Dobrin, M.B | An introduction to geophysical prospecting | McGraw0Hill, New Delhi | 2010 |
| 5 | KVGK Gokhale | Principles of Engineering Geology | BS Publications, Hyderabad | 2011 |

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| 23GES28 | RENEWABLE ENERGY RESOURCES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- At the end of the course, the students are expected to identify the new methodologies/ technologies for effective utilization of renewable energy sources.
- To understand reverse of energy recourses.
- Understand solar energy production and applications.
- To understand wind energy systems.
- Other energy recourses are studied and learned.

**Course Outcomes:**

| | |
|---|---|
| 23GES28.CO1 | Understand the fundamentals of energy scenario. |
| 23GES28.CO2 | Illustrate the techniques used in utilization and measurement of solar energy. |
| 23GES28.CO3 | Demonstrate the types and performance of wind energy systems. |
| 23GES28.CO4 | Comprehend and identify the bio-mass energy sources and applications. |
| 23GES28.CO5 | Outline the utilization techniques of tidal, wave, Hydro, geothermal, fuel cell systems and hybrid system energy sources. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23GES28.CO1 | x | x | x | x | - | x | - | - | - | - | - | x | x | - | x |
| 23GES28.CO2 | x | x | x | x | - | x | - | - | - | - | - | x | - | - | - |
| 23GES28.CO3 | x | x | x | x | - | x | - | - | - | - | - | x | x | x | - |
| 23GES28.CO4 | x | x | x | x | - | x | - | - | - | - | - | x | - | x | x |
| 23GES28.CO5 | x | x | x | x | - | x | - | - | - | - | - | x | x | x | x |

**Unit-I INTRODUCTION** **9**

World Energy Use – Reserves of Energy Resources – Environmental Aspects of Energy Utilisation – Renewable Energy Scenario in Tamilnadu, India and around the World - Potentials - Achievements / Applications – Economics of renewable energy systems.

**Unit-II SOLAR ENERGY** **9**

Solar Radiation – Measurements of Solar Radiation - Flat Plate and Concentrating Collectors – Solar direct Thermal Applications – Solar thermal Power Generation - Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications.

**Unit-III WIND ENERGY** **9**

Wind Data and Energy Estimation – Types of Wind Energy Systems – Performance - Site Selection – Details of Wind Turbine Generator – Safety and Environmental Aspects.

**Unit-IV BIO - ENERGY** **9**

Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production – Bio diesel – Cogeneration - Biomass Applications.

**Unit-V OTHER RENEWABLE ENERGY SOURCES** **9**

Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro-Geothermal Energy Hydrogen and Storage - Fuel Cell Systems – Hybrid Systems.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | G.D. Rai | Non Conventional Energy Sources, | Khanna Publishers, New Delhi, | 2011 |
| 2 | Twidell, J.W. & Weir | A., Renewable Energy Sources | EFN Spon Ltd., UK, | 2006 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | David M. Mousdale | Introduction to Biofuels, | CRC Press Taylor & Francis Group, USA | 2010 |
| 2 | Chetan Singh Solanki | Solar Photovoltaic, Fundamentals, Technologies and Applications, | PHI Learning Private Limited, New Delhi | 2009 |
| 3 | S.P. Sukhatme | Solar Energy | Tata McGraw Hill Publishing Company Ltd., New Delhi, | 1997 |
| 4 | Sinduja S | Renewable Energy Sources | Anuradha Publications | 2012 |
| 5 | Tasneem abbasi and T.A Abbasi | Renewable Energy Sources: Their Impact on Global Warming and Pollution | Prentice Hall India Learning Private Limited | 2010 |

| 23CEC01 | MECHANICS OF SOLIDS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To develop understanding of the state of stresses and strains in structural components as a result of different loading conditions.
- To provide knowledge on shear force and bending moment for all statically determinate beams by recognizing
- To provide knowledge on deflection of determinate beam.
- To have knowledge on principal stress and strain and analysis of plane truss
- To understand the effect of torsion on shafts and springs.

**Course Outcomes:**

| | |
|---|---|
| 23CEC01.CO1 | Realize the state of stresses and strains in structural components under tension, compression and shear. |
| 23CEC01.CO2 | Plot the Shear force and bending moment diagrams for all the statically determinate beams. |
| 23CEC01.CO3 | Analyze the deflection of determinate beam by different methods. |
| 23CEC01.CO4 | Determine principle stress, strain and analysis of plane truss. |
| 23CEC01.CO5 | Comprehend the behavior of members under pure torsion and spring. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC01.CO1 | x | x | x | x | x | x | - | - | - | - | - | - | x | x | x |
| 23CEC01.CO2 | x | x | x | x | x | x | - | - | - | - | - | - | x | x | x |
| 23CEC01.CO3 | x | x | x | x | x | x | - | - | - | - | - | - | x | x | x |
| 23CEC01.CO4 | x | x | x | x | x | - | - | - | - | - | - | x | x | x | x |
| 23CEC01.CO5 | x | x | x | x | x | - | - | - | - | - | - | x | x | x | x |

**Unit-I STRESS AND STRAIN** **9**

Stress and strain at a point - Tension, Compression, Shear Stress – Hook's Law - Relationship among elastic constants - Stress Strain Diagram for Mild Steel - Ultimate Stress - Yield Stress - Factor of Safety - Thermal Stresses - Strain Energy due to Axial Force - Resilience - Stresses due to impact and Suddenly Applied Load - Compound Bars -Thin cylinder & shells.

**Unit-II SHEAR AND BENDING IN BEAMS** **9**

Beams and Bending - Types of loads, supports - Shear Force and Bending Moment Diagrams for statically determinate beam with concentrated load, UDL, uniformly varying load. Theory of Simple Bending - Analysis of Beams for Stresses - Stress Distribution at a cross Section due to bending moment and shear force for Cantilever, simply supported and overhanging beams with different loading conditions

**Unit-III DEFLECTION** **9**

Double integration method - Macaulay's methods - Area moment method - conjugate beam method for computation of slopes and deflections of determinant beams

**Unit-IV PRINCIPAL STRESS AND STRAIN & ANALYSIS OF PLANE TRUSS** **9**

Plane stress - Principal stresses and maximum shear stress - Mohr's circle for plane stress - Determination of principal stresses and planes - plane strain - Applications of plane stress - Maximum stresses in beams- Spherical and deviatory components of stress tensor – Determination of principal stresses and principal planes-Truss-Methods of joints - method of sections.

**Unit-V TORSION OF SHAFTS AND SPRING 9**

Torsional deformations of a circular bar - Circular bars of linearly elastic materials – Non uniform torsion - Stresses and strains in pure shear - transmission of power by circular shafts - Stepped shafts - Shafts fixed at both ends - Strain energy in torsion and pure shear - Springs - Types - Helical and leaf springs - Stresses and deflection of springs.

**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Rajput.R.K | Strength of Materials | S.Chand and Co, New Delhi | 2015 |
| 2 | Gambhir.M.L | Fundamentals of Solid Mechanics | PHI Learning Private Limited., New Delhi | 2010 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Subramanian R | Strength of materials | Oxford University Press, New Delhi | 2012 |
| 2 | Ramamrutham S | Strength of Materials | Dhanpat Rai & Sons | 2014 |
| 3 | Bansal R.K | Strength of materials | Laxmi Publications, NewDelhi | 2014 |
| 4 | William A. Nash | Theory and Problems of Strengthof Materials | Schaum's Outline Series,Tata McGraw-Hill publishing co., NewDelhi | 2010 |
| 5 | Srinath L.S | Advanced Mechanics of Solids | Tata McGraw-Hill Publishing Co., New Delhi | 2017 |

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| 23CEC02 | STRENGTH OF MATERIALS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To understand the concept of energy principles.
- To analyze the indeterminate beams.
- To analyze columns and thick cylinder.
- To understand the concept of theories of failure and state of stress in three dimensions.
- To understand advanced concepts like unsymmetrical bending, stresses in curved bars and locatingshear centre.

**Course Outcomes:**

| | |
|---|---|
| 23CEC02.CO1 | Understand energy method for estimating the slope and deflections of beams and trusses. |
| 23CEC02.CO2 | Analyze the indeterminate beams such as propped cantilever, fixed beams and continuous beams. |
| 23CEC02.CO3 | Formulate the safe load and crippling load on the column for different end conditions. |
| 23CEC02.CO4 | Analyze the stress distribution in three dimensions. |
| 23CEC02.CO5 | Analyze the advanced method of symmetrical and unsymmetrical bending of beams. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC02.CO1 | x | - | - | - | - | x | | - | x | x | - | - | x | x | x |
| 23CEC02.CO2 | - | x | - | x | x | x | - | - | - | - | - | - | x | x | x |
| 23CEC02.CO3 | - | x | x | x | x | x | - | - | - | - | x | - | x | x | x |
| 23CEC02.CO4 | - | x | x | x | x | - | - | x | - | - | x | x | x | x | x |
| 23CEC02.CO5 | - | - | x | x | - | - | - | x | - | - | x | x | x | x | x |

**Unit-I ENERGY PRINCIPLES 9**

Strain energy and strain energy density - strain energy in traction, shear in flexure and torsion -castigliano's theorems - principle of virtual work - application of energy theorems for computing deflections in beams and trusses - Maxwell's reciprocal theorems

**Unit-II INDETERMINATE BEAMS 9**

Propped cantilever and fixed beams-fixed end moments and reactions for concentrated load (central, noncentral), uniformly distributed load, triangular load (maximum at centre and maximum at end) – theorem of three moments - analysis of continuous beams - shear force and bending moment diagrams for continuous beams.

**Unit-III COLUMNS AND CYLINDER 9**

Eccentrically loaded short columns - middle third rule - core section - columns of unsymmetrical sections - (angle channel sections) - Euler's theory of long columns - critical loads for prismatic columns with different end conditions; Rankine's-Gordon formula for eccentrically loaded columns - thick cylinders - compound cylinders.

**Unit-IV STATE OF STRESS IN THREE DIMENSIONS 9**

Spherical and deviatory components of stress tensor - determination of principal stresses and principal Planes - volumetric strain - dilatation and distortion - theories of failure - principal stress dilatation - Principal strain - shear stress - strain energy and distortion energy theories - application in analysis of Stress, load carrying capacity and design of members - residual stresses.

**Unit-V ADVANCED TOPICS IN BENDING OF BEAMS 9**

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections - curved beams Winkler Bach formula - stress concentration - fatigue and fracture.

**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Rajput R.K | Strength of Materials | S.Chand & Company Ltd., New Delhi | 2015 |
| 2 | Bansal R.K | Strength of Materials | Laxmi Publications, NewDelhi | 2019 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Kazimi S.M.A | Solid Mechanics | Tata McGraw-Hill Publishing Co., New Delhi | 2017 |
| 2 | William A Nash | Theory and Problems of Strengthof Materials | Schaum's Outline Series, Tata McGraw Hill Publishing Company Ltd | 2010 |
| 3 | Khurmi R.S | Strength of Materials (Mechanicsof Solids) | S.Chand & Company Ltd | 2010 |
| 4 | Srinath, L.S | Advanced mechanics and solids | Tata-McGraw Hillpublishing company ltd | 2017 |
| 5 | Punmia B.C, Ashok K.Jain and Arun K Jain | Mechanics of Structures (SMTSI) | Laxmi Publications, NewDelhi | 2011 |

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| 23CEC03 | STRUCTURAL ANALYSIS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 |

**Course Objective:**

- To gain knowledge on computing deflection of determinate structures using work- energy methods.
- To know about concepts of force method.
- To gain knowledge on influence lines for statically determinate and indeterminate structures.
- To analyze arched and cable profiled structures.
- To gain knowledge on Plastic Analysis for statically indeterminate structures.

**Course Outcomes:**

| | |
|---|---|
| 23CEC03.CO1 | Determine the deflection of determinate structures by using work- energy methods. |
| 23CEC03.CO2 | Gain knowledge about force method. |
| 23CEC03.CO3 | Draw influence lines for statically determinate and indeterminate structures. |
| 23CEC03.CO4 | Solve arched and cable profiled structures. |
| 23CEC03.CO5 | Solve problems on Plastic Analysis for statically indeterminate structures. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC03.CO1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC03.CO2 | x | x | x | x | x | x | x | x | x | x | x | - | x | x | x |
| 23CEC03.CO3 | x | x | x | x | x | x | x | x | x | x | x | - | x | x | x |
| 23CEC03.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC03.CO5 | x | x | x | x | x | x | x | x | x | x | x | - | x | x | x |

**Unit-I WORK–ENERGY METHODS 12**

Work Energy Principles- Principle of Virtual Displacement-Principle of Stationary Potential Energy – Principle of Complimentary Energy – Principle of Virtual Forces – Castigliano's First and Second Theorem – Engessor's First and Second Theorems – Betti Maxwell's Law – Application to Statically Determinate Beams, Trusses and Frames

**Unit-II CONCEPTS OF FORCE METHOD 12**

Definition and Determination of static and kinematic Indeterminacy – Beams, Trusses and frames – Analysis of statically indeterminate structures by force method – Theorem of three moments for continuous beams (Only two dimension)

**Unit-III MOVING LOADS AND INFLUENCE LINES 12**

Introduction – moving loads in ILD – Load categories- Single concentrated load - Udl longer than the span- Udl shorter than the span – Two concreted load – Multiple wheel loads - Influence lines for statically determinate structures – Applications of Muller- Breslau's principle (Indeterminate structures upto two degrees of freedom)

**Unit-IV ARCHES AND SUSPENSION BRIDGES 12**

Introduction – Analysis of three hinged and two hinged parabolic and circular arches - Analysis ofsuspension cables and suspension bridges with two and three hinged stiffening girders.

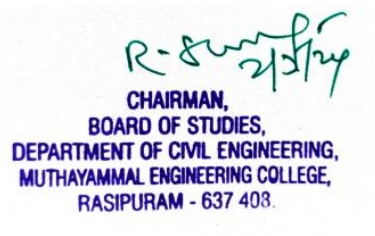
**Unit-V PLASTIC ANALYSIS OF STRUCTURES 12**

Statically indeterminate axial problems - Beams in pure bending - plastic moment of resistance - plastic modulus - shape factor - Load factor - plastic hinge and mechanism - plastic analysis of Indeterminate beams and frames (Single bay and single storey) - upper and lower bound theorems.

**Total Periods: 60**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Bhavikatti.S.S | Structural Analysis, Vol.1and Vol. 2 | Vikas Publishing HousePvt. Ltd | 2011 |
| 2 | Vaidyanadhan.R andPerumal.P | Comprehensive structural Analysis – Vol.1 & Vol.2 | Laxmi Publications,New Delhi | 2019 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Wang C K | Indeterminate Structural Analysis | Tata Mc Graw Hill Education Pvt. Ltd.,New Delhi | 2013 |
| 2 | Gambhir. M.L | Fundamentals of Structural Mechanics and Analysis | PHI Learning Pvt. Ltd.,New Delhi | 2011 |
| 3 | Negi L.S andJangid R S | Structural Analysis | Tata Mc Graw HillPublications, NewDelhi, 6th Edition | 2014 |
| 4 | Reddy. C.S | Basic Structural Analysis | Tata Mc Graw Hill Education Pvt. Ltd.,New Delhi | 2013 |
| 5 | B. C. Punmia<br>Ashok Kumar Jain andArun Kumar Jain | Theory of Structures | Laxmi Publications (P) Ltd., New Delhi | 2012 |



| 23CEC04 | DESIGN OF STEEL STRUCTURES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 |

**Course Objective:**

- To expose limit state design concepts on bolt and welded joints.
- To provide knowledge on design of tension members.
- To get familiar with compression member design.
- To have knowledge on design of beams and plate girder.
- To gain knowledge on design of industrial roof structure.

**Course Outcomes:**

23CEC04.CO1 Gain knowledge on limit state design concepts on bolt and welded joints

23CEC04.CO2 Design tension members.

23CEC04.CO3 Design compression members.

23CEC04.CO4 Get trained with design of beams and plate girder.

23CEC04.CO5 Design components of industrial roof structures.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC04.CO1 | x | x | x | - | - | - | x | - | - | - | - | x | x | x | - |
| 23CEC04.CO2 | x | x | x | - | x | - | - | - | - | - | x | x | x | x | - |
| 23CEC04.CO3 | x | x | x | - | x | - | - | - | - | - | x | x | x | x | - |
| 23CEC04.CO4 | x | x | x | - | x | x | x | x | x | - | x | x | x | x | x |
| 23CEC04.CO5 | x | x | x | x | - | - | - | - | - | x | - | x | x | x | x |

**Unit-I INTRODUCTION 12**

Properties of Steel- Market Forms of Structural steel Structural steel sections – Limit state design concepts – Connections bolted and welded joints - Failure of joints - Efficiency of joints – Eccentric connections.

**Unit-II TENSION MEMBERS 12**

Types of sections – Net area – net effective sections for angles and Tee in tension – Design of connections in tension members – use of lug angles – Design of tension splice – Concept of Shear lag.

**Unit-III COMPRESSION MEMBERS 12**

Effective length about major and minor principal axis - I.S code provisions permissible stresses - Design rules- Design of one component – two components and builtup compression members under axial load- Design of Lacings and Battens - Different types of column bases - Slab base and Gusseted base - connection details.

**Unit-IV BEAMS 12**

Design of laterally supported and unsupported beams – Built up beams – design of Plate Girders – Intermediate and bearing stiffeners – Web splicing.

**Unit-V ROOF TRUSS AND INDUSTRIAL STRUCTURES 12**

Design of roof trusses – Elements of roof trusses – Design of purlins – Estimation of wind loads – Design of gantry girders

**Total Periods: 60**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Subramanian N | Design of Steel Structures | Oxford University Press | 2013 |
| 2 | Duggal S.K | Design of Steel Structures | Tata McGraw-Hill Education | 2014 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Gaylord, E.H Gaylord, N.C and Stallmeyer, J.E | Design of Steel Structures | 3rd edition, McGraw-Hill Publications | 2012 |
| 2 | S.S. Bhavikatti | Design of Steel Structures | I. K. International PvtLtd | 2014 |
| 3 | Gambhir. M.L | Fundamentals of Structural Steel Design | McGraw Hill EducationIndia Pvt. Ltd | 2013 |
| 4 | Narayanan.R.et.al | Teaching Resource on Structural Steel Design | INSDAG, Ministry ofSteel Publications | 2014 |
| 5 | - | IS 800:2007,General Construction in Steel – Code of Practice,(III rd Revision) | BIS, New Delhi | 2014 |

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| 23CEC05 | ESTIMATION COSTING AND VALUATION | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To produce civil engineering students who have strong foundation in estimation of quantities required for roads and buildings
- To estimate the quantities of items of works involved in buildings, water supply and sanitary works, road works and irrigation works.
- To estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents.
- Student should also be able to prepare value estimates.
- To familiarize with the knowledge of preparing reports for various engineering works.

**Course Outcomes:**

| | |
|---|---|
| 23CEC05.CO1 | Student will have the confidence to prepare detailed and abstract estimations for building. |
| 23CEC05.CO2 | Student will demonstrate the ability to prepare estimate for other structures. |
| 23CEC05.CO3 | Student will have the confidence to prepare specifications and tender documents. |
| 23CEC05.CO4 | Gain knowledge about valuation. |
| 23CEC05.CO5 | Gain knowledge about report preparation of projects. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC05.CO1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC05.CO2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC05.CO3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC05.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC05.CO5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

**Unit-I ESTIMATE OF BUILDINGS 9**

Introduction – types of Estimate - unit of measurement - methods of estimate-Load bearing and framed structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches.

**Unit-II ESTIMATE OF OTHER STRUCTURES 9**

Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipe line –sewer line – tube well – open well – estimate of bituminous and cement concrete roads – estimate of retaining walls – culverts – estimating of irrigation works – aqueduct, siphon, fall.

**Unit-III SPECIFICATION AND TENDERS 9**

Data – Schedule of rates – Analysis of rates – Specifications – sources – Detailed and general specifications – Tenders – Contracts – Types of contracts – Arbitration and legal requirements.

**Unit-IV VALUATION 9**

Necessity – Basics of value engineering – Capitalized value – Depreciation – Escalation – Value of Building – Calculation of Standard rent – Mortgage – Lease.

**Unit-V REPORT PREPARATION 9**

Principles for report preparation – report on estimate of residential building – Culvert – Roads – Water Supply and sanitary installations – Tube wells – Open wells.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Dutta, B.N. | Estimating and Costing in CivilEngineering | UBS Publishers & Distributors Pvt. Ltd | 2017 |
| 2 | Kohli, D.D andKohli R.C. | A Text Book of Estimating and Costing(Civil) | S.Chand & CompanyLtd. | 2012 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | - | PWD Data Book. | Public Work Department | - |
| 2 | - | TamilNadu Transparencies in Tender Act. | - | 2016 |
| 3 | - | Arbitration and Concilation Act. | - | 2015 |
| 4 | - | Standard Bid Evaluation Form, Procurement of Gods or Works The World Bank, April. | - | 2016 |
| 5 | Rangwala | Estimating Costing and Valuation | Charotar publishning company pvt ltd | 2015 |

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| 23CEC06 | MECHANICS OF FLUIDS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To understand the basic properties of fluids and fluid statics.
- To get a basic knowledge of fluids in kinematic and dynamics.
- To gain knowledge about various losses in pipes.
- To impart knowledge on boundary layers
- To select appropriate model and similitude in problem related to hydraulics.

**Course Outcomes:**

23CEC06.CO1 Determine the various fluid properties.

23CEC06.CO2 Impart knowledge on fluid in kinematics and dynamics

23CEC06.CO3 Determine the various losses in pipes.

23CEC06.CO4 Compute the energy and momentum thickness.

23CEC06.CO5 Explain the various applications of similitude and model analysis

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC06.CO1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC06.CO2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC06.CO3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC06.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC06.CO5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

**Unit-I** **9**

Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties – density-specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillarity and surface tension-Fluid statics: concept of fluid pressure, absolute and gauge pressures-pressure measurements by manometers and pressure gauges.

**Unit-II** **9**

Fluid Kinematics Stream, streak and path lines – Classification of flows – Continuity equation (one, two and three dimensional forms) – Stream and potential functions – Flow nets –Fluid dynamics –equation of motion- Euler's equation along a streamline-Bernoulli's equation-applications-flow measurements.

**Unit-III** **9**

Shear stress, pressure gradient relationship– Laminar flows through pipes and between plates – Hagen Poiseuille equation –Flow through pipes -Turbulent flow – Darcy- Weisbach formula –pipe roughness– Moody's diagram – Major and minor losses of flow in pipes-pipes in series and in parallel

**Unit-IV** **9**

Definition of boundary layer –boundary layer on a flat plate - thickness and classification – Displacement, energy and momentum thickness-Boundary layer separation and control-drag in flat plate- drag and lift coefficients.

**Unit-V** **9**

Dimensional Analysis – Rayleigh's method, Buckingham's Pi-theorem – Similitude and models – Scale effect and distorted models.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Bansal R.K | Fluid Mechanics and Hydraulic Machines | Laxmi Publications (P) Ltd. | 2016 |
| 2 | Modi P.N. and Seth S.M | Hydraulics and Fluid Mechanics | Standard Book House, NewDelhi | 2011 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Streeter, Victor L and Wylie, Benjamin E | Fluid Mechanics | McGraw- Hill Ltd | 2013 |
| 2 | John Finnemore,Joseph B and Franzini | Fluid Mechanics with Engineering Applications | McGraw-Hill Ltd | 2014 |
| 3 | Fox, Robert W andMacdonald, AlanT | Introduction to Fluid Mechanics | John Wiley & Sons | 2011 |
| 4 | Jain. A.K | Fluid Mechanics | Khanna Publishers | 2013 |
| 5 | Rajput R.K | A text book of Fluid Mechanics | S.Chand and Co | 2010 |

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| 23CEC07 | SURVEY AND GEOMATICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 |

**Course Objective:**

- To learn the various methods of plane and geodetic surveying to solve the real world Civil Engineering problems.
- To introduce the concepts of Control Surveying.
- To introduce the basics of Astronomical Surveying
- To know about control survey and adjustments
- To learn about modern surveying

**Course Outcomes:**

| | |
|---|---|
| 23CEC07.CO1 | The use of various surveying instruments and mapping |
| 23CEC07.CO2 | Measuring Horizontal angle and vertical angle using different instruments |
| 23CEC07.CO3 | Methods of Leveling and setting Levels with different instruments |
| 23CEC07.CO4 | Concepts of astronomical surveying and methods to determine time, longitude, latitude and azimuth |
| 23CEC07.CO5 | Concept and principle of modern surveying. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC07.CO1 | x | x | x | x | x | x | - | x | x | - | x | - | x | x | x |
| 23CEC07.CO2 | x | x | x | x | x | x | - | x | x | - | x | - | x | x | x |
| 23CEC07.CO3 | x | x | x | x | x | x | - | x | x | - | x | - | x | x | x |
| 23CEC07.CO4 | x | x | x | x | x | x | x | x | x | - | x | x | x | x | x |
| 23CEC07.CO5 | x | x | x | x | x | x | x | x | x | - | x | x | x | x | x |

**Unit-I FUNDAMENTALS OF CONVENTIONAL SURVEYING AND LEVELLING 12**

Classifications and basic principles of surveying - Equipment and accessories for ranging and chaining - Methods of ranging – Compass - Types of Compass - Basic Principles- Bearing – Types - True Bearing - Magnetic Bearing - Levelling- Principles and theory of Levelling – Datum- - Bench Marks – Temporary and Permanent Adjustments- Methods of Levelling- Booking –Reduction - Sources of errors in Levelling - Curvature and refraction.

**Unit-II THEODOLITE AND TACHEOMETRIC SURVEYING 12**

Horizontal and vertical angle measurements - Temporary and permanent adjustments - Heights and distances – Tacheometer– Stadia Constants - Analytic Lens -Tangential and Stadia Tacheometry surveying - Contour – Contouring – Characteristics of contours – Methods of contouring – Tacheometric contouring - Contour gradient – Uses of contour plan and map .

**Unit-III ADVANCED TOPICS IN SURVEYING 12**

Horizontal and vertical control – Methods – specifications – triangulation- baseline – satellite stations – reduction to centre- trigonometrical levelling – single and reciprocal observations – traversing – Gale's table. - Errors Sources- precautions and corrections – classification of errors – 40 true and most probable values - weighed observations – method of equal shifts –principle of least squares - normal equation – correlates- level nets- adjustment of simple triangulation networks.

**Unit-IV ADVANCED TOPICS IN SURVEYING 12**

Hydrographic Surveying – Tides – MSL – Sounding methods – Three point problem – Strength of fix – astronomical Surveying –Field observations and determination of Azimuth by altitude and hour angle methods – .Astronomical terms and definitions Motion of sun and stars - Celestial coordinate systems - different time

systems - Nautical Almanac - Apparent altitude and corrections - Field observations and determination of time, longitude, latitude and azimuth by altitude and hour angle method

**Unit-V GEOMATICS 12**

Total Station: Advantages - Fundamental quantities measured - Parts and accessories – working principle – On board calculations –Field procedure - Errors and Good practices in using Total Station GPS Surveying : Different segments - space, control and user segments - satellite configuration -signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability –Task of control segment - Hand Held and Geodetic receivers - data processing.

**Total Periods: 60**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Punmia B.C | Surveying Vol I &II | Laxmi Publications (P) Ltd., New Delhi, | 2012 |
| 2 | Duggal S.K | Surveying Vol I&II | McGraw Hill Publishing Company Ltd., NewDelhi | 2011 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Clark D | Plane and Geodetic Surveying Vols.I and II | C.B.S.,Publishers andDistributors, New Delhi | 2011 |
| 2 | Bannister A andRaymond S | Surveying | Addison Wesley Longman Ltd, England | 2010 |
| 3 | Arora, K.R | Surveying Vol. I and II | Standard Book House | 2015 |
| 4 | Heribert Kahmen and Wolfgang Faig | Surveying | Walter de Gruyter | 2013 |
| 5 | Kanetkar .T.P andKulkarni .S.V | Surveying and Levelling, Vol. I & II | Pune Vidyarthi Griha Prakashan | 2017 |

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| 23CEC08 | GEO TECHNICAL ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To provide knowledge on and classification of soil and compaction
- To acquire knowledge on soil water and permeability
- To impart idea about effective stress distribution due to applied loads and settlement
- To familiarize about shear strength
- To be acquainted with slope stability.

**Course Outcomes:**

23CEC08.CO1 Classify the soil based on index properties

23CEC08.CO2 Know about soil water and permeability

23CEC08.CO3 Find out the stress distribution and settlement

23CEC08.CO4 Estimate the shear strength of various types of soil.

23CEC08.CO5 Analyze the stability of slopes using different methods.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC08.CO1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC08.CO2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC08.CO3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC08.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC08.CO5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

**Unit-I SOIL CLASSIFICATION AND COMPACTION 9**

Nature of soil – phase relationships – Soil classification for engineering purposes – Index properties of soils- IS Classification system – Soil compaction – comparison of laboratory and field compaction methods – Factors influencing compaction

**Unit-II SOIL WATER AND PERMEABILITY 9**

Soil water – types – capillary stress – Permeability measurement in the laboratory and in field – factors influencing permeability of soils – Seepage – introduction to flow nets – Simple problems – effective stress concept in soil

**Unit-III EFFECTIVE STRESS DISTRIBUTION DUE TO APPLIED LOADS AND SETTLEMENT 9**

Boussinesq theory – assumptions – point load – circular load – rectangular load- 2:1 distribution method– equivalent point load method - use of newmarks influence chart – components of settlement – immediate and consolidation settlement – computation of rate of settlement. -√t and log t methods - factors influencing consolidation behavior of soils.

**Unit-IV SHEAR STRENGTH 9**

Shear strength of cohesive and cohesion less soils – Mohr – Coulomb failure - assumptions – Measurement of shear strength, direct shear – Triaxial compression, UCC and Vane shear tests – Pore pressure parameters – Liquefaction

**Unit-V SLOPE STABILITY 9**

Slope failure mechanisms – Types - infinite slopes – finite slopes – Total stress analysis for saturated clay – c -ϕ soil method of slices - Friction circle method – Use of stability number - slope protection measures.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Arora. K.R | Soil Mechanics and FoundationEngineering | Standard Publishers and Distributors | 2015 |
| 2 | Venkataramaiah C | Geotechnical Engineering | New Age International Publishers, New Delhi | 2014 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Punmia B.C | Soil Mechanics and Foundations | Laxmi Publications Pvt. Ltd,New Delhi | 2010 |
| 2 | Kaniraj, S.R | Design aids in Soil Mechanics andFoundation Engineering | Tata McGraw Hill publishing company Ltd., New Delhi | 2014 |
| 3 | Purushothama Raj. P | Soil Mechanics and FoundationEngineering | Pearson Education | 2013 |
| 4 | Gopal Ranjan andRao A.S.R | Basic and Applied Soil Mechanics | New Age International Publishers, New Delhi | 2010 |
| 5 | Murthy V.N.S | Text Book of Soil Mechanics andFoundation Engineering | CBS Publishers | 2011 |

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| 23CEC09 | DESIGN OF REINFORCED CONCRETE ELEMENTS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 |

**Course Objective:**

- To study the stress strain behavior of concrete and steel.
- To gain the knowledge of limit state design for beam
- To gain the knowledge of limit state design for slabs
- To understand the behavior of columns subjected to various load
- To study the design of various types of footing

**Course Outcomes:**

23CEC09.CO1 Design the reinforced concrete structural elements using various methods.

23CEC09.CO2 Design the reinforced concrete beams by LSM

23CEC09.CO3 Design the reinforced concrete slabs by LSM

23CEC09.CO4 Design the reinforced concrete columns by LSM

23CEC09.CO5 Select and design RC footings by using LSM.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC09.CO1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC09.CO2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC09.CO3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC09.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC09.CO5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

**Unit-I METHODS OF DESIGN OF CONCRETE STRUCTURES 12**

Concept of WSM, ultimate load method and limit state method - Advantages of Limit State method over other methods - Limit State philosophy as detailed in current IS Code - Design of rectangular beam section by working stress- Cracked and Uncracked section-Design of one way and two way slab by working stress method.

**Unit-II LIMIT STATE DESIGN OF BEAMS 12**

Design of singly and doubly reinforced rectangular and flanged beams - Use of design aids for flexure - Behavior of R.C. beams in shear and torsion - Shear and torsion reinforcement - Limit State design of R.C. members for combined bending, shear and torsion - Use of design aids - Design requirement for bond and anchorage as per IS code - Serviceability requirements.

**Unit-III LIMIT STATE DESIGN OF SLABS 12**

Behavior of one way and two way slabs - Design of one way simply supported, cantilever and continuous slabs - Design of two-way slabs for various edge conditions - Types of staircases - design of dog-legged staircase-Open well staircase.

**Unit-IV LIMIT STATE DESIGN OF COLUMNS 12**

Types of columns - Braced and unbraced columns - Assumptions - Design of rectangular and circular columns for axial load - Provisions of IS-456 & SP19 code for the analysis of columns subjected to axial load and uniaxial bending - Design of short and long columns subjected to axial load and biaxial bending moment.

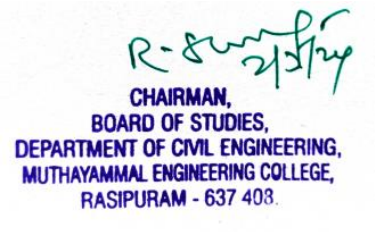
**Unit-V LIMIT STATE DESIGN OF FOOTING 12**

Classification of Foundations - Design guidelines - Codal provisions -Design of wall footing– Design of axially and eccentrically loaded square, rectangular and circular footing – Design of combined footing (rectangular and trapezoidal) - Detailing of RC footing.

**Total Periods: 60**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | N. Krishna Raju and R. N. Pranesh | Reinforced Concrete Design – IS 456 – 2000 Principles andPractice | New Age International Publishers, New Delhi | 2010 |
| 2 | P. C. Varghese | Limit State Design of ReinforcedConcrete | Prentice Hall of India Ltd.,New Delhi | 2010 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Punmia, B.C Ashok Kumar Jain and Arun Kumar Jain | Limit state Design of Reinforcedconcrete | Laxmi Publications Pvt. Ltd.,New Delhi | 2019 |
| 2 | Sinha, S.N | Reinforced Concrete Design | Tata McGraw Hill Publishing Company Ltd., New Delhi | 2017 |
| 3 | I.C.Syal and A.K.Goel | Reinforced Concrete Structures | S.Chand and Company Ltd, New Delhi | 2012 |
| 4 | Shah V L Karve S R | Limit State Theory and Design ofReinforced Concrete | Structures Publilcations, Pune | 2013 |
| 5 | Gambhir.M.L | Fundamentals of Reinforced Concrete Design | Prentice Hall of India Private limited, New Delhi | 2013 |



| 23CEC10 | WATER SUPPLY AND WASTE WATER ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To make the students conversant with sources, demand and characteristics of water
- To expose the students to understand the concept of various water supply lines.
- To provide adequate knowledge about the water treatment processes.
- To prefer the suitable advanced treatment techniques.
- To provide knowledge on water distribution and plumbing system

**Course Outcomes:**

| | |
|---|---|
| 23CEC10.CO1 | Understand the various components of water supply scheme and design of intake structure and conveyance system for water transmission |
| 23CEC10.CO2 | Understand on the characteristics and composition of sewage, ability to estimate sewage generation and design sewer system including sewage pumping stations |
| 23CEC10.CO3 | Understand the process of conventional treatment and design of water and wastewater treatment system and gain knowledge of selection of treatment process and biological treatment process. |
| 23CEC10.CO4 | Ability to design and evaluate water distribution system and water supply in buildings and understand the self-purification of streams and sludge and septage disposal methods. |
| 23CEC10.CO5 | Able to understand and design the various advanced treatment system and knowledge about the recent advances in water and wastewater treatment process and reuse of sewage |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC10.CO1 | - | x | - | x | - | - | x | x | x | - | - | - | x | x | x |
| 23CEC10.CO2 | x | x | x | - | x | x | - | - | - | x | - | - | x | x | - |
| 23CEC10.CO3 | x | x | x | - | - | x | - | - | - | x | - | - | x | x | - |
| 23CEC10.CO4 | - | x | - | - | x | - | - | - | - | x | - | x | x | x | - |
| 23CEC10.CO5 | x | x | x | x | - | - | - | x | - | - | x | - | x | x | x |

**Unit-I WATER SUPPLY** **9**

Estimation of surface and subsurface water resources - Predicting demand for water- Impurities of water and their significance - Physical, chemical and bacteriological analysis - Waterborne diseases - Standards for potable water. Intake of water: Pumping and gravity schemes.

**Unit-II WATER TREATMENT** **9**

Objectives - Unit operations and processes - Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation – Clarifloccuator - Plate and tube settlers - Pulsator clarifier - sand filters - Disinfection - softening, removal of iron and manganese - Defluoridation - Softening - Desalination process - Residue Management - Construction, Operation and Maintenance aspects

**Unit-III WATER STORAGE AND DISTRIBUTION** **9**

Storage and balancing reservoirs - types, location and capacity. Distribution system: layout, hydraulics of pipe lines, pipe fittings, valves including check and pressure reducing valves, meters, analysis of distribution systems, leak detection, maintenance of distribution systems, pumping stations and their operations - House service connections.

**Unit-IV PLANNING AND DESIGN OF SEWERAGE SYSTEM** **9**

Characteristics and composition of sewage - Population equivalent - Sanitary sewage flow estimation- Sewer materials - Hydraulics of flow in sanitary sewers - Sewer design - Storm drainage-Storm runoff estimation - Sewer appurtenances - Corrosion in sewers - Prevention and control – Sewage pumping-drainage in buildings –

septic tank with dispersion -Plumbing systems for drainage.

**Unit-V SEWAGE TREATMENT AND DISPOSAL 9**

Objectives - Selection of Treatment Methods - Principles, Functions, - Activated Sludge Process and Extended aeration systems - Trickling filters - Sequencing Batch Reactor(SBR) - UASB – Waste Stabilization Ponds - Other treatment methods - Reclamation and Reuse of sewage – Recent Advances in Sewage Treatment - Construction, Operation and Maintenance aspects. – Discharge standards-sludge treatment -Disposal of sludge

**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | S.K. Garg | Water Supply Engineering | Khanna Publications Pvt.Ltd. New Delhi. | 2010 |
| 2 | Modi, P.N | Environmental Engineering I | Standard Book House, Delhi | 2015 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | CpheecoManual | Manual on Water supply and Treatment | Government of India, NewDelhi | 2019 |
| 2 | Birdie.G | Water Supply and Sanitary Engineering | Dhanpat Rai and sons | 2011 |
| 3 | - | Hand book on Water Supply andDrainage | SP35, B.I.S., New Delhi | 2013 |
| 4 | Syed R Qasim, MotleyE M | Water Works Engineering – Planning, Design and Operation | Prentice- hall of India, NewDelhi, | 2013 |
| 5 | Babbit. H. E., andDonald. J. J | Water Supply Engineering | McGraw Hill book Co | 2012 |

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| 23CEC11 | HIGHWAY ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To introduce the fundamentals related to the planning and alignment of road.
- To provide knowledge on geometric design of highway components.
- To provide knowledge on design of flexible and rigid pavements.
- To provide knowledge on various materials and procedures in pavement construction.
- To provide knowledge on evaluation of pavement and maintenance methods.

**Course Outcomes:**

23CEC11.CO1 Apply the concepts behind the Highway planning and aligning.

23CEC11.CO2 Design the cross sectional elements, horizontal and vertical curves.

23CEC11.CO3 Design flexible and rigid pavements.

23CEC11.CO4 Choose the characteristics of pavement materials.

23CEC11.CO5 Perform evaluation and maintenance of pavement.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC11.CO1 | x | x | x | x | - | x | x | - | - | x | - | x | x | - | - |
| 23CEC11.CO2 | x | x | x | - | - | x | x | - | - | x | - | x | x | - | - |
| 23CEC11.CO3 | x | x | x | - | - | - | x | - | x | x | - | - | x | - | - |
| 23CEC11.CO4 | x | x | x | - | - | x | x | - | - | x | - | - | x | - | - |
| 23CEC11.CO5 | x | x | x | - | - | - | x | - | x | x | - | - | x | - | - |

**Unit-I HIGHWAY PLANNING AND ALIGNMENT 9**

Significance of highway planning – Modal limitations towards sustainability - History of road development in India – Classification of highways – Locations and functions – Factors influencing highway alignment – Soil suitability analysis - Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods

**Unit-II GEOMETRIC DESIGN OF HIGHWAYS 9**

Typical cross sections of Urban and Rural roads - Cross sectional elements - Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves - Vertical curves - Gradients, Special consideration for hill roads - Hairpin bends – Lateral and vertical clearance at underpasses.

**Unit-III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS 9**

Design principles – pavement components and their role - Design practice for flexible and rigid Pavements (IRC methods only) - Embankments

**Unit-IV HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE 9**

Highway construction materials, properties, testing methods – CBR Test for subgrade - tests on aggregate & bitumen – Construction practice including modern materials and methods, Bituminous and Concrete road construction, Polymer modified bitumen, Recycling, Different materials – Glass, Fiber, Plastic, Geo-Textiles, Geo-Membrane (problem not included) - Quality control measures - Highway drainage - Construction machineries..

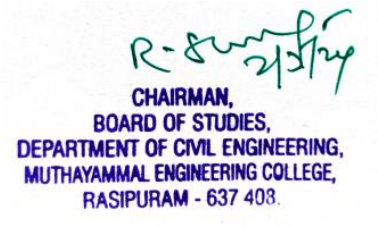
**Unit-V EVALUATION AND MAINTENANCE OF PAVEMENTS 9**

Pavement distress in flexible and rigid pavements – Pavement Management Systems - Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements -Strengthening of pavements –Types of maintenance – Highway Project formulation.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Khanna, K. and Justo C.E.G. | Highway Engineering | Khanna Publishers | 2015 |
| 2 | Kadiyali L R | Principles and practice of Highway engineering | Khanna Technical Publishers | 2006 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Bindra S P | Highway Engineering | Dhanpat Rai & Sons | 2012 |
| 2 | Khiroliya R K | Principle of Highway Engineering | Dhanpat rai and Sons | 2019 |
| 3 | Brockenbrough R LBoedecker K J | Highway engineering handbook | Highway engineering handbook | 2015 |
| 4 | Subramaniyan K P | Highways,Railways,Airport And Harbour Engineering Engineering | Scitech Publications,Chennai | 2010 |
| 5 | - | Indian Road Congress(IRC), Guidelines and special Publications of Planning and design | IRC | - |



| 23CEC12 | RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To give exposure to planning of railway tracks.
- To provide proficiency in the railway construction and maintenance.
- To develop skills on planning of airports
- To give exposure on airport design.
- To have basic knowledge on components of docks and harbors.

**Course Outcomes:**

23CEC12.CO1 Planning the railway track components.

23CEC12.CO2 Perform the railway construction and maintenance.

23CEC12.CO3 Possess knowledge on airport planning

23CEC12.CO4 Do the design of runways, taxiways and apron.

23CEC12.CO5 Familiarize the components of docks and harbors

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC12.CO1 | x | - | - | - | - | - | x | x | x | - | - | - | x | x | x |
| 23CEC12.CO2 | - | - | x | - | x | x | - | - | - | - | - | x | x | x | x |
| 23CEC12.CO3 | - | x | x | x | x | - | - | - | x | x | x | x | x | x | x |
| 23CEC12.CO4 | x | x | - | x | x | x | - | x | x | x | - | x | x | x | x |
| 23CEC12.CO5 | x | x | x | x | - | - | - | - | - | x | x | - | x | x | x |

**Unit-I RAILWAY PLANNING 9**

Significance of Road, Rail, Air and Water transports - Coordination of all modes to achieve sustainability - Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods (Remote Sensing, GIS & GPS, EDM and other equipments)- Soil suitability analysis - Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings.

**Unit-II RAILWAY CONSTRUCTION AND MAINTENANCE 9**

Earthwork – Stabilization of track on poor soil –- Tunneling Methods, drainage and ventilation – Calculation of Materials required for track laying - Construction and maintenance of tracks –Modern methods of construction & maintenance - Railway stations and yards and passenger amenities- Urban rail – Infrastructure for Metro, Mono and underground railways.

**Unit-III AIRPORT PLANNING 9**

Floors - Types of flooring - Repair of floors - Classification of roofs - Types of Pitched & Flat roofs -Roof covering materials - Drainage on pitched &flat roofs - Types of scaffolding - types of shoring - Methods of underpinning - Types of formwork - centering.

**Unit-IV CONSTRUCTION PRACTICES 9**

Runway Design: Orientation, Wind Rose Diagram - Runway length - Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles - Elements of Taxiway Design– Airport Zones , Clear Zone, Approach Zone, Buffer Zone, Turning Zone, wind direction indicators, Clearance over Highways and Railways - Passenger Facilities and Services - Runway and Taxiway Markings and lighting.

**Unit-V HARBOUR ENGINEERING 9**

Definition of Basic Terms: Harbor, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbors Requirements, Classification, Location and Design Principles – Harbor Layout and Terminal Facilities - Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage - Inland Water Transport - Wave action on Coastal Structures and Coastal Protection Works - Environmental concern of Port Operations - Coastal Regulation Zone, 2011.

**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Rangwala | Railway Engineering | Charotar Publishing House | 2013 |
| 2 | Bindra S P | A Course in Docks and Harbour Engineering | Dhanpat Rai and Sons | 2013 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Rangwala | Airport Engineering | Charotar Publishing House | 2013 |
| 2 | Dr.K.P.Subramanian | A text book on Railways, Airports,Docks and Harbours | Scitech, Chennai | 2012 |
| 3 | Oza.H.P andOza.G.H | A course in Docks & Harbour Engineering | Charotar Publishing Co. | 2013 |
| 4 | Mundrey J.S | A course in Railway Track Engineering | Tata McGraw Hill | 2017 |
| 5 | Saxena Subhash C andSatyapal Arora | A Course in Railway Engineering | Dhanpat Rai and Sons | 2016 |

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| 23CEC13 | CONSTRUCTION MANAGEMENT AND SAFETY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- Perform formulations of projects.
- Analyze project costing.
- To study scheduling of the construction.
- To study various safety concepts.
- To Provide the requirements applied to construction projects.

**Course Outcomes:**

23CEC13.CO1 To study and understand the formulation of projects.

23CEC13.CO2 To study and understand the costing of construction projects.

23CEC13.CO3 Identify and estimate the activity in the construction.

23CEC13.CO4 Develop the knowledge on accidents and their causes.

23CEC13.CO5 Plan, assess, analyze and manage the construction project sites.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC13.CO1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC13.CO2 | x | x | x | - | - | x | x | x | x | x | x | - | x | x | x |
| 23CEC13.CO3 | x | x | x | - | x | x | x | x | x | x | - | x | x | x | x |
| 23CEC13.CO4 | x | - | x | - | x | x | x | x | x | x | x | - | x | x | x |
| 23CEC13.CO5 | x | x | x | x | x | x | x | x | x | x | - | x | x | - | - |

**Unit-I GENERAL OVERVIEW AND PROJECT ORGANIZATION 9**

Introduction - Interdisciplinary nature of modern construction projects – execution of project – evaluation of bits – resource management.

**Unit-II ESTIMATION OF PROJECT COST & ECONOMICS 9**

Estimating quantities – description of items – estimation of project cost – running account bills – decision making in construction projects – depreciation of construction equipment – case study.

**Unit-III PLANNING AND SCHEDULING 9**

Introduction – project scheduling – uncertainties in duration of activities using PERT – Project monitoring and control system – resource levelling and allocation – crashing of network.

**Unit-IV SAFETY DURING CONSTRUCTION 9**

Basic terminology in safety - types of injuries - safety pyramid - Accident patterns - Planning for safety budget, safety culture - Introduction to OSHA regulations - Site safety programs - Job hazard analysis, accident investigation & accident indices-violation, penalty.

**Unit-V SAFE OPERATING PROCEDURES 9**

Safety during alteration, demolition works – Earthwork, steel construction, temporary structures, masonry & concrete construction, cutting & welding - Construction equipment, materials handling- disposal & hand tools - Other hazards – fire, confined spaces, electrical safety.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | S.K. Bhattacharje | Safety Management in Construction | Khana Publishers | 2011 |
| 2 | Chitkara.K.K | Construction Project Management | Tata McGraw Hill Publishing Co., New Delhi, | 2015 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Barcus, S.W. and Wilkinson.J.W., | Hand Book of Management Consulting Services | McGraw Hill, New York, | 1986 |
| 2 | Joy P.K. | Total Project Management - The Indian Context, | Macmillan India Ltd, New Delhi | 1992 |
| 3 | Albert Lester | Project Management, Planning and Control, 7th Edition | Butterworth-Heinemann, USA | 2017 |
| 4 | Patrick X.W. Zou ,Riza YosiaSunindijo, | Strategic Safety Management in Construction and Engineering | John Wiley & Sons, Ltd | 2015 |

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| 23CEC14 | CONCRETE TECHNOLOGY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To study the properties of different constituent materials
- To give knowledge on chemical and mineral admixtures concrete.
- To design a mix using ACI and BIS methods and their suitability.
- To practice about various tests on fresh concrete and hardened concrete.
- To understand the concepts of special concretes and concreting methods.

**Course Outcomes:**

23CEC14.CO1 To have an exposure on quality of concrete.

23CEC14.CO2 To select a suitable admixture in concrete according to the required properties.

23CEC14.CO3 To do mix design under various methods.

23CEC14.CO4 To conduct various tests on fresh and hardened concrete

23CEC14.CO5 To familiarize about special concretes and their concreting methods.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC14.CO1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC14.CO2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC14.CO3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC14.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC14.CO5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

**Unit-I CONSTITUENT MATERIALS 9**

Cement-Different types-Chemical composition and Properties -Tests on cement - IS Specifications – Aggregates - Classification - Mechanical properties and tests as per BIS Grading requirements - Water - Quality of water for use in concrete – Sea water and their effects

**Unit-II ADMIXTURES AND THEIR EFFECTS 9**

Chemical admixtures like Accelerators - Retarders - Plasticizers- Super plasticizers - Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline - Their effects on concrete properties

**Unit-III PROPORTIONING OF CONCRETE MIX 9**

Principles of Mix Proportioning - Properties of concrete related to Mix Design-Physical properties of materials required for Mix Design - Design Mix and Nominal Mix - IS Method of Mix Design - Mix Design Examples

**Unit-IV FRESH AND HARDENED PROPERTIES OF CONCRETE 9**

Workability - Tests for workability of concrete - Slump Test and Compacting factor Test - Segregation and Bleeding - Determination of Compressive and Flexural strength as per BIS - Properties of Hardened concrete - Determination of Compressive and Flexural strength - Stress-strain curve for concrete - Determination of Young's Modulus.

**Unit-V SPECIAL CONCRETES 9**

Light weight concretes - High strength concrete - Self compacting concrete - Fibre reinforced concrete - Ferrocement - Ready mix concrete – SIFCON - Shotcrete – Smart concrete - Guniting and shotcreting - Polymer concrete - High performance concrete - Geopolymer Concrete

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Shetty. M.S | Concrete Technology, Theory &Practice | S.Chand & Co, Pvt.Ltd., New Delhi | 2017 |
| 2 | Gambhir, M.L | Concrete Technology | Tata McGraw Hill | 2017 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Santhakumar A.R | Concrete Technology | Oxford University Press | 2017 |
| 2 | IS Board | IS: 456 – 2000 Plain and Reinforced Concrete | Bureau of Indian Standards | 2000 |
| 3 | IS Board | IS:10262 – 2009 Recommended guide lines for concrete mix design | Bureau of Indian Standards | 2009 |
| 4 | A.M. Neville,J.J Brooks | Concrete Technology | Pearson Education, | 2010 |
| 5 | Nevile A.M | Properties of Concrete | Longman Publishers | 2012 |

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| 23CEC15 | SURVEYING LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 |

**Course Objective:**

- At the end of the course the student will posses knowledge about Survey field techniques

**Course Outcomes:**

23CEC15.CO1 To know the various instruments used in surveying.

23CEC15.CO2 To draw the layout of the site with a plane table.

23CEC15.CO3 To use leveling instruments for surveying operations.

23CEC15.CO4 To use a theodolite for various surveying operations.

23CEC15.CO5 To calculate the elevation of different structures.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC15.CO1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC15.CO2 | x | x | x | - | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC15.CO3 | x | x | x | - | x | x | - | - | x | - | - | x | x | x | x |
| 23CEC15.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC15.CO5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

| Sl.No. | List of Experiments |
|---|---|
| 1. | Study of chains and its accessories |
| 2. | Ranging and Chaining of a line |
| 3. | Area of the boundary using chain survey |
| 4. | Compass Traversing |
| 5. | Plane table surveying: Resection – Two point problem |
| 6. | Study of levels and leveling staff |
| 7. | Fly leveling using Dumpy level |
| 8. | Longitudinal Section (LS) and Cross Section (CS) |
| 9. | Study of theodolite |
| 10. | Measurements of horizontal angles by reiteration and repetition and vertical angles |
| 11. | Elevation of an object by using single plane method |
| 12. | Study of Total Station, Measuring horizontal and vertical angles |

**Total Periods: 30**

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| 23CEC16 | STRENGTH OF MATERIALS LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 |

**Course Objective:**

- To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally.

**Course Outcomes:**

| | |
|---|---|
| 23CEC16.CO1 | To know the mechanical properties of different materials. |
| 23CEC16.CO2 | To acquire knowledge about different types of materials. |
| 23CEC16.CO3 | To know the behavior of beam under loading conditions. |
| 23CEC16.CO4 | To learn about the behavior of spring. |
| 23CEC16.CO5 | Able to analyze the bending stress on different types of sections. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC16.CO1 | x | x | - | x | x | x | x | x | - | - | - | x | x | x | x |
| 23CEC16.CO2 | x | x | - | x | x | x | x | x | - | - | - | x | x | x | x |
| 23CEC16.CO3 | x | x | - | x | x | x | x | x | - | - | - | x | x | x | x |
| 23CEC16.CO4 | x | x | - | x | x | x | x | x | - | - | - | x | x | x | x |
| 23CEC16.CO5 | x | x | - | x | x | x | x | x | - | - | - | x | x | x | x |

| Sl.No. | List of Experiments |
|---|---|
| 1. | Tension test on mild steel rod |
| 2. | Compression test on wood |
| 3. | Double shear test on metal |
| 4. | Torsion test on mild steel rod |
| 5. | Impact test on metal specimen (Izod and Charpy) |
| 6. | Hardness test on metals (Rockwell and Brinell Hardness Tests) |
| 7. | Deflection test on wooden and metal beam |
| 8. | Tension and Compression test on helical spring |

**Total Periods: 30**

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| 23CEC17 | HYDRAULIC ENGINEERING LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 |

**Course Objective:**

- Students should be able to verify the principles studied in theory by performing the experiments in lab.

**Course Outcomes:**

23CEC17.CO1 To learn about co-efficient of discharge.

23CEC17.CO2 To acquire knowledge about the various losses in pipes.

23CEC17.CO3 To adequate knowledge about the efficiency of different pumps.

23CEC17.CO4 To learn about the working efficiency of turbines.

23CEC17.CO5 Able to determine metacentre of a floating vessel.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC17.CO1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC17.CO2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC17.CO3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC17.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC17.CO5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

| Sl.No. | List of Experiments |
|---|---|
| 1. | Determination of Coefficient of Discharge of Orifice and Mouthpiece. |
| 2. | Determination of Coefficient of Discharge of Notches. |
| 3. | Determination of Friction factor of a given pipe. |
| 4. | Determination of various minor losses in pipes. |
| 5. | Calibration of Venturimeter and Orifice meter. |
| 6. | Determination of Metacentric height of a ship model. |
| 7. | Performance study of single stage, multistage, variable speed centrifugal pumps. |
| 8. | Determination of efficiency of submersible and variable speed reciprocating pumps. |
| 9. | Performance study on Pelton wheel turbine. |
| 10. | Determination of Efficiency of Francis turbine. |
| 11. | Determination of Efficiency of Kaplan turbine. |
| 12. | Minihydraulic flume |
| 13. | Calibration of rotometer. |
| 14. | Determination of gear pump. |

**Total Periods: 30**

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| 23CEC18 | GEOTECHNICAL ENGINEERING LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 |

**Course Objective:**

- At the end of the course student attains adequate knowledge in assessing both Physical and Engineering behaviour of soils through laboratory testing procedures.

**Course Outcomes:**

23CEC18.CO1 To learn about engineering properties of soil.

23CEC18.CO2 To acquire knowledge about different tests conducted on soil .

23CEC18.CO3 To adequate knowledge about the compaction characteristics of soil.

23CEC18.CO4 To learn about the index properties of soil.

23CEC18.CO5 Able to identify and classify soil based on standard geotechnical

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC18.CO1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC18.CO2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC18.CO3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC18.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC18.CO5 | x | x | - | x | x | x | - | x | x | x | x | x | x | x | x |

| Sl.No. | List of Experiments |
|---|---|
| 1. | Collection of Soil Sample Using Split Spoon Sampler |
| 2. | Determination of Index Properties<br>a. Special gravity of soil solids<br>b. Grain size distribution – Sieve analysis and Hydrometer analysis<br>c. Liquid limit, Plastic limit and shrinkage limit tests |
| 3. | Determination of Insitu Density and Compaction Characteristics<br>a. Field density Test (Core cutter and Sand replacement method)<br>b. Moisture – density relationship using Standard Proctor Compaction test |
| 4. | Determination of Engineering Properties<br>a. Permeability (constant head and falling head methods)<br>b. One dimensional consolidation test on cohesive soil<br>c. Direct shear test in cohesionless soil<br>d. Unconfined compression test in cohesive soil<br>e. California Bearing Ratio Test on Road materials<br>f. Tri-axial compression test in cohesionless soil to estimate shear strength parameters |

**Total Periods: 30**

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| 23CEC19 | CONCRETE AND HIGHWAY ENGINEERING LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 |

**Course Objective:**

- To learn the principles and procedures of testing Concrete and Highway materials and to get hands on experience by conducting the tests and evolving inferences.

**Course Outcomes:**

23CEC19.CO1 To learn about the properties of fresh and hardened concrete.

23CEC19.CO2 To acquire knowledge about different tests conducted on concrete.

23CEC19.CO3 To adequate knowledge about the various tests on aggregate.

23CEC19.CO4 To adequate knowledge about the various tests on bitumen.

23CEC19.CO5 To Design Concrete Mix Proportioning by Using Indian Standard Method.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC19.CO1 | x | x | x | x | x | x | x | x | x | x | x | - | x | x | x |
| 23CEC19.CO2 | x | x | x | x | x | x | x | x | x | x | x | - | x | x | x |
| 23CEC19.CO3 | x | x | x | x | x | x | x | x | x | x | x | - | x | x | x |
| 23CEC19.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC19.CO5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

| Sl.No. | List of Experiments |
|---|---|
| 1. | TESTS ON FRESH CONCRETE<br>1. Slump cone test<br>2. Flow table<br>3. Compaction factor<br>4. Vee bee test. |
| 2. | TESTS ON HARDENED CONCRETE<br>1. Compressive strength - Cube & Cylinder<br>2. Flexure test<br>3. Modulus of Elasticity |
| 3. | TESTS ON AGGREGATES<br>1. Specific Gravity<br>2. Gradation of Aggregate<br>3. Crushing Strength<br>4. Abrasion Value<br>5. Impact Value<br>6. Water Absorption<br>7. Flakiness and Elongation Indices |
| 4. | TESTS ON BITUMEN<br>1. Penetration<br>2. Softening Point<br>3. Ductility<br>4. Flash and fire points.<br>5. Viscosity |
| 5. | TESTS ON BITUMINOUS MIXES<br>1. Determination of Binder Content<br>2. Marshall Stability and Flow values<br>3. Density |

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**Total Periods: 30**

| 23CEC20 | SURVEY CAMP | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 0 | 1 |

**Course Objective:**

- The aim of the camp is to make the student familiar in mapping and contouring any type of area.

**Course Outcomes:**

23CEC20.CO1 To know the various instruments used in surveying.

23CEC20.CO2 To acquire knowledge about different types of surveying.

23CEC20.CO3 To draw the layout of site by plane table.

23CEC20.CO4 To calculate the elevation of different stuctures.

23CEC20.CO5 To calculate the area of different structures.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC20.CO1 | x | x | - | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC20.CO2 | x | x | - | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC20.CO3 | x | x | x | - | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC20.CO4 | x | x | x | - | x | x | x | x | x | x | x | x | x | x | x |
| 23CEC20.CO5 | x | x | x | - | x | x | x | - | x | x | x | x | x | x | X |

| Sl.No. | List of Experiments |
|---|---|
| 1. | Alignment of Road (LS and CS) by using total station |
| 2. | Contouring (Radial and Grid) |
| 3. | Setting out of work<br>a.Curve<br>b.Building |
| 4. | Triangulation |
| 5. | Trilateration |
| 6. | Calculating and plotting the given area using GPS |
| 7. | Calculating and plotting the given area using Total Station |

**EVALUATION PROCEDURE**

**Internal Marks:** 20 marks (decided by the staff in-charge appointed by the Institution)

**Evaluation of Survey Camp Report:** 30 marks (Evaluated by the external examiner appointed by the Institution)

**Viva voce examination:** 50 marks (evaluated by the internal examiner appointed by the HOD with the approval of HOI and external examiner appointed by the Institution – with equal Weightage)

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| 23CEC21 | COMPUTER AIDED DESIGN AND DRAFTING LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 |

**Course Objective:**

- To acquire hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

**Course Outcomes:**

23CEC21.CO1 To know the various components of the different types of Retaining wall.

23CEC21.CO2 To design about various elements of a building.

23CEC21.CO3 To know about the designs of water tanks.

23CEC21.CO4 To know about the designs of bridges.

23CEC21.CO5 Present the drawings both in conventional method and using modern software tool.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC21.CO1 | x | x | - | x | x | - | - | - | - | x | - | - | x | - | x |
| 23CEC21.CO2 | x | x | - | - | x | - | - | - | - | x | x | x | x | - | x |
| 23CEC21.CO3 | x | x | x | x | x | - | - | - | - | x | - | x | x | x | x |
| 23CEC21.CO4 | x | x | x | x | - | - | - | - | - | - | - | x | x | x | - |
| 23CEC21.CO5 | x | x | x | x | - | - | - | - | - | x | - | x | x | - | - |

| Sl.No. | List of Experiments |
|---|---|
| 1. | Design and Detailing of Cantilever retaining wall |
| 2. | Design and Detailing of Counter fort retaining wall |
| 3. | Design and Detailing of Elevated circular water tank with staging |
| 4. | Design and Detailing of deep beams |
| 5. | Design and Detailing of Floor slab system with T beam |
| 6. | Design and Detailing of Reinforced concrete T beam bridge deck |

**Total Periods: 30**

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| 23CEC22 | ENVIRONMENTAL ENGINEERING LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 |

**Course Objective:**

- To understand the sampling and preservation methods and significance of characterization of wastewater.

**Course Outcomes:**

23CEC22.CO1 To learn about the physical and chemical properties of water.

23CEC22.CO2 To learn about various tests on water.

23CEC22.CO3 To know about the calculation of COD & BOD.

23CEC22.CO4 To know about the determination of solids present in water.

23CEC22.CO5 Propose appropriate solutions to environmental problems.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEC22.CO1 | x | x | x | x | - | x | - | - | - | x | - | - | x | - | - |
| 23CEC22.CO2 | x | x | - | x | - | x | - | - | - | x | - | x | x | - | - |
| 23CEC22.CO3 | x | x | x | x | - | x | - | - | x | x | - | x | x | - | - |
| 23CEC22.CO4 | x | x | x | x | - | x | - | - | x | x | - | x | x | - | - |
| 23CEC22.CO5 | x | x | - | x | - | x | - | - | x | x | - | x | x | - | x |

| Sl.No. | List of Experiments |
|---|---|
| 1. | Determination of pH & Turbidity |
| 2. | Determination of Hardness |
| 3. | Determination of Dissolved Oxygen & BOD |
| 4. | Determination of Optimum Coagulant Dosage |
| 5. | Determination of Suspended, Volatile and Fixed Solids |
| 6. | Determination of Chlorides |
| 7. | Determination of Ammonia Nitrogen |
| 8. | Determination of Sodium and Potassium |
| 9. | Determination of Nitrate and Phosphate |
| 10. | Determination of COD |

**Total Periods: 30**

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| 23CEE01 | ADVANCED STRUCTURAL ANALYSIS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To analyze the indeterminate structure by slope deflection method.
- To analyze indeterminate structures by Moment distribution method.
- To analyze statically indeterminate structures by flexibility matrix method.
- To formulate the element stiffness matrix and assemble the structure stiffness matrix for solving indeterminate structures.
- To understand the basics of finite element method and its applications.

**Course Outcomes:**

| | |
|---|---|
| 23CEE01.CO1 | Determine shear force and bending moment of beams and frames using slopedeflection method. |
| 23CEE01.CO2 | Determine shear force and bending moment using moment distribution method for beams and frames. |
| 23CEE01.CO3 | Analyze the statically indeterminate structures using flexibility matrix method. |
| 23CEE01.CO4 | Analyze the statically indeterminate structures using stiffness matrix method. |
| 23CEE01.CO5 | Apply the finite element method to structures. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE01.CO1 | x | x | x | x | - | x | - | - | - | - | - | - | x | - | - |
| 23CEE01.CO2 | x | x | x | x | - | x | - | - | - | - | - | - | x | - | - |
| 23CEE01.CO3 | x | x | x | x | - | x | - | - | - | - | - | - | x | - | - |
| 23CEE01.CO4 | x | x | x | x | - | x | - | - | - | - | - | - | x | - | - |
| 23CEE01.CO5 | x | x | x | x | - | x | - | - | - | - | - | - | x | - | - |

**Unit-I SLOPE DEFLECTION METHOD 9**

Continuous beams and rigid frames (with and without sway) – symmetry and anti -symmetry loading Deformed shape, Bending moment and shear force diagram - (Unknowns restricted to three only).

**Unit-II MOMENT DISTRIBUTION METHOD 9**

Basic concepts – stiffness, distribution and carry over factors – Analysis of continuous Beams – plane and rigid frames with and without sway – Deflected shape, bending moment and shear force diagram.

**Unit-III FLEXIBILITY MATRIX METHOD 9**

Equilibrium and compatibility equation – Determinate Vs Indeterminate structures - Indeterminacy – Primary Structure – compatibility conditions – Analysis of indeterminate structures - continuous beams, Pin- jointed plane frames, rigid jointed plane frames (with redundancy restricted to two).

**Unit-IV STIFFNESS MATRIX METHOD 9**

Element and global stiffness matrices – Analysis of continuous beams – co-ordinate transformations – Rotation Matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis ofpin –Jointed plane frames and rigid frames (with redundancy restricted up to three).

**Unit-V FINITE ELEMENT METHOD 9**

Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element –Plane stress and plane strain Triangular elements (Concept Only).

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Bhavikatti.S.S | Structural Analysis, Vol.1and Vol. 2 | Vikas Publishing HousePvt. Ltd | 2011 |
| 2 | Vaidyanadhan.R and Perumal.P | Comprehensive structural Analysis – Vol.1 & Vol.2 | Laxmi Publications,New Delhi | 2016 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | T.S.Thandavamoorthy | Structural Analysis | Oxford university press, New Delhi | 2011 |
| 2 | Pandit & S.P.Gupta | Structural Analysis – A matrix Approach | Tata MCGraw Hill | 2011 |
| 3 | L.S. Negi& R.S. Jangid | Structural Analysis | Tata McGraw Hill Publications, NewDelhi, 6th Edition | 2014 |
| 4 | Manickaselvam M.K. | Elements of Matrix And Stability Analysis of Structures | Khanna Publishers | 2013 |
| 5 | B. C. Punmia, Ashok Kumar Jain and ArunKumar Jain | Theory of Structures | Laxmi Publications (P) Ltd., New Delhi | 2011 |

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| 23CEE02 | DESIGN OF REINFORCED CONCRETE STRUCTURES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To provide knowledge about cantilever and counterfort retaining walls.
- To provide knowledge on design of various components in the water tank by working stressmethod.
- To explain the basic concepts about the yield line theory for the analysis and design of slab ofvarious cross sections.
- To provide knowledge on IRC loading ,Principle & design of bridges
- To provide knowledge on design of various reinforced concrete structures such as flat slabs,continuous and deep beams.

**Course Outcomes:**

23CEE02.CO1 To design cantilever and counterfort retaining walls

23CEE02.CO2 To design underground and overhead water tanks

23CEE02.CO3 To design Slab using yield line theory

23CEE02.CO4 To design RCC and Prestressed bridges.

23CEE02.CO5 To design and detailing of flat slab, grid floor, continuous and deep beams.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE02.CO1 | x | x | x | x | - | x | - | - | - | - | - | - | x | - | - |
| 23CEE02.CO2 | x | x | x | x | - | x | - | - | - | - | - | - | x | - | - |
| 23CEE02.CO3 | x | x | x | x | - | x | - | - | - | - | - | - | x | - | - |
| 23CEE02.CO4 | x | x | x | x | - | x | - | - | - | - | - | - | x | - | - |
| 23CEE02.CO5 | x | x | x | x | - | x | - | - | - | - | - | - | x | - | - |

**Unit-I RETAINING WALLS** **9**

Design of cantilever and counter fort retaining walls

**Unit-II WATER TANKS** **9**

Underground rectangular and Circular tanks – Domes – Overhead circular and rectangular tanks – Design of staging and foundations

**Unit-III YIELD LINE THEORY** **9**

Assumptions – Characteristics of yield line – Determination of collapse load/ plastic moment – Application of virtual work method to square, rectangular, circular and triangular slabs

**Unit-IV BRIDGES** **9**

Introduction-Types of bridges – IRC loading – Design of single and double lane slab culvert for class A loading – Principles of design of box culvert, balanced cantilever bridges and Prestressed concrete bridges

**Unit-V SELECTED TOPICS** **9**

Design of flat slabs – Grid floors using Rankine Method – Grashoff method -Design of continuous beams - Deep beams-Design of continuous deep beam.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | N. Krishna Raju | Advanced Reinforced ConcreteDesign | CBS Publishers andDistributors | 2010 |
| 2 | M.L.Gambhir | Design of Reinforced ConcreteStructures | PHI learning Pvt. Ltd., NewDelhi | 2008 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | KrishnaRaju.N | Design of Bridges | Oxford and IBH | 2010 |
| 2 | Subramanian.N | Design of Reinforced ConcreteStructures | Oxford University Press, New Delhi | 2013 |
| 3 | P. C.Varghese | Advanced Reinforced ConcreteDesign | Prentice Hall of India Ltd.,New Delhi | 2010 |
| 4 | UnnikrishnaPillai. SDevdasMenon | Reinforced Concrete Design | Tata McGraw-Hill Publishing Company Ltd., New Delhi | 2015 |
| 5 | Sinha. S.N | Reinforced Concrete Design | Tata McGraw-Hill Publishing Company Ltd., New Delhi | 2014 |

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| 23CEE03 | CONSTRUCTION TECHNOLOGY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To know about the various types of foundation in building construction.
- To guide & know about the masonry & Wall in Buildings.
- To identify the types of roofs, floors and scaffolding for the construction activity.
- To know about the various Construction practices.
- To select the construction equipments as per requirements of construction.

**Course Outcomes:**

23CEE03.CO1 Explain the laws and theorems of electrical networks.

23CEE03.CO2 Outline the parameters of AC circuits.

23CEE03.CO3 Explain the constructional features of electric machines.

23CEE03.CO4 Illustrate the characteristics of semiconductor diodes.

23CEE03.CO5 Explain the Characteristics of transistors and opto-electronic devices.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE03.CO1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEE03.CO2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEE03.CO3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEE03.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEE03.CO5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

**Unit-I FOUNDATIONS 9**

Concept of foundations - Factors affecting selection of foundations - Types of foundation - Shallow & Deep foundations - Piles and their classification - Foundation on black cotton soils

**Unit-II MASONRY & WALLS 9**

Brick Masonry -Terminologies - Types of bonds in brick work and their suitability - Stone Masonry - Terminologies - Types of bonds in Stone masonry and their suitability - Classification of walls - Load bearing & Non-Load bearing - Hollow - Reinforced Brick Walls - Construction with fly ash bricks & Light weight bricks - Lintels and sunshade - Types & Construction

**Unit-III FLOORS, ROOFS & SCAFFOLDING 9**

Floors - Types of flooring - Repair of floors - Classification of roofs - Types of Pitched & Flat roofs -Roof covering materials - Drainage on pitched &flat roofs - Types of scaffolding - types of shoring - Methods of underpinning - Types of formwork - centering.

**Unit-IV CONSTRUCTION PRACTICES 9**

Specifications - details and sequence of activities and construction co-ordination-site clearance marking-earthwork - construction joints - movement and expansion joints - pre cast pavements - Causes of dampness; Methods of preventing dampness - Damp proofing materials and their classification - weather and water proof courses-roof finishes - acoustic and fire protection.

**Unit-V CONSTRUCTION EQUIPMENT** **9**

Data acquisition and processing - signal processing and control for smart structures - sensors as geometrical processors - signal processing - control system - linear and non - linear.

**Total Periods: 45**

| **Text Books:** | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Brain Culshaw | Smart Structure and Materials | Artech House - Borton.London | 2013 |
| 2 | A. V. Srinivasan & D.Michael McFarland | Smart Structures: Analysis andDesign | Cambridge UniversityPress; 1st Edition | 2009 |

| **Reference Books:** | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | L. S. Srinath | Experimental Stress Analysis | Tata McGraw-Hill | 2016 |
| 2 | J. W. Dally & W. F.Riley | Experimental Stress Analysis | Tata McGraw-Hill | 2014 |
| 3 | M.V. Gandhi and B.S.Thompson | Smart Materials and Structures | Chapman & Hall, London;New York | 2008 |
| 4 | Peter R. Savage | Smart Materials- Wiley | Chapman & Hall, London;New York | 2014 |
| 5 | A.V. Srinivasan | Smart Structures: Analysis andDesign | Cambridge University Press, Cambridge; New York | 2009 |

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| 23CEE04 | INDUSTRIAL STRUCTURES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To impart knowledge on planning, layout and components of Industrial Structures
- To get knowledge on functional requirements of Industrial Structures
- To impart knowledge on design and detailing of industrial RC structures
- To know the concept of power transmission structures
- To design other industrial structures and prefabricated techniques

**Course Outcomes:**

23CEE04.CO1 Explain the laws and theorems of electrical networks.

23CEE04.CO2 Outline the parameters of AC circuits.

23CEE04.CO3 Explain the constructional features of electric machines.

23CEE04.CO4 Illustrate the characteristics of semiconductor diodes.

23CEE04.CO5 Explain the Characteristics of transistors and opto-electronic devices.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE04.CO1 | x | x | x | x | - | x | - | - | - | x | - | - | x | - | x |
| 23CEE04.CO2 | x | x | - | x | - | x | - | - | - | x | - | - | x | - | x |
| 23CEE04.CO3 | x | x | x | x | - | x | - | - | x | x | - | - | x | - | x |
| 23CEE04.CO4 | x | x | x | x | - | x | - | - | x | x | - | - | x | - | x |
| 23CEE04.CO5 | x | x | - | x | - | x | - | - | x | x | - | - | x | - | x |

**Unit-I GENERAL 9**

Classification of Industries and Industrial Structures – General requirements of various industries –planning and layout of building and components

**Unit-II FUNCTIONAL REQUIREMENTS 9**

Natural and artificial lighting - Protection from the sun light - Services - Electrical wiring fixtures - Cable andpipe bridge - Electrical installations - substations - Effluent disposal - Fire expanse and chutes - Fire alarm, extinguishers and hydrants - Heating and Ventilation - Air conditioning - Guidelines from factories act.

**Unit-III INDUSTRIAL RC STRUCTURES 9**

Design and detailing of R.C. gable frames, corbels, nibs, bunkers, silos, folded plate and chimneys - Cooling towers

**Unit-IV POWER TRANSMISSION STRUCTURES 9**

Cables - Transmission line towers - Tower Foundation - Testing of towers - Substation Structures

**Unit-V OTHER STRUCTURES 9**

Design of Nuclear containment structures - Gantry girders - Machine Foundations - Design procedure - Application of prefabrication techniques

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | N. Krishna Raju | Advanced Reinforced ConcreteDesign | CBS Publishers andDistributors | 2016 |
| 2 | A. R. Santhakumar and S. S. Murthy | Transmission Line Structures | Tata McGraw Hill | 2012 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | P. Dayaratnam | Deign of steel structures | A.H. Wheeler & Co., Ltd., Allahabad, | 2007 |
| 2 | S. N. Manokar | Tall Chimneys – Design and Construction | Tata McGraw Hill | 2012 |
| 3 | - | IS 4998-1 | BIS | 1992(R2013) |
| 4 | - | IS: 4995(Part 1 & part 2) | BIS | 1974(R2013) |
| 5 | - | IS: 3483 | BIS | 1965(R2013) |

| 23CEE05 | HEALTH MONITORING OF STRUCTURES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To Study about maintenance and repair of structure
- To impart the quality and durability of concrete
- To Study about special materials for repair of structures.
- To learn about repair and demolition technique.
- To gain the knowledge about rehabilitation and strengthening of structures.

**Course Outcomes:**

23CEE05.CO1 Obtain the knowledge of maintenance and repair of structures.

23CEE05.CO2 Obtain the knowledge serviceability and durability of concrete.

23CEE05.CO3 Select suitable material for repair.

23CEE05.CO4 Select appropriate techniques for repair and demolition.

23CEE05.CO5 Know about repair, rehabilitation and strengthening of structures.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE05.CO1 | - | - | x | - | x | x | x | x | x | - | - | x | x | x | x |
| 23CEE05.CO2 | x | x | x | x | x | x | x | x | x | - | - | x | x | x | x |
| 23CEE05.CO3 | x | x | x | x | x | x | x | x | x | - | - | x | x | x | x |
| 23CEE05.CO4 | x | x | x | x | x | x | x | x | x | - | - | x | x | x | x |
| 23CEE05.CO5 | x | x | x | x | x | x | x | x | x | - | - | x | x | x | x |

**Unit-I MAINTENANCE AND REPAIR STRATEGIES 9**

Maintenance, repair and rehabilitation - Facts of Maintenance - importance of Maintenance various aspects of Inspection - Assessment procedure for evaluating a damaged structure - causes of deterioration - Diagnosis of causes and preventive measures.

**Unit-II SERVICEABILITY AND DURABILITY OF CONCRETE 9**

Quality assurance for concrete construction concrete properties - strength, permeability, thermal properties and cracking - Effects due to climate, temperature, chemicals, corrosion - design and construction errors - Effects of cover thickness and cracking.

**Unit-III SPECIAL MATERIALS FOR REPAIR 9**

Special concretes and mortar - concrete chemicals - special elements for accelerated strength gain - Expansive cement - polymer concrete - sulphur infiltrated concrete - ferro cement - Fibre reinforced concrete.

**Unit-IV TECHNIQUES FOR REPAIR AND DEMOLITION 9**

Rust eliminators and polymers coating for rebars during repair - foamed concrete - mortar and dry pack - vacuum concrete - Gunite and Shotcrete - Epoxy injection - Mortar repair for cracks - shoring and underpinning - Methods of corrosion protection - corrosion inhibitors - coating and cathodic protection - Engineered demolition techniques for Dilapildated structures - case studies.

**Unit-V REPAIRS, REHABILITATION & STRENGTHENING OF STRUCTURES 9**

Repairs to overcome low member strength - Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure - Strengthening of Super Structures - plating - Conversion to composite construction - post stressing - Jacketing - Reinforcement addition, strengthening the substructures - Increasing the load capacity of footing.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Denison Campbell,Allen and Harold Roper | Concrete Structures, Materials,Maintenance and Repair | Longman Scientific and Technical UK | 2006 |
| 2 | R.T.Allen andS.C.Edwards | Repair of Concrete structures | Blakie and Sons, UK | 2007 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Dr.B Vidivelli | Rehabilitation of Concrete Structures | Standard Publishers Distributors | 2013 |
| 2 | M.S.Shetty | Concrete Technology - Theory andPractice | S.Chand and Company,New Delhi | 2006 |
| 3 | M.L. Gambhir | Concrete Technology | Tata McGraw Hill Company, Noida | 2011 |
| 4 | Santhakumar, A.R | Training Course notes on Damage Assessment and repairsin Low Cost Housing,"RHDC–NBO" | Anna University | 1995 |
| 5 | Lakshmipathy, M | Lecture notes of Workshop on"Repairs and Rehabilitation of Structures" | - | 1999 |

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| 23CEE06 | BUILDING SERVICES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To learn about different types of machineries.
- To know about electrical systems used in Buildings
- To understand principles and design of lighting system.
- To know about principles and applications of refrigeration.
- To learn about fire safety illuminations in buildings.

**Course Outcomes:**

23CEE06.CO1 To know about different types of machineries.

23CEE06.CO2 To implement wiring systems and prepare the plan for electrical wiring for buildings.

23CEE06.CO3 To design the lighting facilities for building.

23CEE06.CO4 To choose suitable air conditioning system for the building.

23CEE06.CO5 To choose fire safety systems for various types of buildings

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE06.CO1 | x | x | x | x | - | x | - | - | - | x | - | - | x | - | x |
| 23CEE06.CO2 | x | x | - | x | - | x | - | - | - | x | - | - | x | - | x |
| 23CEE06.CO3 | x | x | x | x | - | x | - | - | x | x | - | - | x | - | x |
| 23CEE06.CO4 | x | x | x | x | - | x | - | - | x | x | - | - | x | - | x |
| 23CEE06.CO5 | x | x | - | x | - | x | - | - | x | x | - | - | x | - | x |

**Unit-I MACHINERIES 9**

Hot Water Boilers -Lifts and Escalators -Special features required for physically handicapped and elderly - Conveyors - Vibrators - Concrete mixers -DC/AC motors - Generators - Laboratory services - Gas, water, air and electricity

**Unit-II ELECTRICAL SYSTEMS IN BUILDINGS 9**

Basics of electricity - Single / Three phase supply – Protective devices in electrical installations - Earthing for safety - Types of Earthing - ISI specifications - Types of wires, wiring systems and their choice - Planning electrical wiring for building - Main and distribution boards - Transformers and switch gears - Layout of substations

**Unit-III PRINCIPLES OF ILLUMINATION & DESIGN 9**

Design of modern lighting - Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

**Unit-IV REFRIGERATION PRINCIPLES & APPLICATIONS 9**

Refrigerants-Refrigerant control devices - Electric motors -Starters - Air handling units - Cooling towers - Window type and packaged air- conditioners - Chilled water plant - Fan coil systems -Water piping - Cooling load -Air conditioning systems for different types of buildings - Protection against fire to be caused by A.C. Systems

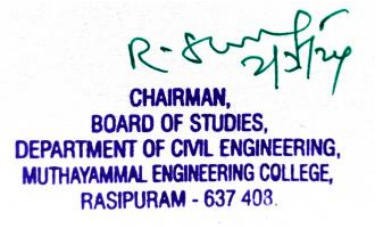
**Unit-V FIRE SAFETY INSTALLATION 9**

Causes of fire in buildings - Safety regulations - NBC - Planning considerations in buildings like non - combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | A.F.C. Sherratt | Air-conditioning and EnergyConservation | The Architectural Press,London | 2006 |
| 2 | Derek Phillips | Lighting in Architectural Design | McGraw-Hill, New York | 2012 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | E.R.Ambrose | Heat Pumps and Electric Heating | John and Wiley and Sons,Inc., New York | 2013 |
| 2 | William H.Severns and Julian R.Fellows | Air-conditioning and Refrigeration | John Wiley and Sons,London | 2006 |
| 3 | Arora and Bindra | Building Construction | Dhanpatrai &Sons | 2012 |
| 4 | E.R.Ambrose | Heat Pumps and Electric Heating | John and Wiley andSons, Inc., New York | 2013 |
| 5 | - | National Building Codes | Bureau of Indian Standards | 2015 |



| 23CEE07 | SMART MATERIALS AND SMART STRUCTURES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To introduce the smart material, function and response of the smart structures.
- To understand the various measuring techniques in smart structures.
- To learn about the sensors and their types.
- To understand the various actuator materials and actuating techniques.
- To understand the data acquisition and data processing using sensors.

**Course Outcomes:**

| | |
|---|---|
| 23CEE07.CO1 | Know about smart structures. |
| 23CEE07.CO2 | Apply the measuring techniques to measure the various responses of the smart structures. |
| 23CEE07.CO3 | Identify the types of sensors for the measurement techniques. |
| 23CEE07.CO4 | Select the actuator material and technique for structural assessment. |
| 23CEE07.CO5 | Apply the data acquisition and data processing techniques for a sensor |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE07.CO1 | x | x | x | x | - | x | - | - | - | x | - | - | x | - | x |
| 23CEE07.CO2 | x | x | - | x | - | x | - | - | - | x | - | - | x | - | x |
| 23CEE07.CO3 | x | x | x | x | - | x | - | - | x | x | - | - | x | - | x |
| 23CEE07.CO4 | x | x | x | x | - | x | - | - | x | x | - | - | x | - | x |
| 23CEE07.CO5 | x | x | - | x | - | x | - | - | x | x | - | - | x | - | x |

**Unit-I INTRODUCTION TO SMART STRUCTURES 9**

Introduction - smart materials and structures - functions and response - sensing systems - self-diagnosis -signal processing consideration - actuation systems and effectors.

**Unit-II MEASURING TECHNIQUES 9**

Strain measuring techniques using electrical strain gauges – types - resistance, capacitance and inductance - Wheatstone bridge - types - pressure transducers - load cells - temperature compensation- strain rosettes - applications.

**Unit-III SENSORS 9**

Sensing technology -sensors - types - physical measurement using Piezo Electric strain measurement inductively read transducers - LVDT - fiber optic techniques - chemical and bio-chemical sensing in structural assessment - absorptive chemical sensors – spectroscopes - fiber optic chemical sensing systems and distributed measurement.

**Unit-IV ACTUATORS 9**

Actuator techniques - actuator - materials - Piezoelectric and Electrostrictive material - magneto-structure material - shape memory alloys - electro rheological fluids - electromagnetic actuation - role of actuators and actuator materials in structural assessment.

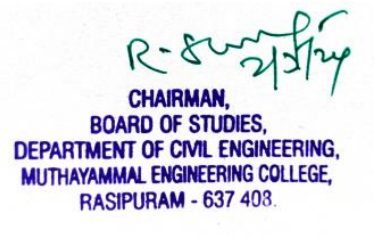
**Unit-V SIGNAL PROCESSING AND CONTROL SYSTEMS 9**

Data acquisition and processing - signal processing and control for smart structures - sensors as geometrical processors - signal processing - control system - linear and non - linear.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Brain Culshaw | Smart Structure and Materials | Artech House - Borton. London | 2013 |
| 2 | A. V. Srinivasan & D.Michael McFarland | Smart Structures: Analysis andDesign | Cambridge UniversityPress; 1st Edition | 2009 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | L. S. Srinath | Experimental Stress Analysis | Tata McGraw-Hill | 2016 |
| 2 | J. W. Dally & W. F.Riley | Experimental Stress Analysis | Tata McGraw-Hill | 2014 |
| 3 | M.V. Gandhi and B.S.Thompson | Smart Materials and Structures | Chapman & Hall, London;New York | 2008 |
| 4 | Peter R. Savage | Smart Materials- Wiley | Chapman & Hall, London;New York | 2014 |
| 5 | A.V. Srinivasan | Smart Structures: Analysis andDesign | Cambridge University Press, Cambridge; New York | 2009 |



| 23CEE08 | MASONRY STRUCTURES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To develop an understanding for implementation of Masonry structures.
- To present fundamental principles and methodologies of design of Masonry structures.
- To categorize, classify and understand the masonry building component.
- To have the ability to analyse and design of masonry structure.
- Design of masonry structures

**Course Outcomes:**

| | |
|---|---|
| 23CEE08.CO1 | To understand the behavior of masonry structure |
| 23CEE08.CO2 | To make use of fundamental of design methodologies for design of masonry structure. |
| 23CEE08.CO3 | To identify different component of masonry structure. |
| 23CEE08.CO4 | Become familiar with basic masonry materials, including clay brick, concrete block, mortar, grout, and reinforcing accessories |
| 23CEE08.CO5 | Understand the behavior of reinforced masonry structures under flexure, shear, axial forces, combined flexure and axial forces, and in-plane shear forces. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE08.CO1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEE08.CO2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEE08.CO3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEE08.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEE08.CO5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

**Unit-I INTRODUCTION, MASONRY UNITS, TYPES OF MASONRY STRUCTURE 9**

History of masonry -clay block - concrete block - stabilized mud block masonry units -- Application for lifting stones - Joints in stone masonry - Safe permissible load on Stone masonry - Brick masonry –Method of brick laying- Defects in brick masonry - permissible compressive stress of brick masonry - typical structures in brick work - Composite masonry – Stone composite masonry, concrete masonry, Hollow clay blocks masonry, reinforcement in brick masonry.

**Unit-II TYPES OF WALL, ARCHES AND LINTELS 9**

Basic structural analysis and design of wall- Cavity wall – Advantages of cavity wall - position of cavity wall - construction of cavity wall - Partition wall – Types of partition wall, Requirement of partition wall - Lintels and Arches – Classification of lintels, loading on lintels, different terms of arch, Stability of arch, classification and construction of arches.

**Unit-III STRENGTH OF MASONRY 9**

Strength and elastic properties of masonry - behavior of masonry under compressive force - effect of height on compressive strength of masonry - failures of masonry structure under compression - effect of bonding pattern - slenderness, material - workmanship and curing on compressive strength - Tests for determining flexural and shear bond strength - factors affecting bond strength, flexure, shear strength of masonry unit.

**Unit-IV EARTHQUAKE RESISTANT MASONRY BUILDINGS 9**

Behavior of masonry during earthquakes, concepts and design procedure for earthquake resistant masonry, BIS codal provisions, Earthquake resisting feature.

**Unit-V DESIGN OF UNREINFORCED BRICK MASONRY 9**

Introduction - Classification of walls - Lateral supports and stability - Effective height of wall and column – Effective length of walls - Design loads, load dispersion - Permissible stresses - Design of axially and eccentrically loaded brick wall.

**Total Periods: 45**

| **Text Books:** | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | UnnikrishnaPillai, S., Devdas Menon | Reinforced Concrete Design | Tata McGraw-Hill Publishing Company Ltd., New Delhi | 2017 |
| 2 | Dayaratnam, P, Sarah, P | Brick and Reinforced Brick Structures | Medtech | 2018 |

| **Reference Books:** | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Dayaratnam P | Brick and Reinforced Brick Structures | Oxford & IBH | 2017 |
| 2 | Sinha B.P & Davis S.R., | Design of Masonry structures | E & FN Spon. | 2015 |
| 3 | Hendry A.W. | Structural masonry | Macmillan Educaon Ltd | 2021 |
| 4 | Curtin | Design of Reinforced and Prestressed Masonry | Thomas Telford | 1997 |

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| 23CEE09 | SEISMIC DESIGN OF STRUCTURES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To impart knowledge on the theory of vibration and basics of structural dynamics.
- To impart knowledge on structural dynamics and its response.
- To know about basics of seismic elements.
- To impart the design philosophy of earthquake resistant design of structures
- To create awareness on the use of codal provisions for seismic design of structures.

**Course Outcomes:**

| | |
|---|---|
| 23CEE09.CO1 | Analyze the amount vibration a structure can withstand it. |
| 23CEE09.CO2 | Analyze a structure by seismic coefficient method. |
| 23CEE09.CO3 | Knowledge about earthquake causes and intensity of magnitude. |
| 23CEE09.CO4 | Knowledge about earthquake resistant structures. |
| 23CEE09.CO5 | Design the building concept, ductility and design of masonry structures as per IS Codal provisions. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE09.CO1 | x | x | - | - | - | x | - | - | - | - | - | - | x | - | - |
| 23CEE09.CO2 | x | x | x | - | - | x | - | - | - | - | - | - | x | - | - |
| 23CEE09.CO3 | x | - | x | - | - | x | - | - | - | - | - | - | x | - | - |
| 23CEE09.CO4 | x | x | x | - | - | x | - | - | - | - | - | - | x | - | - |
| 23CEE09.CO5 | x | - | x | - | - | x | - | - | - | - | - | - | x | - | - |

**Unit-I ELEMENTS OF VIBRATIONS 9**

Introduction – Basic concept of Vibration – Static and Dynamic loading – Basic definitions – Types of Vibration – Response of the system – consequences of vibration-vibration control measures.

**Unit-II STRUCTURAL DYNAMICS AND RESPONSE 9**

Undamped free vibration – Derivation of equation of motion – Equivalent stiffness of spring combinations – Natural frequency and Time Period – Introduction to two degree of freedom system and Multi degree of Freedom system

**Unit-III ELEMENTS OF SEISMOLOGY 9**

Causes of earthquake – Geological faults – Tectonic Plate Theory – Elastic Rebound Theory – Epicenter – Hypocenter – Seismic waves – Seismogram – Magnitude and Intensity of Earthquake – Magnitude and Intensity scales – Information on Some Disaster Earthquakes – Concept of Seismic Microzonation

**Unit-IV RESPONSE OF STRUCTURES TO EARTHQUAKE 9**

Response and Design Spectra – Design Earthquake – Concept of Peak Acceleration – Site Specific Response Spectrum – Effect of Soil properties and Damping – Types of Base Isolation and its Effects.

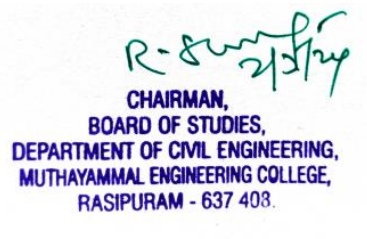
**Unit-V DESIGN MORPHOLOGY 9**

Design concept of Buildings – IS: 1893-2002 – Importance of Ductility – Methods of Introducing Ductility in RC Structures as per IS: 13920- 1993 – Behavior and Design of Masonry Structures as per IS: 13827- 1993

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Pankaj Agarwal andManish Shrikhande | Earthquake Resistant Design ofStructures | PHI Pvt Ltd, NewDelhi | 2010 |
| 2 | Damodarasamy S.R. | Basics of Structural Dynamics andAseismic Design | Laxmi publications,New Delhi | 2010 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Paz Mario | Structural Dynamics - Theory andComputation | CBS publishers | 2010 |
| 2 | en L.Kramer | Geotechnical Earthquake Engineering | Pearson Education, Inc, New Delhi | 2016 |
| 3 | Jai Krishna, Chandrasekaran.A.R and Brijesh Chandra | Elements of Earthquake Engineering | South Asia Publishers | 2013 |
| 4 | Humar.J.L | Dynamics of Structures | Prentice Hall Inc. | 2015 |
| 5 | Brijesh Chandra | Elements of Dynamic Structure | CBS publishers | 2011 |



| 23CEE10 | PREFABRICATED STRUCTURES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To introduce the fundamentals related to the prefabricated structures.
- To provide knowledge on prefabricated reinforced concrete constructions.
- To provide knowledge on disunity of structures.
- To provide knowledge on types of wall joints and their behavior.
- To provide knowledge on abnormal loads.

**Course Outcomes:**

23CEE10.CO1 Understand the concepts behind the fundamentals related to the prefabricatedstructures.

23CEE10.CO2 Familiarize the behavior of prefabricated structural components.

23CEE10.CO3 Apply the knowledge on disunity of structures and joint flexibility.

23CEE10.CO4 Understand the joints of structural elements and their behavior.

23CEE10.CO5 Design the prefabricated structures for abnormal loads using various codalprovisions.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE10.CO1 | x | x | x | x | x | x | - | x | x | x | x | x | x | x | x |
| 23CEE10.CO2 | x | x | x | x | x | x | - | x | x | x | x | x | x | x | x |
| 23CEE10.CO3 | x | x | x | x | x | x | - | x | x | x | x | x | x | x | x |
| 23CEE10.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEE10.CO5 | x | x | x | x | x | x | - | x | x | x | x | x | x | x | x |

**Unit-I INTRODUCTION 9**

Need for prefabrication – Principles – Materials – Modular coordination – Standardization – Systems Production – Transportation – Erection.

**Unit-II PREFABRICATED COMPONENTS 9**

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls.

**Unit-III DESIGN PRINCIPLES 9**

Disuniting of structures- Design of cross section based on efficiency of material used – Problems In design because of joint flexibility – Allowance for joint deformation.

**Unit-IV JOINT IN STRUCTURAL MEMBERS 9**

Joints for different structural connections – Dimensions and detailing – Design of expansion joints

**Unit-V DESIGN FOR ABNORMAL LOADS 9**

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc - Importance of avoidance of progressive collapse.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Laszlo Mokk | Prefabricated Concrete for Industrial and Public Structures. | Akademiai Kiado, Budapest | 2011 |
| 2 | Koncz.T | Manual of Precast Concrete Construction, Vol.I II and III & IV. | Bauverlag, GMBH | 2011 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Warszawski A | Industrialization and Robotics in Building andA managerial approach. | Harper and Row | 2010 |
| 2 | Gerostiza C.Z Hendrikson C and Rehat D.R | Knowledge based process planning for construction and manufacturing. | Academic Press Inc., | 2011 |
| 3 | - | CBRI | Building materials and components, India. | 2010 |
| 4 | Lewicki.B | Building with Large Prefabricates. | Elsevier Publishing Company, Amsterdam/ London/New York | 2010 |
| 5 | - | Structural Design Manual, Precast Concrete Connection Details, Societyfor the Studies in the use ofPrecast Concrete. | Netherland Betor Verlag | 2011 |

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| 23CEE11 | PRESTRESSED CONCRETE STRUCTURES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To understand the basic concepts, principles and methods of prestressing.
- To compute flexural strength and ultimate shear resistance capacity as per IS code.
- To determine the deflection of prestressed members and design the anchorage zone stresses.
- To understand the concepts of composite and continuous beams.
- To know about tension and compression members and methods of partial prestressing.

**Course Outcomes:**

23CEE11.CO1 Know the basic concepts of prestressing.

23CEE11.CO2 Obtain the design for flexure and shear as per IS codal provision.

23CEE11.CO3 Understand the deflection and design anchorage zone.

23CEE11.CO4 Design the composite and continuous beams.

23CEE11CO5 Design tension and compression members.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE11.CO1 | x | x | x | x | x | x | x | x | - | x | x | x | x | x | x |
| 23CEE11.CO2 | x | x | x | x | x | x | x | x | - | x | x | x | x | x | x |
| 23CEE11.CO3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEE11.CO4 | x | x | x | x | x | x | x | x | - | x | x | x | x | x | x |
| 23CEE11CO5 | x | x | x | x | x | x | x | x | - | x | x | x | x | x | x |

**Unit-I INTRODUCTION – THEORY AND BEHAVIOUR 9**

Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons –- Losses of prestress

**Unit-II DESIGN FOR FLEXURE AND SHEAR 9**

Design and Drawing of screen chamber - Grit channel - Primary clarifier - Activated sludge process – Aeration tank & oxidation ditch – Trickling filters – Secondary clarifiers – Sludge digester – Sludge drying beds – Waste stabilization ponds - Septic tanks and disposal arrangements – Manholes.

**Unit-III DEFLECTION AND DESIGN OF ANCHORAGE ZONE 9**

Deflection – Factors influencing deflections - Effect of tendon profile on deflection - Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection. Determination of anchorage zone stresses in post-tensioned beams by Magnel's method, Guyon's method and IS1343 code – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.

**Unit-IV COMPOSITE BEAMS AND CONTINUOUS BEAMS 9**

Analysis and design of composite beams – Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

**Unit-V MISCELLANEOUS STRUCTURES 9**

Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.

**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Krishnaraju.N | Prestressed concrete | Tata McGraw Hill Publishing company Ltd., New Delhi | 2015 |
| 2 | Pandit.G.S. andGupta.S.P | Prestressed Concrete | CBS Publishers and Distributers Pvt. Ltd | 2012 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Lin .T.Y., and Ned H. Burns | Design of prestressed concrete structures | John Wiley & Sons, International Edition, New York | 2015 |
| 2 | Aratnam.P | Prestressed Concrete Structures | Oxford and IBH Publishing Company pvt, Ltd, New Delhi | 2017 |
| 3 | N.Rajagopalan | Prestressed Concrete | Narosana Publications | 2013 |
| 4 | Guyon, Y | Limit State Design of PrestressedConcrete Vols. I & II | Applied Science Publishers, London | 2010 |
| 5 | Sinha. N.C and Roy.S.K | Fundamentals of prestressed concrete | S.Chand and Co Ltd | 2011 |

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| 23CEE12 | FOUNDATION ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To get the basic knowledge of the geotechnical site investigation.
- To understand the types of shallow foundation and design principles.
- To discuss the different types of footing and raft design
- To study the types of pile foundation and its load bearing capacity
- To study the knowledge on retaining wall design and load analysis.

**Course Outcomes:**

23CEE12.CO1 Conduct subsurface investigation and select type of foundation based on soil condition.

23CEE12.CO2 Know about shallow foundation.

23CEE12.CO3 Know about footing tyoes and rafts

23CEE12.CO4 Calculate the load carrying capacity of piles.

23CEE12.CO5 Check the stability of retaining wall

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE12.CO1 | x | x | x | x | x | x | - | x | x | x | x | x | x | x | x |
| 23CEE12.CO2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEE12.CO3 | x | x | x | x | x | x | - | x | x | x | x | x | x | x | x |
| 23CEE12.CO4 | x | x | x | x | x | x | - | x | x | x | x | x | x | x | x |
| 23CEE12.CO5 | x | x | x | x | x | x | - | x | x | x | x | x | x | x | x |

**Unit-I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9**

Methods of exploration – boring technology – Depth of boring – Spacing of bore hole – Sampling – methods -thick, Thin wall samplers, Stationery piston sampler – Penetration tests - Bore log report – Data interpretation.

**Unit-II SHALLOW FOUNDATION 9**

Introduction – Location and depth of foundation – Codal provisions – bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – factors affecting bearing capacity – problems – Bearing capacity from in-situ tests (SPT, SCPT and plate load)Allowable bearing pressure – Seismic considerations in bearing capacity evaluation. Determination of Settlement of foundations on granular and clay deposits – Total and differential settlement – Allowable settlements – Codal provision – Methods of minimizing total and differential settlements.

**Unit-III PILE FOUNDATION 9**

Types of piles and their function – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – static formula – dynamic formulae (Engineering news and Hileys) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – Group capacity and efficiency (Feld's rule, Converse – Labarra rule and block failure) – Settlement of pile groups – Interpretation of pile load test (routine test only) – Under reamed piles – Capacity under compression and uplift.

**Unit-IV RETAINING WALLS 9**

Plastic equilibrium in soils – active and passive states – Rankine's theory – cohesionless and cohesive soil – Coulomb's wedge theory – Earth pressure on retaining walls of simple configurations – Culmann Graphical method – Stability analysis of retaining walls.

**Unit-V SPECIAL FOUNDATION** **9**

Introduction - Foundations of transmission line towers - Well foundation - Mat foundation – Types- Floating foundation - Types of footings – Contact pressure distribution: Isolated footing – Combined footings – Types and proportioning.

**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Arora. K.R | Soil Mechanics and Foundation Engineering | Standard Publishers and Distributors | 2015 |
| 2 | Venkataramaiah C | Geotechnical Engineering | New Age International Publishers, New Delhi | 2016 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Punmia B.C | Soil Mechanics and Foundations | Laxmi Publications Pvt. Ltd,New Delhi | 2016 |
| 2 | Varghese P.C | Foundation Engineering | Prentice Hall of India Pvt.Ltd., New Delhi | 2010 |
| 3 | Purushothama Raj. P | Soil Mechanics and FoundationEngineering | Pearson Education | 2013 |
| 4 | Gopal Ranjan and RaoA.S.R | Basic and Applied Soil Mechanics | New Age International Publishers, New Delhi | 2017 |
| 5 | Murthy, V.N.S | Text Book of Soil Mechanics andFoundation Engineering | CBS Publishers | 2016 |

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| 23CEE13 | GROUND IMPROVEMENT TECHNIQUES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To get exposed to various methods of dewatering techniques.
- To be familiar with compaction methods and influencing factors.
- To Understand about consolidation and vertical drains.
- To distribute Knowledge about various soil stabilization techniques and its applications.
- To learn about various strengthening materials and techniques of soil.

**Course Outcomes:**

| | |
|---|---|
| 23CEE13.CO1 | Choose the suitable method of dewatering. |
| 23CEE13.CO2 | Identify the soil and select suitable compaction method |
| 23CEE13CO3 | Monitor consolidation of soil |
| 23CEE13.CO4 | Apply suitable techniques for improving the soil properties in the field |
| 23CEE13.CO5 | Use various types of to strengthening techniques. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE13.CO1 | x | x | x | x | x | x | - | - | x | - | x | x | x | x | x |
| 23CEE13.CO2 | x | x | x | x | x | x | - | - | x | x | x | x | x | x | x |
| 23CEE13.CO2 | x | x | x | x | x | x | - | x | - | x | x | x | x | x | x |
| 23CEE13.CO4 | x | x | x | x | x | x | - | - | - | x | x | x | x | x | x |
| 23CEE13.CO5 | x | x | x | x | x | x | - | - | - | - | x | x | x | x | x |

**Unit-I DEWATERING** **9**

Introduction - Ground improvement - scope - necessity - New Technologies - Basic concepts – drainage methods - ground water lowering by well points - Deep well - Vacuum and electro - osmosis methods.

**Unit-II COMPACTION** **9**

Introduction - compaction mechanics - field procedure - Surface compaction -selection - compaction quality control -Vibration methods - vibro-compaction, blasting, vibratory probe, vibratory compactors - vibro-displacement compaction - displacement piles - vibro flotation - Sand compaction piles - stone columns - heavy tamping.

**Unit-III CONSOLIDATION AND VERTICAL DRAINS** **9**

Introduction -compressibility of soil and consolidation - preloading and surcharge fills - monitoring of compression - vertical drains - principle, design, types, construction, efficiency and applications.

**Unit-IV SOIL STABILIZATION** **9**

Introduction -Stabilization methods - mechanical stabilization, chemical stabilization - cement, lime, bitumen -electrical stabilization - stabilization of expansive clays - Pre wetting.

**Unit-V MISCELLANEOUS METHODS** **9**

Grouting and injection - aspects, procedure and applications - geosynthetics - types, properties andapplications - soil reinforcement - thermal methods.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Klaus Kirsch and AlanBell | Ground improvement | Taylor and Francis Group | 2013 |
| 2 | C.A.Raison | Ground and Soil Improvement | Thomas Telford Publishing, London | 2010 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | M.P.Moseley andK.Kirsch | Ground Improvement | Spon press, New York | 2004 |
| 2 | ushothama Raj, P | Ground Improvement Techniques | Laxmi Publications (P) Ltd.,New Delhi | 2016 |
| 3 | Reuben H. Karol | Chemical grouting and soil stabilization | Taylor and Francis | 2010 |
| 4 | Mittal.S | An Introduction to Ground Improvement Engineering | Medtech Publisher | 2015 |
| 5 | Nihar Ranjan Patra | Ground Improvement Techniques | Vikas Publishing house | 2012 |

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| 23CEE14 | ENVIRONMENTAL IMPACT ASSESMENT IN CIVIL ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To Carry out scoping and screening of developmental projects for environmental and socialassessments.
- To explain different methodologies for environmental impact assessment.
- To plan environmental prediction and assessments.
- To evaluate environmental impact assessment reports and management plans.
- To develop knowledge on case studies about EIA for infrastructure projects.

**Course Outcomes:**

23CEE14.CO1 Know Environmental Impact Assessment and Legal provisions.

23CEE14.CO2 Explain different methodologies for environmental impact assessment.

23CEE14.CO3 Plan environmental prediction and assessment.

23CEE14.CO4 Evaluate environmental impact assessment reports.

23CEE14.CO5 Case studies about environmental impact assessment.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE14.CO1 | x | x | x | x | x | x | - | - | x | - | X | x | x | x | x |
| 23CEE14.CO2 | x | x | x | x | x | x | - | - | x | x | X | x | x | x | x |
| 23CEE14CO2 | x | x | x | x | x | x | - | x | - | x | X | x | x | x | x |
| 23CEE14.CO4 | x | x | x | x | x | x | - | - | - | x | X | x | x | x | x |
| 23CEE14.CO5 | x | x | x | x | x | x | - | - | - | - | X | x | x | x | X |

**Unit-I INTRODUCTION** **9**

Impact of development projects - Sustainable development - Need for Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) - EIA capability and limitations - Legal provisions on EIA - Stages of EIA, Types of EIA.

**Unit-II METHODOLOGIES** **9**

Methods of EIA - Check lists - Matrices - Networks - Cost-benefit analysis - Analysis of alternatives.

**Unit-III PREDICTION AND ASSESSMENT** **9**

Formulation of Housing Projects - Site Analysis, Layout Design, Design of Housing Units (Simple designproblems) - Procedure for site analysis and layout planning.

**Unit-IV ENVIRONMENTAL MANAGEMENT PLAN** **9**

Plan for mitigation of adverse impact on environment - Options for mitigation of impact on water, air, landand on flora & fauna - Addressing the issues related to the Project Affected People – ISO 14000.

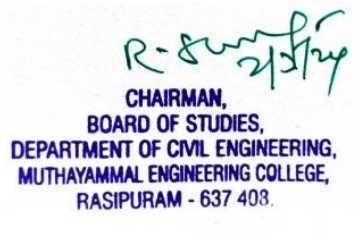
**Unit-V CASE STUDIES** **9**

EIA for infrastructure projects - Dams - Highways - Multi-storey Buildings - Water Supply and Drainage Projects - Waste water treatment plants, STP.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Canter, R.L | Environmental Impact Assessment | McGraw Hill Inc., New Delhi | 2016 |
| 2 | Shukla, S.K. andSrivastava, P.R | Concepts in Environmental ImpactAnalysis | Common Wealth Publishers,New Delhi | 2010 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | John G. Rau and DavidC Hooten | Environmental Impact AnalysisHandbook | McGraw Hill Book Company | 2012 |
| 2 | Judith Petts | Handbook of Environmental Impact Assessment Vol.I &II | Blackwell Science | 2014 |
| 3 | - | Environmental Assessment Sourcebook", Vol. I, II & III | World Bank, Washington,D.C | 2011 |
| 4 | Bala Krishnamoorthy | Environmental Management | Blackwell Science | 2010 |
| 5 | Judith Petts | Environmental Assessment Sourcebook", Vol. I, II & III | McGraw Hill Book Company | 2011 |



| 23CEE15 | WASTE WATER ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To realize the principles of planning, sources and estimation of waste water.
- To impart knowledge on selection of sewers and pump for various sources of wastewater.
- To recognize the different primary treatment techniques for wastewater.
- To acquire knowledge in the principles of secondary treatment of wastewater.
- To expert in the sludge management.

**Course Outcomes:**

23CEE15.CO1 Estimate the sanitary sewage flow and storm runoff.

23CEE15.CO2 Design the sanitary and storm sewers.

23CEE15.CO3 Design and prefer the various primary wastewater treatment units.

23CEE15.CO4 Design and choose the various wastewater secondary treatment units.

23CEE15.CO5 Analyze the various methods on disposal of sludge.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE15.CO1 | - | - | x | x | - | - | x | x | - | x | x | - | - | x | x |
| 23CEE15.CO2 | x | - | x | x | x | x | - | x | - | x | - | - | x | x | x |
| 23CEE15.CO2 | x | - | x | x | - | x | - | - | - | x | - | - | x | x | x |
| 23CEE15.CO4 | x | - | x | x | x | - | - | - | - | x | x | x | x | x | x |
| 23CEE15.CO5 | x | x | x | x | x | - | - | x | x | x | x | x | x | x | x |

**Unit-I PLANNING FOR SEWERAGE SYSTEMS 9**

Sources of wastewater generation – Effects – Estimation of sanitary sewage flow – Estimation of storm runoff – Factors affecting Characteristics and composition of sewage and their significance – Effluent standards – Legislation requirements.

**Unit-II SEWER DESIGN 9**

Sewerage – Hydraulics of flow in sewers – Objectives – Design period - Design of sanitary and storm sewers – Small bore systems - Computer applications – Laying, joining & testing of sewers– appurtenances – Pumps selection of pumps and pipe Drainage -. Plumbing System for Buildings – One pipe and two pipe system.

**Unit-III PRIMARY TREATMENT OF SEWAGE 9**

Objective – Selection of treatment processes – Principles, Functions, Design and Drawing of Units-Onsite sanitation - Septic tank with dispersion - Grey water harvesting – Primary treatment – Principles, functions design and drawing of screen, grit chambers and primary sedimentation tanks– Construction, operation and Maintenance aspects.

**Unit-IV SECONDARY TREATMENT OF SEWAGE 9**

Objective – Selection of Treatment Methods – Principles, Functions, Design and Drawing of Units - Activated Sludge Process and Trickling filter – Oxidation ditches, UASB – Waste Stabilization Ponds – Reclamation and Reuse of sewage - sewage recycle in residential complex - Recent Advances in Sewage Treatment – Construction

and Operation & Maintenance of Sewage Treatment Plants.

**Unit-V DISPOSAL OF SEWAGE AND SLUDGE MANAGEMENT 9**

Standards for Disposal - Methods – dilution – Self purification of surface water bodies – Oxygen sag curve – Land disposal – Sludge characterization – Thickening – Sludge digestion – Biogas recovery – Sludge Conditioning and Dewatering – disposal – Advances in Sludge Treatment and disposal.

**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Garg. S.K | Environmental Engineering", Vol.2 | Khanna Publishers, New Delhi | 2010 |
| 2 | Hussain. S. K | Text Book of Water Supply and Sanitary Engineering | Oxford and IBH Publishing. | 2010 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Metcalf and Eddy | Wastewater Engineering – Treatment and Reuse | Tata McGraw Hill, NewDelhi | 2003 |
| 2 | Punmia, B.C Ashok K Jain and Arun K Jain | Waste Water Engineering | Laxmi Publications Pvt. Ltd.,New Delhi | 2013 |
| 3 | Shah.C. S | Water supply and Sanitation | Galgotia Publishing Company | 2013 |
| 4 | Mark J. Hammer,Mark J and Hammer J R | Water and Waste Water Technology | Prentice Hall of India | 2012 |
| 5 | Duggal. K.N | Elements of public Health Engineering | S.Chand and Company Ltd, New Delhi. | 2017 |

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| 23CEE16 | MUNICIPAL SOLID WASTE MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To know about the different sources and types of municipal solid waste.
- To provide the knowledge about onsite processing and storage of municipal solid waste.
- To study about collection and transfer of municipal solid waste.
- To knowledge about off-site processing of solid waste.
- To understand the various disposal techniques.

**Course Outcomes:**

23CEE16.CO1 Get an idea about different sources and types of municipal solid waste.

23CEE16.CO2 Know about onsite storage and processing system.

23CEE16.CO3 Understand the different methods of collection and transfer of solid waste.

23CEE16.CO4 Select the suitable offsite processing method for various solid waste.

23CEE16.CO5 Select the appropriate waste disposal method.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE16.CO1 | x | x | x | - | - | - | - | - | - | - | - | - | x | - | - |
| 23CEE16.CO2 | x | x | x | - | - | - | - | - | - | - | - | - | x | x | - |
| 23CEE16.CO2 | x | x | x | - | - | - | - | - | - | - | - | - | x | - | - |
| 23CEE16.CO4 | x | x | x | - | - | - | - | - | - | - | - | - | x | - | - |
| 23CEE16.CO5 | x | - | - | - | x | - | - | - | - | - | - | - | - | x | - |

**Unit-I SOURCES AND TYPES OF MUNICIPAL SOLID WASTE** **9**

Solid waste - sources - types - quantity - factors affecting generation - characteristics - Methods of sampling effects of improper disposal of solid wastes - Public health effects and awareness -Elements of solid waste Management-Social and economic aspects-Municipal solid waste (M&H)-Integrated management - Role of NGOs; Legislation-Public awareness.

**Unit-II ON-SITE STORAGE AND PROCESSING** **9**

On-site storage methods - materials used for containers - on-site segregation of solid wastes - Public health and Economic aspects of storage - waste segregation and storage - Reduction, Reuse and Recycling - optionsunder Indian conditions - Critical Evaluation of Options.

**Unit-III COLLECTION AND TRANSFER** **9**

Methods of Collection - types of vehicles - Manpower requirement - collection route- transfer stations - Need for transfer and transport, Selection of location, operation and maintenance - options under Indian conditions - Field problems- solving

**Unit-IV OFF-SITE PROCESSING** **9**

Objectives of waste processing-Physical processing techniques and equipment - resource recovery fromsolid wastes - composting and biomethanation – Thermal processing options- Incineration - Pyrolysis

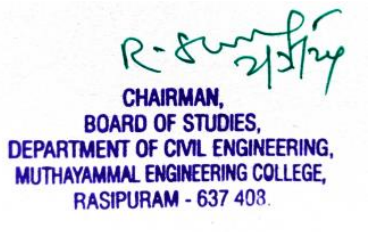
**Unit-V DISPOSAL** **9**

E Land disposal of solid waste - sanitary landfills - site selection, design and operation of sanitary landfills - Management of leachate and landfill gas - landfill closure and environmental monitoring - Leachate collection and treatment – Landslide rehabilitation.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | George Tchobanoglous | Integrated Solid Waste Management | McGraw- Hill | 2014 |
| 2 | Sasikumar K & KrishnaSanoop Gopi | Solid Waste Management | PHI, New Delhi | 2012 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Vesilind, Aarne P & Worrell, William A &Reinhart, Debra R | Solid Waste Engineering | Cengage Learning Pvt. Ltd,New Delhi | 2011 |
| 2 | Landreth.R.E andRebers.P.A | Municipal Solid Wastes–Problemsand Solutions | Lewis Publishers | 2015 |
| 3 | Bhide.A.D. and Sundaresan.B.B | Solid Waste Management in Developing Countries | Dhanpat Rai and Sons | 2012 |
| 4 | J. Cointreau | Waste Management | InTechOpen, Published | 2011 |
| 5 | Jacqueline Vaughn | Waste Management | ABC-CLIO | 2009 |



| 23CEE17 | INDUSTRIAL WASTE MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To impart the concepts of sources and effects of industrial wastes.
- To recognize about the cleaner production in waste management.
- To knowledge about various pollution arising from the major industries.
- To understand the concept of various treatment technologies for industrial waste.
- To learn about hazardous waste management.

**Course Outcomes:**

23CEE17.CO1 Gain knowledge about the sources and effects of industrial solid waste.

23CEE17.CO2 Prefer the choices of cleaner production in waste management.

23CEE17.CO3 Identify the pollution from major industries and treatment techniques.

23CEE17.CO4 Select the suitable treatment technologies for different solid wastes.

23CEE17.CO5 Understand the principles behind the hazardous waste management.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE17.CO1 | x | x | x | - | - | - | - | - | - | - | - | - | x | - | - |
| 23CEE17.CO2 | x | x | x | - | - | - | - | - | - | - | - | - | x | x | - |
| 23CEE17.CO2 | x | x | x | - | - | - | - | - | - | - | - | - | x | - | - |
| 23CEE17.CO4 | x | x | x | - | - | - | - | - | - | - | - | - | x | - | - |
| 23CEE17.CO5 | x | - | - | - | x | - | - | - | - | - | - | - | - | x | - |

**Unit-I INTRODUCTION** **9**

Types of industries and industrial pollution - characteristics of industrial wastes - population equivalent - bio-assay studies - effects of industrial effluents on streams, sewer, land, effluent treatment plants and human health - environmental legislations related to prevention and control of industrial effluents and hazardous wastes.

**Unit-II CLEANER PRODUCTION** **9**

Waste management approach - waste audit – ISO 14000 volume and strength reduction - material and process modifications - recycle, reuse and byproduct recovery - applications.

**Unit-III POLLUTION FROM MAJOR INDUSTRIES** **9**

Sources, characteristics, waste treatment flow sheets for selected industries - textiles, tanneries, pharmaceuticals, electroplating industries, dairy, sugar, paper, distilleries, steel plants, refineries, fertilizer and thermal power plants - wastewater reclamation concepts.

**Unit-IV TREATMENT TECHNOLOGIES** **9**

Equalization -neutralization - removal of suspended and dissolved organic solids - chemical oxidation - adsorption - removal of dissolved inorganic - combined treatment of industrial and municipal wastes - residue management - dewatering - disposal

**Unit-V HAZARDOUS WASTE MANAGEMENT** **9**

Hazardous wastes - physic - chemical treatment - solidification - incineration - secured landfills.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Rao.M.N and Dutta.AK | Wastewater Treatment | Oxford - IBH Publication | 2017 |
| 2 | Eckenfelder Jr.W.W | Industrial Water Pollution Control | McGraw-Hill Book Company, New Delhi | 2014 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Dr. Jagbir Singh | Solid Waste Management | I.K. International | 2010 |
| 2 | Shen T.T | Industrial Pollution Prevention | Springer | 2013 |
| 3 | Stephenson R.L. andBlackburn, Jr. J.B | Industrial Wastewater Systems Hand book | Lewis Publisher, New York | 2016 |
| 4 | Freeman .H.M | Industrial Pollution PreventionHand Book | McGraw-Hill Inc., New Delhi | 2008 |
| 5 | Bishop, P.L | Pollution Prevention Fundamental and Practice | McGraw-Hill | 2010 |

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| 23CEE18 | AIR POLLUTION AND MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To impart knowledge about sources and effect of air pollution.
- To know about dispersion of pollutants.
- To impose the knowledge in the control of air pollution.
- To learn the concepts behind the air quality management.
- To deliver the sources, effect and control of noise pollution.

**Course Outcomes:**

23CEE18.CO1 Classify the sources and effects of air pollution.

23CEE18.CO2 Realize the dispersion characteristics and modeling of air pollution.

23CEE18.CO3 know about air pollution control methods.

23CEE18.CO4 Familiarize about air quality management system.

23CEE18.CO5 Know the sources, effects and control of noise pollution.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE18.CO1 | x | x | x | - | - | - | - | - | - | - | - | - | x | - | - |
| 23CEE18.CO2 | x | x | x | - | - | - | - | - | - | - | - | - | x | x | - |
| 23CEE18.CO3 | x | x | x | - | - | - | - | - | - | - | - | - | x | - | - |
| 23CEE18.CO4 | x | x | x | - | - | - | - | - | - | - | - | - | x | - | - |
| 23CEE18.CO5 | x | - | - | - | x | - | - | - | - | - | - | - | - | x | - |

**Unit-I SOURCES AND EFFECTS OF AIR POLLUTANTS 9**

Classification of air pollutants - particulates and gaseous pollutants - sources of air pollution - source inventory - effects of air pollution on human beings, materials, vegetation and animals - global warming - ozone layer depletion, sampling - basic principles - source and ambient sampling - analysis of pollutants.

**Unit-II DISPERSION OF POLLUTANTS 9**

Elements of atmosphere - meteorological factors - wind roses - lapse rate atmospheric stability andturbulence - plume rise - dispersion of pollutants - dispersion models - applications.

**Unit-III AIR POLLUTION CONTROL 9**

Concepts of control - principles and design of control measures - particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation - selection criteria for equipment - gaseous pollutants control by adsorption, absorption, condensation, combustion - pollution control for specific major industries.

**Unit-IV AIR QUALITY MANAGEMENT 9**

Air quality standards - Air quality monitoring - preventive measures - air pollution control efforts - Zoning - town planning regulation of new industries - legislation and enforcement - environmental impact assessment on air quality.

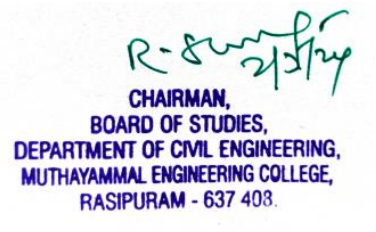
**Unit-V NOISE POLLUTION 9**

Sources of noise pollution - effects - assessment - standards - control methods - prevention measures.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Rao M.N. andRao H.V.N | Air Pollution | McGraw Hill Education,New Delhi | 2013 |
| 2 | Rao C.S | Environmental Pollution ControlEngineering | Wiley Eassern Ltd.,New Delhi | 2005 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Anjaneyulu D | Air Pollution and Control Technologies | Allied Publishers, Mumbai | 2016 |
| 2 | Peavy S.W Rowe D.R. & Tchobanoglous G | EnvironmentalEngineering | McGraw Hill | 2010 |
| 3 | Garg, S.K. | Environmental Engineering Vol. II | Khanna Publishers,New Delhi. | 1999 |
| 4 | Mahajan S.P | Pollution Control in Process Industries | Tata McGraw Hill, NewDelhi, | 2002 |
| 5 | Thod Godesh | Air Quality | Lewis Indian Edition | 2013 |



| 23CEE19 | PUBLIC HEALTH AND IRRIGATION ENGINEERING DRAWING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To draw the water supply layout
- To draw the waste water treatment plant layout
- To draw the impounding reservoir of the structures
- To draw the canal transmission structures
- To draw the canal regulator structures

**Course Outcomes:**

23CEE19.CO1 Design and draw the plan section and elevation of water supply treatment plant

23CEE19.CO2 Design and draw the plan section elevation of waste water treatment plant

23CEE19.CO3 Design and draw the impounding structures.

23CEE19.CO4 Design and draw the canal transmission structures.

23CEE19.CO5 Design and draw the canal regulator structures.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE19.CO1 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE19.CO2 | X | X | X | - | - | - | - | - | - | - | - | - | X | X | - |
| 23CEE19.CO3 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE19.CO4 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE19.CO5 | X | - | - | - | X | - | - | - | - | - | - | - | - | X | - |

**Unit-I WATER SUPPLY AND TREATMENT 9**

Design & Drawing of flash mixer, flocculator, clarifier – Slow sand filter – Rapid sand filter –Infiltration gallery – Intake towers – Service reservoirs – Pumping station – House service connection for water supply and drainage.

**Unit-II SEWAGE TREATMENT & DISPOSAL 9**

Design and Drawing of screen chamber - Grit channel - Primary clarifier - Activated sludge process – Aeration tank & oxidation ditch – Trickling filters – Secondary clarifiers – Sludge digester – Sludge drying beds – Waste stabilization ponds - Septic tanks and disposal arrangements – Manholes.

**Unit-III IMPOUNDING STRUCTURES 9**

Gravity dam, Tank Surplus Weir, Tank Sluice with tower road – Drawing showing plan, elevation, halfsection including foundation details.

**Unit-IV CANAL TRANSMISSION STRUCTURES 9**

Aqueducts – Syphon Aqueducts – Super passage – Canal siphon – Canal Drops- Drawing showing plan, elevation and foundation details.

**Unit-V CANAL REGULATOR STRUCTURES 9**

Canal head works- Canal Regulator – Canal escape- Proportional Distributors – Drawing showing detailedplan, elevation and foundation.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Modi. P.N | Environmental Engineering I &II | Standard Book House,Delhi-6 | 2015 |
| 2 | SathyanarayanaMurthy | Irrigation Design and Drawing | Published by Mrs L.Banumathi, Tuni east Godavari District. A.P | 2010 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Peary. H.S Rowe. D.R and Tchobanoglous.G | Environmental Engineering | McGraw-Hill Book Co., New Delhi | 2012 |
| 2 | Metcalf & Eddy | "Wastewater Engineering (Treatment and Reuse)",4th edition | Tata McGraw-Hill, NewDelhi | 2003 |
| 3 | Garg S.K | Environmental Engineering anddesign Structures | Khanna Publishers, New Delhi.dDelhi, 17th Reprint | 2014 |
| 4 | - | Manual on Water Supply and Treatment | CPHEEO, Government of India, New Delhi | 2015 |
| 5 | - | Manual on Sewerage and SewageTreatment | CPHEEO, Government of India, New Delhi | 2012 |

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| 23CEE20 | HYDROLOGY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To know about the hydrological cycle and precipitation.
- To understand the precipitation and infiltration process.
- To acquire in depth knowledge on various types of hydrographs and their applications.
- To realize the importance of flood control and mitigation measures.
- To integrate the fundamental knowledge on ground water hydrology.

**Course Outcomes:**

23CEE20.CO1 Understand, rainfall the various components of hydrological cycle and their interactions

23CEE20.CO2 Estimate the mean area precipitation, infiltration and their significance

23CEE20.CO3 Understand the various methods of hydrographs and its applications

23CEE20.CO4 Estimate the flood by various methods and concept of flood routing

23CEE20.CO5 Understand the dynamics of groundwater flow and their estimation

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE20.CO1 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE20.CO2 | X | X | X | - | - | - | - | - | - | - | - | - | X | X | - |
| 23CEE20.CO3 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE20.CO4 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE20.CO5 | X | - | - | - | X | - | - | - | - | - | - | - | - | X | - |

**Unit-I PRECIPITATION** **9**

Hydrologic cycle - Hydro meteorological factors - Cloud formation - Winds and their movement - Types of precipitation - Forms of precipitation - Measurement of Rainfall - Spatial measurement methods - Temporal measurement methods - Frequency analysis of point rainfall - Intensity, duration, frequency relationship - Probable maximum precipitation - Density and Adequacy of rain gauges - Recording and non- recording rain gauges - Optimum number of rain gauges

**Unit-II ABSTRACTION FROM PRECIPITATION** **9**

Losses from precipitation - Evaporation process - Reservoir evaporation - Infiltration process - Infiltration capacity loss - Measurement of infiltration - Infiltration indices -Horton‘s equation - Effective rainfall Spatial distribution - Consistency analysis -Frequency analysis - Intensity, duration, frequency relationships - abstraction

**Unit-III HYDROGRAPHS ANALYSIS** **9**

Flood Hydrograph - Components of flood hydrograph -Factors affecting shape of Hydrograph - Base flow separation - Unit hydrograph - Advantages - Instantaneous Unit hydrograph - S curve Hydrograph - Synthetic unit hydrograph -Applications - Derivation of unit hydrograph - Unit hydrograph of different deviations

**Unit-IV FLOODS AND FLOOD ROUTING** **9**

Flood frequency studies - Recurrence interval - Flood estimation - Gumbel’s method - Log Pearson type IIImethod - Flood routing - Reservoir flood routing - Muskingum’s Channel Routing - Flood control.

**Unit-V GROUND WATER HYDROLOGY** **9**

Types of Aquifers - Darcy's Law - Dupuit's assumptions - confined aquifer - unconfined aquifer -recuperation test - transmissibility - specific capacity - pumping test -steady flow analysis only.

**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Subramanya, K | Engineering Hydrology | Tata McGraw-Hill Publishing Co., Ltd,Delhi | 2013 |
| 2 | Raghunath, H.M | Hydrology | Wiley Eastern Ltd | 2014 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | JayaRam Reddy | Text Book of Hydrology | Laxmi Publications | 2016 |
| 2 | Singh V P | Hydrology | McGraw Hill Inc., Ltd | 2016 |
| 3 | Chow,V.T. andMaidment | Hydrology for Engineers | Mc Graw - Hill Inc., Ltd | 2013 |
| 4 | Santosh Kumar Garg | Hydrology and Water ResourcesEngineering | Khanna Publications Pvt.Ltd. NewDelhi | 2017 |
| 5 | Warren Viessman andGary L.Lewis | Introduction to Hydrology | Prentice Hall of IndiaPvt.Ltd NewDelhi | 2017 |

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| 21CEE21 | WATER RESOURCE ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To learn about water resources and collection of hydrological data.
- To study the Network design using hydrological data.
- To know the importance, features and uses of Water resources and its needs.
- To learn about reservoir planning and management.
- To learn about economic analysis of water resources.

**Course Outcomes:**

23CEE21.CO1 Know general details about water resources

23CEE21.CO2 Able to plan the Network design using Hydrological data.

23CEE21.CO3 Familiarize about Water resources and its needs.

23CEE21.CO4 Gain knowledge about reservoirs planning and management

23CEE21.CO5 Know about economic analysis of water resources

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE21.CO1 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE21.CO2 | X | X | X | - | - | - | - | - | - | - | - | - | X | X- | - |
| 23CEE21.CO3 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE21.CO4 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE21.CO5 | X | - | - | - | X | - | - | - | - | - | - | - | - | X | - |

**Unit-I GENERAL** **9**

Water resources survey – Water resources of India and Tamilnadu – Description of water resources planning – Economics of water resources planning, physical and socio economic data – National Water Policy – Collection of meteorological and hydrological data for water resources.

**Unit-II NETWORK DESIGN** **9**

Hydrologic measurements – Analysis of hydrologic data – Hydrologic station network – Station network design Statistical techniques in network design.

**Unit-III WATER RESOURCE NEEDS** **9**

Consumptive and non-consumptive water use - Estimation of water requirements for irrigation, for drinking and navigation –Water characteristics and quality – Scope and aims of master plan - Concept of basin as a unit for development - Water budget and development plan

**Unit-IV RESERVOIR PLANNING AND MANAGEMENT** **9**

Reservoir - Single and multipurpose – Multi objective - Fixation of Storage capacity -Strategies for reservoir operation - Sedimentation of reservoirs - Design flood-levees and flood walls -

**Unit-V ECONOMIC ANALYSIS** **9**

Estimation of cost and Evaluation of Benefits - Discount rate - Discounting factors – Discounting techniques – Computer Applications**.**

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Punmia .B.C. and Pande B.B.Lal | Irrigation and Water Power Engineering | Laxmi publications Pvt. Ltd, New Delhi | 2012 |
| 2 | K.Subramanya | Engineering hydrology | McGraw-Hill Inc, New York | 2012 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Raghunath .H.M | Hydrology | New Age International Publishers, New Delhi | 2014 |
| 2 | Sharma .R.K | Irrigation Engineering and Hydraulic Structures | Oxford and IBH Publishing Company, New Delhi | 2014 |
| 3 | Raghunath .H.M | Ground Water Hydrology | Wiley Eastern Ltd., Second reprint | 2015 |
| 4 | Goodman Alvin S | Principles of Water Resources Planning | Prentice - Hall India, New Delhi | 2011 |
| 5 | Linsley R.K. and Franzini J.B | Water Resources Engineering | McGraw - Hill Inc, New York | 2014 |

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| 23CEE22 | GROUND WATER ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To know about hydro geological parameters in ground water.
- To know about well hydraulics.
- To knowledge about ground water management.
- To learn about groundwater quality.
- To familiarize about groundwater conservation.

**Course Outcomes:**

23CEE22.CO1 Understand about the hydro geological parameters of ground water.

23CEE22.CO2 Knowledge about well hydraulics

23CEE22.CO3 Learn about ground water management.

23CEE22.CO4 know about groundwater quality.

23CEE22.CO5 Learn about groundwater conservation Techniques.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE22.CO1 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE22.CO2 | X | X | X | - | - | - | - | - | - | - | - | - | X | X | - |
| 23CEE22.CO3 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE22.CO4 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE22.CO5 | X | - | - | - | X | - | - | - | - | - | - | - | - | X | - |

**Unit-I HYDROGEOLOGICAL PARAMETERS 9**

Introduction - water bearing Properties of Rock -Type of aquifers - Aquifer properties - Permeability, specific yield, transmissivity and storage coefficient - methods of Estimation - Ground water table fluctuation and its interpretations - ground water development and Potential in India - GEC norms

**Unit-II WELL HYDRAULICS 9**

Objectives of Ground water hydraulics - Darcy's Law-- Ground water equation - steady state flow - Dupuit Forchheimer assumption - unsteady state flow - thesis method - Jacob method - Slug tests - Image well theory - Partial penetrations of wells.

**Unit-III GROUND WATER MANAGEMENT 9**

Need for management model - Database for groundwater management - ground water balance study - Introduction to mathematical model - Conjunctive use - Collector well and infiltration gallery.

**Unit-IV GROUNDWATER QUALITY 9**

Groundwater chemistry - origin, movement and quality - water quality standards - health and aestheticaspects of water quality - Saline intrusion - Environmental concern and regulatory requirements

**Unit-V GROUNDWATER CONSERVATION 9**

Artificial recharge techniques - Remediation of Saline Intrusion - Groundwater management studies - protection zone delineation, Contamination source inventory, remediation schemes - Ground water Pollution and legislation.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Raghunath H.M. | ound Water Hydrology | New Age International (P) Ltd. New Delhi | 2010 |
| 2 | Todd D.K | ound Water Hydrology | John Wiley and Sons,New York | 2010 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Raghunath H.M. | Ground Water Hydrology | New Age International (P) Ltd. New Delhi | 2015 |
| 2 | Todd D.K | und Water Hydrology | John Wiley and Sons, NewYork | 2013 |
| 3 | Fitts R Charles | Groundwater Science | Elsevier, Academic Press | 2014 |
| 4 | Ramakrishnan,S | Advanced mechanics and solids | Tata-McGraw Hill publishing company ltd | 2016 |
| 5 | Punmia B.C, Ashok K.Jain and Arun K. Jain | Ground water, K.J. | Graph arts, Chennai | 2017 |

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| 23CEE23 | IRRIGATION ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To obtain knowledge about irrigation system and crops season
- To design the various methods of irrigation which are needed for the practical life.
- To understand about canal structures and regulators
- To learn about diversion head work and impounding structure
- To provide knowledge on water management and to minimize irrigation water losses

**Course Outcomes:**

| | |
|---|---|
| 23CEE23.CO1 | Assess the irrigation systems and crop seasons |
| 23CEE23.CO2 | Select the suitable methods of irrigation |
| 23CEE23.CO3 | Design various types of canal structures and regulators. |
| 23CEE23.CO4 | Select and design suitable type of dam based on the requirement |
| 23CEE23CO5 | Examine various river training methods and providing solution to various issues on irrigation water management |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE23.CO1 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE23.CO2 | X | X | X | - | - | - | - | - | - | - | - | - | X | X | - |
| 23CEE23.CO3 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE23.CO4 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE23CO5 | X | - | - | - | X | - | - | - | - | - | - | - | - | X | - |

**Unit-I INTRODUCTION** **9**

Necessity – Merits and demerits of irrigation– Crops and crop seasons–Soil- water- plant relations – saline, alkaline soils and their reclamation – root zone depth – Duty and Delta relationship – Factors affecting duty – Consumptive use of water by a crop – Estimation and assessment of irrigation water – Irrigation efficiencies – optimum utilization of water– Planning and development of irrigation– Problems onIrrigation

**Unit-II IRRIGATION METHOD** **9**

Methods of irrigation– Canal irrigation – lift irrigation – tank irrigation – Surface and sub-surface methods of application of water – Sprinkler and drip irrigation methods.

**Unit-III CANAL STRUCTURE AND REGULATORS** **9**

Alignment of canals – classification of canals – Design of canals based on Kennedy's and Lacey's silt theories – canal lining - water logging - canal drops – hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal head works – Functions of Regulators - Design of head and cross regulators– Classification of aqueducts and syphon aqueducts

**Unit-IV DIVERSION HEAD WORK AND IMPOUNDING STRUCTURE** **9**

Functions of diversion head works – Types – Layout of diversion head works – Component parts – functions - Weir –types – Causes of failure of weirs and their remedies –Bligh's theory -Khosla's theory – Design of a vertical drop weir – Design principles for under sluices – Types of impounding structures– Gravity dams – Earth dams – Arch dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams

**Unit-V IRRIGATION WATER MANAGEMENT 9**

Need for optimization of water use – Minimizing irrigation water losses – On farm development works - Participatory irrigation management – Water users associations – Changing paradigms in water management due to climate change – Performance evaluation–River training methods - Investigation and preparation of irrigation project: Classification of projects, concepts of multipurpose projects**.**

**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Santosh Kumar Garg | Irrigation Engineering and Hydraulics Structures. | Khanna Publications Pvt.Ltd. New Delhi. | 2016 |
| 2 | Punmia B.C & Pande B.B Lal | Irrigation and water power Engineering. | Lakshmi publications, NewDelhi. | 2016 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Sharma R.K andSharma T.K | Irrigation Engineering and Hydraulics Structures | S. Chand & CompanyPvt.Ltd, New Delhi | 2010 |
| 2 | Michel A.M | Irrigation Engineering | Vikas Publishing HousePvt.Ltd, New Delhi | 2009 |
| 3 | Dilip KumarMajumdar | Irrigation Water Management(Principles & Practices) | Prentice Hall of India (P),Ltd, New Delhi. | 2013 |
| 4 | Varshney and Gupta | Irrigation Engineering & Hydraulic Structure | Nem Chand & Bros.,Roorkee | 2010 |
| 5 | Arora K R | Irrigation Water Power & WaterResources Engineering | Standard Publishers Distributors, Delhi | 2010 |

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| 23CEE24 | APPLIED HYDRAULIC ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To impart knowledge on basic concepts of open channel flows and their types.
- To provide knowledge on designing a most economical section of various shapes in uniform flow.
- To understand the behaviour of various types of non-uniform channel flows and their practical applications.
- To create knowledge on basic concepts of various pumps.
- To study the fundamental concepts of various types of turbines.

**Course Outcomes:**

23CEE24.CO1 Analyze the various classifications of open channel flows.

23CEE24.CO2 Design of various types of channels and velocity measurement in open channel flows.

23CEE24.CO3 Design silting basin for the given non-uniform flow condition.

23CEE24.CO4 Select a suitable pump according to the requirement

23CEE24.CO5 Choose a suitable type of hydraulic turbine.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE24.CO1 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE24.CO2 | X | X | X | - | - | - | - | - | - | - | - | - | X | X | - |
| 23CEE24.CO3 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE24.CO4 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE24.CO5 | X | - | - | - | X | - | - | - | - | - | - | - | - | X | - |

**Unit-I OPEN CHANNEL AND CRITICAL FLOW 9**

Introduction to open channel flow – Types and regimes of flow – Velocity distribution in open channel flow– Wide open channel – Specific energy and specific force – Critical flow and its computation – Channel transition.

**Unit-II UNIFORM FLOW 9**

Uniform flow – Various methods of velocity measurements – Chezy's and Manning's formula – Determination of roughness coefficients- Determination of normal depth and velocity – Most economical section –Conditions for various types of open channels – Non Erodible channel.

**Unit-III NON – UNIFORM FLOW 9**

Dynamic equation of Gradually Varied Flow (GVF) – Determination of GVF profiles – Direct and standard step methods – Hydraulic jump – Sequent depths -- Introduction to positive and negative surge.

**Unit-IV PUMPS 9**

Classification of pumps based on field applications-Minimum speed to start the pump-NPSH - Centrifugal pump - Cavitations in pumps – Single and Multi-stage pumps – Reciprocating pump –Negative slip-Flow separation condition- Air vessels, indicator diagrams and its variations –Cavitations-rotary pumps: Gear pump

**Unit-V TURBINES 9**

Impact of jet on flat and curved plates, stationary and moving – Classification of turbines – impulse turbine – reaction turbine – radial flow turbine -Francis turbine – Propeller and Kaplan turbine – Draft tube and cavitations - performance of turbine-specific speed.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Subramanya K | Flow in Open channels | Tata McGraw-Hill Publishing Company | 2011 |
| 2 | Bansal R.K | Fluid mechanics & Hydraulicmachines | Laxmi Publishing Pvt Ltd, | 2017 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Jain A.K | Fluid Mechanics (including Hydraulic Machines) | Khanna Publishers, 8th Edition | 2010 |
| 2 | Ranga Raju, K.G | Flow through Open Channels | Tata McGraw-Hill | 2010 |
| 3 | Rajesh Srivastava | Flow through open channels | Oxford University Press | 2016 |
| 4 | Rajput R.K | A Text book of Fluid Mechanics | S.Chand Publication Ltd., New Delhi | 2015 |
| 5 | Modi .P.N andSeth S.M | Hydraulics and Fluid Mechanics | Standard Book House, | 2013 |

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| 23CEE25 | PAVEMENT ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To understand the types of pavement.
- To gain the knowledge of flexible Pavements design as per IRC guidelines.
- To gain the knowledge of rigid Pavements design as per IRC guidelines.
- To know about the pavement evaluation and Maintenance.
- To study about Stabilization of Pavements.

**Course Outcomes:**

23CEE25.CO1 To find the stress and deflections in pavements under repeated loading.

23CEE25.CO2 To design flexible pavement based on IRC guidelines.

23CEE25.CO3 To design rigid pavement based on IRC guidelines.

23CEE25.CO4 To evaluate performance of pavements.

23CEE25.CO5 To adopt suitable soil stabilization techniques for pavements

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE25.CO1 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE25.CO2 | X | X | X | - | - | - | - | - | - | - | - | - | X | X | - |
| 23CEE25.CO3 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE25.CO4 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE25.CO5 | X | - | - | - | X | - | - | - | - | - | - | - | - | X | - |

**Unit-I TYPES OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM 9**

Introduction - Pavement as layered structure - Pavement types rigid and flexible - Resilient modulus -Stress and deflections in pavements under repeated loading.

**Unit-II DESIGN OF FLEXIBLE PAVEMENTS 9**

Flexible pavement design - factors influencing design of flexible pavement - Empirical, Semi- empirical and theoretical methods - Design procedure as per IRC guidelines -design and specification of rural roads.

**Unit-III DESIGN OF RIGID PAVEMENTS 9**

Cement concrete pavements factors influencing CC pavements - Modified Westergaard approach - design procedure as per IRC guidelines - Concrete roads and their scope in India.

**Unit-IV PERFORMANCE EVALUATION AND MAINTENANCE 9**

Pavement Evaluation - causes of distress in rigid and flexible pavements - Evaluation based on Surface Appearance, Cracks, patches and Pot holes, Undulations, Raveling, Roughness, Skid Resistance - Structural evaluation by Deflection Measurements - Pavement Serviceability index pavement maintenance (IRC recommendations only).

**Unit-V STABILIZATION OF PAVEMENTS 9**

Stabilization with special reference to highway pavements - Choice of stabilizers - Testing and field control stabilization for rural roads in India - Use of Geosynthetics in roads

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Wright P.H. | Highway Engineers | John Wiley and Sons, Inc., New York | 2009 |
| 2 | Khanna S.K., Justo C.E.G and Veeraragavan.A. | Highway Engineering | Nem Chand and Brothers,10th Edition, Roorkee | 2014 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Yoder R.J. andWitchak M.W. | Principles of Pavement Design | John Wiley | 2016 |
| 2 | Rajib B. Mallick,Tahar El-Korchi | Pavement Engineering | Principles and Practice 2nd edition, CRC Press | 2013 |
| 3 | - | Guidelines for the Design ofFlexible Pavements - IRC 37 | Indian Road Congress | 2012 |
| 4 | - | Guideline for the Design of RigidPavements for Highways, IRC 58 | Indian Road Congress | 2016 |
| 5 | - | Standard Specifications and code of practice for construction ofconcrete roads, IRC - 015 | Indian Road Congress | 2011 |

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| | | L | T | P | C |
|---|---|---|---|---|---|
| **23CEE26** | **TRAFFIC ENGINEERING AND SAFETY TRANSPORT** | **3** | **0** | **0** | **3** |

**Course Objective:**

- To familiarize the basics of traffic engineering.
- To give knowledge about traffic control system and geometric design of intersections.
- To familiarize about traffic management system.
- To impart knowledge about road transport systems and preventive measures
- To create awareness among students about road safety.

**Course Outcomes:**

| | |
|---|---|
| 23CEE26.CO1 | Have knowledge on traffic engineering basics. |
| 23CEE26.CO2 | Apply geometric design of intersections. |
| 23CEE26.CO3 | Knowledge about traffic management system |
| 23CEE26.CO4 | Learn about road transport systems and preventive measures |
| 23CEE26.CO5 | Understand the various road safety measures. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE26.CO1 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE26.CO2 | X | X | X | - | - | - | - | - | - | - | - | - | X | X | - |
| 23CEE26.CO3 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE26.CO4 | X | X | X | - | - | - | - | - | - | - | - | - | X | - | - |
| 23CEE26.CO5 | X | - | - | - | X | - | - | - | - | - | - | - | - | X | - |

**Unit-I INTRODUCTION** **9**

Significance and scope - Characteristics of Vehicles and Road Users - Skid Resistance and Braking Efficiency (Problems) - Components of Traffic Engineering - Road, Traffic and Land Use Characteristics - Traffic surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services - Basic principles of Traffic flow

**Unit-II TRAFFIC CONTROL AND GEOMETRIC DESIGN OF INTERSECTIONS** **9**

Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems) - Traffic control aids and Street furniture - Street Lighting - Computer applications in Signal design - Conflicts at Intersections, Classification of 'At Grade Intersections' - Channelized Intersections - Principles of Intersection Design - Elements of Intersection Design - Rotary design - Grade Separation and interchanges - Design principles.

**Unit-III TRAFFIC MANAGEMENT** **9**

Traffic Management - Transportation System Management (TSM) - Travel Demand Management (TDM) - Traffic Forecasting techniques - Restrictions on turning movements - One-way Streets - Traffic Segregation - Traffic Calming - Tidal flow operations - Exclusive Bus Lanes - Introduction to Intelligent Transportation System (ITS).

**Unit-IV ROAD TRANSPORT** **9**

Introduction - factors for improving safety on roads - causes of accidents due to drivers and pedestrians - design, selection, operation and maintenance of motor trucks - preventive maintenance check lists - motor vehicles act - motor vehicle insurance and surveys

**Unit-V ROAD SAFETY** **9**

Road alignment and gradient-reconnaissance - ruling gradient, maximum rise per km - factors influencing alignment like tractive resistance, tractive force, direct alignment, vertical curves - breaking characteristics of vehicle-skidding-restriction of speeds-significance of speeds- Pavement conditions - Sight distance - Safety at intersections - Traffic control lines and guide posts-guard rails and barriers - street lighting and illumination overloading - concentration of driver.

**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Kadiyali L R | Traffic Engineering and Transport Planning | Khanna Technical Publications | 2016 |
| 2 | Khanna K andJusto C E G | Highway Engineering | Khanna Publishers | 2017 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Subhash C.Saxena | A Course in Traffic Planning andDesign | Dhanpat Rai Publications | 2014 |
| 2 | C. Jotin Khisty, B. Kent Lall | Transportation Engineering - AnIntroduction | Prentice Hall of India Pvt Ltd | 2010 |
| 3 | Babkov, V.F | Road Conditions and Traffic Safety | MIR Publications | 2017 |
| 4 | - | Motor Vehicles Act | Government of India | 2017 |
| 5 | K.W.Ogden | Safer Roads - A guide to RoadSafety Engineering | Avebury Technical | 2011 |

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| 23CEE27 | RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To give exposure to planning of railway tracks.
- To provide proficiency in the railway construction and maintenance.
- To develop skills on planning of airports
- To give exposure on airport design.
- To have basic knowledge on components of docks and harbors.

**Course Outcomes:**

23CEE27.CO1 Planning the railway track components.

23CEE27.CO2 Perform the railway construction and maintenance.

23CEE27.CO3 Possess knowledge on airport planning

23CEE27.CO4 Do the design of runways, taxiways and apron.

23CEE27.CO5 Familiarize the components of docks and harbors

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE27.CO1 | X | - | - | - | - | - | X | X | X | - | - | - | X | X | X |
| 23CEE27.CO2 | - | - | X | | X | X | - | - | - | - | - | X | X | X | X |
| 23CEE27.CO3 | - | X | X | X | X | - | - | - | X | X | X | X | X | X | X |
| 23CEE27.CO4 | X | X | - | X | X | X | - | X | X | X | - | X | X | X | X |
| 23CEE27.CO5 | X | X | X | X | - | - | - | - | - | X | X | - | X | X | X |

**Unit-I RAILWAY PLANNING 9**

Significance of Road, Rail, Air and Water transports - Coordination of all modes to achieve sustainability - Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods (Remote Sensing, GIS & GPS, EDM and other equipments)- Soil suitability analysis - Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings.

**Unit-II RAILWAY CONSTRUCTION AND MAINTENANCE 9**

Earthwork – Stabilization of track on poor soil –- Tunneling Methods, drainage and ventilation – Calculation of Materials required for track laying - Construction and maintenance of tracks –Modern methods of construction & maintenance - Railway stations and yards and passenger amenities- Urban rail – Infrastructure for Metro, Mono and underground railways.

**Unit-III AIRPORT PLANNING 9**

Floors - Types of flooring - Repair of floors - Classification of roofs - Types of Pitched & Flat roofs -Roof covering materials - Drainage on pitched &flat roofs - Types of scaffolding - types of shoring - Methods of underpinning - Types of formwork - centering.

**Unit-IV CONSTRUCTION PRACTICES 9**

Runway Design: Orientation, Wind Rose Diagram - Runway length - Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles - Elements of Taxiway Design– Airport Zones , Clear Zone, Approach Zone, Buffer Zone, Turning Zone, wind direction indicators, Clearance over Highways and Railways - Passenger Facilities and Services - Runway and Taxiway Markings and lighting.

**Unit-V HARBOUR ENGINEERING 9**

Definition of Basic Terms: Harbor, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbors Requirements, Classification, Location and Design Principles – Harbor Layout and Terminal Facilities - Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage - Inland Water Transport - Wave action on Coastal Structures and Coastal Protection Works - Environmental concern of Port Operations - Coastal Regulation Zone, 2011.

**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Rangwala | Railway Engineering | Charotar Publishing House | 2013 |
| 2 | Bindra S P | A Course in Docks and HarbourEngineering | Dhanpat Rai and Sons | 2013 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Rangwala | Airport Engineering | Charotar Publishing House | 2013 |
| 2 | Dr.K.P.Subramanian | A text book on Railways, Airports,Docks and Harbours | Scitech, Chennai | 2012 |
| 3 | Oza.H.P andOza.G.H | A course in Docks & Harbour Engineering | Charotar Publishing Co. | 2013 |
| 4 | Mundrey J.S | A course in Railway Track Engineering | Tata McGraw Hill | 2017 |
| 5 | Saxena Subhash C andSatyapal Arora | A Course in Railway Engineering | Dhanpat Rai and Sons | 2016 |

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| 23CEE28 | CONSTRUCTION PLANNING AND MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To make the students to learn about basic concepts of planning and methods.
- To study about scheduling procedures and techniques involved in construction projects
- To learn about cost control monitoring and accounting systems.
- To know about the quality control and safety measures during construction practice.
- To learn about organization and use of project information in database management system.

**Course Outcomes:**

23CEE28.CO1 Understand the requirement of planning techniques exercised in the constructionprojects.

23CEE28CO2 Choose suitable scheduling technique for the particular project.

23CEE28.CO3 Practice modern cost account systems and control techniques adopted.

23CEE28.CO4 Adopt the quality control and safety measures during construction.

23CEE28.CO5 Understand the use of project information system.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE28.CO1 | X | - | - | - | - | X | X | X | X | X | - | X | - | X | - |
| 23CEE28CO2 | X | - | - | - | - | X | X | X | X | X | - | X | - | X | - |
| 23CEE28.CO3 | X | X | X | X | - | X | X | X | X | X | - | X | - | X | - |
| 23CEE28.CO4 | X | X | X | X | - | X | X | X | X | X | - | X | - | X | - |
| 23CEE28.CO5 | X | X | - | - | X | X | X | X | X | X | - | X | - | X | - |

**Unit-I CONSTRUCTION PLANNING 9**

Necessity - Basic concepts - Phases and stages of project planning - Types of construction plans for projects- Planning for materials, labour and equipment - Defining activities and precedence relationships - Estimating activity durations and resource requirements - Program for progress of work and control - Bar and Milestone charts - Uses and drawbacks - Terminology - Coding systems

**Unit-II MANAGEMENT TECHNIQUES 9**

Evolution of networks - Inter-relationship of events and activities - Fundamental rules for network construction - Critical path method - Program Evaluation and Review Technique - Probability of project completion time - Precedence networks - Scheduling for activity - on-node networks - Resource oriented scheduling - Scheduling with resource constraints - Improving scheduling

**Unit-III COST CONTROL MONITORING AND ACCOUNTING 9**

The cost control problem-The project Budget-Forecasting for Activity cost control - financial accounting systems and cost accounts - Control of project cash flows – schedule control – schedule and budget updates – relating cost and schedule information

**Unit-IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9**

Quality and safety Concerns in Construction - Organizing for Quality and Safety - Work and Material Specifications - Total Quality control - Quality control by statistical methods - Statistical Quality control with Sampling by Attributes - Statistical Quality control by Sampling and Variables-Safety.

**Unit-V ORGANIZATION AND USE OF PROJECT INFORMATION 9**

Types of project information - Accuracy and Use of Information - Computerized organization and use of Information - Organizing information in databases-relational model of Data bases - Other conceptual Models of Databases - Centralized database Management systems - Databases and application programs - Information transfer and Flow.

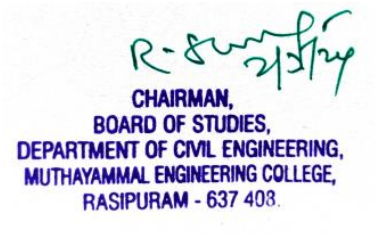
**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Chitkara. K.K | Construction Project Management | Tata McGraw Hill Publishing Co., New Delhi, | 2015 |
| 2 | Srinath.L.S | PERT and CPM Principles and Applications“, Affiliated East WestPress, 2001 | Wiley, 6th Edition | 2013 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Chris Hendrickson andTung Au | Project Management for Construction | Prentice Hall, Pitsburgh,. | 2012 |
| 2 | Moder.J., Phillips. Cand Davis E | Project Management with CPM”,PERT and Precedence Diagramming | Van Nostrand Reinhold co | 2015 |
| 3 | Willis., E.M | “Scheduling Construction projects” | John Wiley and Sons, | 2015 |
| 4 | Halpin, D.W | Financial and Cost Concepts forConstruction Management | John Wiley and Sons, New York | 2011 |
| 5 | Andrew Baldwin | Construction Planning and Scheduling | I.K International publishing | 2014 |



| 23CEE29 | HOUSING PLANNING AND MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To learn the basics about housing planning and management.
- To give awareness about the existing housing programmes
- To train the students to do the planning and design of housing projects
- To give exposure about the cost effective construction techniques.
- To knowledge about housing finance and project appraisal.

**Course Outcomes:**

23CEE29.CO1 Know the basics of housing planning and management system

23CEE29.CO2 Learn the various housing programmes and role of public and private organization.

23CEE29.CO3 Plan and design the housing projects.

23CEE29.CO4 knowledge about the cost effective construction techniques

23CEE29.CO5 Perform the economic analysis based project appraisal of housing projects.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE29.CO1 | X | - | - | - | - | X | X | X | X | X | - | X | - | X | - |
| 23CEE29.CO2 | X | - | - | - | - | X | X | X | X | X | - | X | - | X | - |
| 23CEE29.CO3 | X | X | X | X | - | X | X | X | X | X | - | X | - | X | - |
| 23CEE29.CO4 | X | X | X | X | - | X | X | X | X | X | - | X | - | X | - |
| 23CEE29.CO5 | X | X | - | - | X | X | X | X | X | X | - | X | - | X | - |

**Unit-I INTRODUCTION TO HOUSING** **9**

Definition of Basic Terms - House, Home, Household - Row houses, Apartments, Multi storied Buildings, Special Buildings - Objectives and Strategies of National Housing Policies - Principle of Sustainable Housing, Housing Laws at State level, Bye - laws at Urban and Rural Local Bodies - DC Regulations, Institutions for Housing at National, State and Local levels.

**Unit-II HOUSING PROGRAMMES** **9**

Basic Concepts, Contents and Standards for various Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organizations.

**Unit-III PLANNING AND DESIGN OF HOUSING PROJECTS** **9**

Formulation of Housing Projects - Site Analysis, Layout Design, Design of Housing Units (Simple designproblems) - Procedure for site analysis and layout planning.

**Unit-IV CONSTRUCTION TECHNIQUES AND COST EFFECTIVE TECHNIQUE** **9**

New construction techniques - Cost effective, Modern Construction Materials, Building centers concept, Functions and Performance Evaluation.

**Unit-V HOUSING FINANCE AND PROJECT APPRAISAL** **9**

Appraisal of Housing Projects - Housing Finance, Cost Recovery - Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern (Problems)

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Meera Mehta and Dinesh Mehta | Metropolitan Housing Markets | Sage Publications Pvt. Ltd., New Delhi. | 2015 |
| 2 | Francis Cherunilam and Odeyar D Heggade | Housing in India | Himalaya Publishing House, Bombay. | 2012 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Wiley- Blackwell | Neufert Architects | 4th Edition, Blackwell Publishing Ltd. | 2012 |
| 2 | Donald Watson andMichael J.Crosbie | Time Saver Standards for Architectural Design | 8th Edition, Tata McGrawHill Edition. | 2011 |
| 3 | Walter Martin Hosack | Land Development Calculations | McGraw Hill 2nd Edition. | 2010 |
| 4 | Meera Mehta andDinesh Mehta | Metropolitan Housing Markets | Sage Publications Pvt. Ltd.,New Delhi. | 2015 |
| 5 | Francis Cherunilam andOdeyar D Heggade | Housing in India | Himalaya Publishing House,Bombay. | 2012 |

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| 23CEE30 | ENGINEERING ECONOMICS AND COST ANALYSIS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To learn about basics of economics.
- To understand the concepts of demand and schedule.
- To learn about different types of organization
- To learn the concepts behind the process of financing.
- To learn about cost and break even analysis.

**Course Outcomes:**

23CEE30.CO1 Know the basic concepts of economics.

23CEE30.CO2 Know about demand and schedule

23CEE30.CO3 Understand about different types of organizations

23CEE30.CO4 Understood the financing process.

23CEE30.CO5 Apply cost and break even analysis.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE30.CO1 | X | - | - | - | - | X | X | X | X | X | - | X | - | X | - |
| 23CEE30.CO2 | X | - | - | - | - | X | X | X | X | X | - | X | - | X | - |
| 23CEE30.CO3 | X | X | X | X | - | X | X | X | X | X | - | X | - | X | - |
| 23CEE30.CO4 | X | X | X | X | - | X | X | X | X | X | - | X | - | X | - |
| 23CEE30.CO5 | X | X | - | - | X | X | X | X | X | X | - | X | - | X | - |

**Unit-I BASIC ECONOMICS 9**

Definition of economics - nature and scope of economic science - nature and scope of managerial economics - basic terms and concepts - goods - utility - value - wealth - factors of production - land - its peculiarities - labour - economies of large and small scale - consumption - wants - its characteristics and classification - law of diminishing marginal utility - relation between economic decision and technical decision.

**Unit-II DEMAND AND SCHEDULE 9**

Demand - demand schedule - demand curve - law of demand - elasticity of demand - types of elasticity - factors determining elasticity - measurement - its significance - supply - supply schedule - supply curve - law of supply - elasticity of supply - time element in the determination of value - market price and normal price - perfect competition - monopoly - monopolistic competition.

**Unit-III ORGANISATION 9**

Forms of business - proprietorship - partnership - joint stock company - cooperative organization - state enterprise - mixed economy - money and banking - banking - kinds - commercial banks - central banking functions - control of credit - monetary policy - credit instrument.

**Unit-IV FINANCING 9**

Types of financing - Short term borrowing - Long term borrowing - Internal generation of funds - External commercial borrowings - Assistance from government budgeting support and international finance corporations - analysis of financial statement – Balance Sheet - Profit and Loss account - Funds flow statement.

**Unit-V COST AND BREAK EVEN ANALYSES 9**

Types of costing - traditional costing approach - activity base costing - Fixed Cost - variable cost - marginal cost - cost output relationship in the short run and in long run - pricing practice - full cost pricing - marginal cost pricing - going rate pricing - bid pricing - pricing for a rate of return - appraising project profitability - internal rate of return - payback period - net present value - cost benefit analysis - feasibility reports - appraisal process - technical feasibility economic feasibility - financial feasibility - Break even analysis - basic assumptions - break even chart - managerial uses of break even analysis.

**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Dewett K.K andvarma J.D | Elementary Economic Theory | S. Chand & Co | 2006 |
| 2 | Sharma JC | Construction Management and Accounts | Oxford and IBH, New Delhi. | 2013 |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Adhikary M | Managerial Economics | Khosla Publishers. | 2015 |
| 2 | n M Y andP K | Financial management | McGraw-Hill publishing | 2013 |
| 3 | Varshney R L andMaheswary K L | Managerial Economics | S Chand and Co | 2017 |
| 4 | Ramachandra Aryashri | Engineering Economics and Financial Accounting | McGraw-Hill | 2015 |
| 5 | Collier, C.A and C. R. Glagola | Engineering Economic and CostAnalysis | Pearson | 2012 |

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| 23CEE31 | WATERSHED CONSERVATION AND MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To provide the technical and sociological understanding of a watershed.
- To provide a comprehensive discourse on the engineering practices of watershed management for realizing the higher benefits
- To protect, conserve and improve the land of watershed for more efficient and sustained production
- To protect and enhance the water resource originating in the watershed
- To manage and utilize the runoff water for useful purpose

**Course Outcomes:**

| | |
|---|---|
| 23CEE31.CO1 | Recognize and Interpret the morphological features of a watershed |
| 23CEE31.CO2 | State, design and sketch the soil conservation structures |
| 23CEE31.CO3 | Describe the micro catchment and apply the concepts to design the small water harvesting structures |
| 23CEE31.CO4 | Illustrate the application of modern tools and technology in the management of watershed. |
| 23CEE31.CO5 | Classify the management activities and to develop an integrated watershed development plan. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE31.CO1 | - | x | - | x | - | - | x | x | x | - | - | - | x | x | x |
| 23CEE31.CO2 | x | x | x | - | x | x | - | - | - | x | - | - | x | x | - |
| 23CEE31.CO3 | x | x | x | - | - | x | - | - | - | x | - | - | x | x | - |
| 23CEE31.CO4 | - | x | - | - | x | - | - | - | - | x | - | x | x | x | - |
| 23CEE31.CO5 | x | x | x | x | - | - | - | x | - | - | x | - | x | x | x |

**Unit-I WATERSHED CONCEPTS** **9**

Watershed – Definition, Need and Elements – Principles - Influencing Factors: Geology – Soil - Morphological Characteristics - Toposheet - Delineation – Codification – Prioritization – Watershed Atlas

**Unit-II SOIL CONSERVATION MEASURES** **9**

Types of Erosion – Water and Wind Erosion: Causes, Factors, Effects and Management – Soil Conservation Measures: Agronomical and Mechanical – Design of Terraces and Bunds - Estimation of Soil Loss – USLE Equation – Sedimentation

**Unit-III WATER HARVESTING AND CONSERVATION** **9**

Yield from a Catchment - Traditional Water Harvesting Techniques – Micro-Catchments - Design of Small Water Harvesting Structures: Farm Ponds, Percolation Tanks, Check dams, Grassed Waterways.

**Unit-IV GIS FOR WATERSHED MANAGEMENT** **9**

Applications of Remote Sensing and Geographical Information System - Role of Decision Support System – Conceptual Models and Case Studies.

**Unit-V WATERSHED MANAGEMENT** **9**

Project Proposal Formulation - Watershed Development Plan – Entry Point Activities – Watershed Economics - Agroforestry – Grassland Management – Wasteland Management – Watershed Approach in Government Programmes – People's Participation – Evaluation of Watershed Management Programmes – Integrated Watershed Management – Case studies

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Ghanashyam Das | Hydrology and Soil Conservation Engineering | Prentice Hall of India Private Limited, New Delhi, Second Edition | 2009. |
| 2 | Suresh, R | Soil and Water Conservation Engineering | Standard Publishers and Distributors Private Limited, New Delhi | 2020 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Glenn O Schwab. etal | Soil and Water Conservation engineering | Wiley India Private Limited | 2009 |
| 2 | Heathcote, I | Integrated Watershed Management: Principles and Practice | John Wiley and Sons, Inc., New York, Second Edition. | 2009 |
| 3 | John G. Lyon | GIS for Water Resources and Watershed Management | CRC Press | 2002 |
| 4 | Vijay P. Singh, Donald K. Frevert | Watershed Models | CRC Press | 2005 |
| 5 | Vir Singh, Raj | Watershed Planning and Management | Bio- Green Publisher | 2016 |

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| 23CEE32 | COASTAL ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- Explain and quantify ocean/lake wave processes including wave generation, propagation, refraction, shoaling, diffraction, and breaking
- To provide the students the knowledge of coastal environment and to determine the characteristics of waves
- To provide the students the knowledge of wave transformation, sediment transport, coastal protection measures and coastal structure design
- Characterize and quantify basic coastal sediment transport processes and rates
- Analyze coastal sites to determine design waves by utilizing historical and bathymetric data

**Course Outcomes:**

| | |
|---|---|
| 23CEE32.CO1 | Understand the basic concepts of coastal environment |
| 23CEE32.CO2 | Calculate sea state parameters (wave height, wave period, water levels) in shallow and deep water conditions |
| 23CEE32.CO3 | Understand the principles of near-shore wave transformation |
| 23CEE32.CO4 | Analysis the sediment and its transport processes |
| 23CEE32.CO5 | Evaluate measures to protect beaches from erosion due to waves and currents |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE32.CO1 | x | x | x | - | - | - | - | - | - | - | - | - | x | - | - |
| 23CEE32.CO2 | x | x | x | - | - | - | - | - | - | - | - | - | x | x | - |
| 23CEE32.CO3 | x | x | x | - | - | - | - | - | - | - | - | - | x | - | - |
| 23CEE32.CO4 | x | x | x | - | - | - | - | - | - | - | - | - | x | - | - |
| 23CEE32.CO5 | x | - | - | - | x | - | - | - | - | - | - | - | - | x | - |

**Unit-I COASTAL ENVIRONMENT 9**

Beaches - Coastal features - Coastal Zonation - EEZ -Inshore and Offshore Areas - Mean Sea level - Basics of Tides and Waves - Coastal Morphology

**Unit-II WAVES DYNAMICS 9**

Basics of waves - Classification - Wave Theory - Physical Characteristics of different types of waves - Linear Wave Theory - Wave celerity - Velocities -Accelerations - Displacements - Wave dynamics in shallow and deep water conditions.

**Unit-III NEARSHORE WAVE TRANSFORMATION 9**

Shoaling, refraction, diffraction and breaking– Interaction currents and waves- near shore currents- wave run-up and overtopping

**Unit-IV SEDIMENT DYNAMICS AND TRANSPORT 9**

Introduction to sediments, Sediment Analysis, types and sizes of sediments, sedimentation processes, sediment Supply & movement - Cross-shore sediment transport - Long shore sediment transport - Shoreline Changes - Shoreline Evolution - Erosion & Accretion

**Unit-V SHORE PROTECTION 9**

Design of shore defense structures; Hard Engineering measures - Sea walls, Revetments, Bulkheads, Dikes, Groynes, Breakwaters; Soft Engineering measures – Artificial Reefs, Beach nourishment, Dune regeneration, Salt marsh Creation, Bioshields - Case studies

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Kamphuis, J.W | Introduction to coastal engineering and management | - | 2000 |
| 2 | Dean, R.G. and Dalrymple, R.A., | Water wave mechanics for Engineers and Scientists | Prentice- Hall, Inc., Englewood Cliffs, New Jersey. | 1994 |
| 3 | Mani J.S | "Coastal Engineering book", | PHI Publishing Company, 2nd Edition. | 2021 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Ippen, A.T | Estuary and Coastline Hydrodynamics | McGraw-Hill Book Company, Inc., New York. | 1978. |
| 2 | Sorenson, R.M | Basic Coastal Engineering | A Wiley-Interscience Publication | 1978 |

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| 23CEE33 | DRONE SURVEYING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- To learn the components in Drone
- Explain the planning process in Drone Surveying
- Discuss the software workflow
- To know the concepts of mapping , RTK and GCP
- To learn the drone data processing

**Course Outcomes:**

23CEE33.CO1 Explain the fundamentals of Drone surveying

23CEE33.CO2 Describe the Methods of Surveying with Drone

23CEE33.CO3 Explain the concepts of Image processing and Photogrammetry

23CEE33.CO4 Explain Modeling with Drones

23CEE33.CO5 Discuss the Drone applications

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE33.CO1 | x | x | x | x | x | x | - | x | x | - | x | - | x | x | x |
| 23CEE33.CO2 | x | x | x | x | x | x | - | x | x | - | x | - | x | x | x |
| 23CEE33.CO3 | x | x | x | x | x | x | - | x | x | - | x | - | x | x | x |
| 23CEE33.CO4 | x | x | x | x | x | x | x | x | x | - | x | x | x | x | x |
| 23CEE33.CO5 | x | x | x | x | x | x | x | x | x | - | x | x | x | x | x |

**Unit-I INTRODUCTION ON DRONES 9**

Introduction to Drones, History of Drone/UAS/UAVs, payload, battery life, Specs for good results, Regulations of DGCA and Drone license, Pre and Post Flight planning- Flight execution and photography, data collection- Image Format, GSD, Scale and Resolution

**Unit-II SURVEYING WITH DRONE 9**

Consideration for hardware selections, comparison on surveying drone and its accuracy, Techniques of controlling errors, Consideration of GCP in vertical and horizontal accuracies, Planning and estimation of drone surveying jobs, Autonomous flight vs. manual and hybrid flight profiles

**Unit-III IMAGE PROCESSING AND PHOTOGRAMMETRY 9**

Aerial Triangulation, post processing softwares, Analyzing Data, Contouring, DEM, DSM, Cut, Fill, and Volumetric Measurement Calculation and orthophoto generation

**Unit-IV MAPPING AND MODELING 9**

Introduction to mapping and modeling concepts, Understanding RTK, PPK and GCP's, Overview of popular data processing software platforms and functions

**Unit-V APPLICATIONS 9**

Application of drone for Surveying & Mapping-Construction, Irrigation and Agricultural, Engineering Land Survey and Transportation.

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Lillesand and Kiefer | Remote Sensing and Image Interpretation | John Wiley and Sons | 2008 |
| 2 | A.M. Chandra, S.K. Ghosh | Remote Sensing and Geographical Information System | Narosa Publishing house, 1st Edition. | 2007 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | David P Paine | Aerial Photography and Image Interpretation | Wiley | 2006 |

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| 23CEE34 | LAWS FOR CIVIL ENGINEERS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- The contract and arbitration laws
- The fundamental constitutional rights and laws related to RTI
- The human rights and labour laws
- Legal requirements and statutory regulations
- Copyright and patent laws related to products developed

**Course Outcomes:**

23CEE34.CO1 Exercise the contract and arbitration laws during conflicts in projects

23CEE34.CO2 Practice the fundamental constitutional rights and laws related to RTI

23CEE34.CO3 Adopt human rights and labour laws for smooth project operations

23CEE34.CO4 Apply tax and property laws during purchasing and selling of properties

23CEE34.CO5 Register copyright and patent laws for the products developed

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE34.CO1 | x | x | x | x | x | x | - | x | x | - | x | - | x | x | x |
| 23CEE34.CO2 | x | x | x | x | x | x | - | x | x | - | x | - | x | x | x |
| 23CEE34.CO3 | x | x | x | x | x | x | - | x | x | - | x | - | x | x | x |
| 23CEE34.CO4 | x | x | x | x | x | x | x | x | x | - | x | x | x | x | x |
| 23CEE34.CO5 | x | x | x | x | x | x | x | x | x | - | x | x | x | x | x |

**Unit-I CONTRACT AND ARBITRATION LAWS 9**

Indian contracts act - Elements - Types and features of contracts - Suitability - Design of contract documents -International and standard contract documents - Law of torts - Transparency in tenders act. Arbitration - Comparison of acts and laws - Agreements - Violations - Appointment of arbitrators - Conditions ofarbitration - Powers and duties of arbitrator - Rules of evidence - Enforcement of award - Costs.

**Unit-II FUNDAMENTAL CONSTITUTIONAL RIGHTS AND LAWS RELATED TO RTI 9**

Constitutional Law - Fundamental Rights - Directive principles of State policy - Fundamental Duties – Emergency provisions - kinds, legal requirements and legal effects - Right to Information Act - Official Secret Act - IndianEvidence Act - Information Technology Act.

**Unit-III HUMAN RIGHTS AND LABOUR LAWS 9**

Introduction - Human Rights in Indian tradition and Western tradition - Civil & Political Rights - Economic, Social and Cultural Rights-Laws for social security - Welfare legislation - Insurance and safety regulations - Workmen's compensation Act - Indian factory Act - Tamilnadu factory Act - Child labour Act - Industrial Disputes Act - Industrial Employment (Standing Orders) Act.

**Unit-IV LEGAL REQUIREMENTS 9**

Insurance and bonding - Laws governing sale, purchase and use of urban and rural land - Land revenue codes – Tax laws - Income tax, Sales tax, Excise and Custom duties and their influence on construction costs - Legal requirementsfor planning - Property law - Agency law - Local government laws for approval – Statutory.

**Unit-V COPYRIGHT AND PATENT LAWS 9**

Law relating to Intellectual property - Main forms of IP, Copyright, Trademarks, Patents and Designs - Secrets -International instruments on IP - International organizations relating to IPR - Law relating to Trademarks under Trademark Act - Law relating to Patents under Patents Act - Process of obtaining patent - Rights and obligations of patentee, Duration of patents - Law and policy considerations, Infringement and related remedies.

**Total Periods: 45**

**Text Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Nikita AgarawaL Rishi Kumar | Laws for Engineers | Genius Publications | 2016. |
| 2 | Abrahamson M.V | Engineering Law and the I.C.E Contracts | - | 2016. |

**Reference Books:**

| Sl.No. | Author(s) | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Gajaria G.T | Laws Relating to Building and Engineering Contracts in India | Lexis Nexis; Fourth edition | 2000 |
| 2 | Lexis Nexis; Fourth edition | Construction Contracts | McGraw-Hill Education; 3 edition, | 2013 |
| 3 | Joseph T. Bockrath | Contracts and the Legal Environment for Engineers and Architects | Seventh Edition, McGraw Hill | 2013 |

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| 23CEE35 | FUNDAMENTALS OF FIRE SAFETY ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 3 | 3 |

**Course Objective:**

- To provide an in depth knowledge about the fundamentals of fire and explosion
- To understand the causes and effects of fire and explosion
- To know the various fire and explosion prevention systems and protective equipment
- To understand the protection of building from fire
- understand the various fire prevention techniques to be followed in a building

**Course Outcomes:**

23CEE35.CO1 Make familiar about basic concepts of fire science

23CEE35.CO2 Understand the operation of various types of firefighting equipment

23CEE35.CO3 Know the different causes and effects of fire.

23CEE35.CO4 Equip the students to effectively employ fire protection techniques in building.

23CEE35.CO5 Understand the technics of prevention of explosion

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE35.CO1 | x | x | x | x | x | x | - | x | x | - | x | - | x | x | x |
| 23CEE35.CO2 | x | x | x | x | x | x | - | x | x | - | x | - | x | x | x |
| 23CEE35.CO3 | x | x | x | x | x | x | - | x | x | - | x | - | x | x | x |
| 23CEE35.CO4 | x | x | x | x | x | x | x | x | x | - | x | x | x | x | x |
| 23CEE35.CO5 | x | x | x | x | x | x | x | x | x | - | x | x | x | x | x |

**Unit-I FUNDAMENTALS OF FIRE 9**

Combustion process & concepts, combustion in solids, liquid, gases- smouldering fires- Spontaneous combustion -rapid fire progress phenomena- Properties influencing fire hazard – properties of solid, liquid and gaseous fuels -classification of fires.

**Unit-II FIRE CONTROL 9**

Fire extinguishers – Location and operation of extinguishers - Extinguishing methods- extinguishing agents: water,foam, chemical powder, CO2, sand, steam, saw dust – Fire detectors – Fire tender - Automatic fire extinguishing system - Fixed firefighting installations - Risk analysis: risk assessment, consequence analysis, risk reduction – Fire drill – Emergency procedures.

**Unit-III PRODUCTS AND EFFECTS OF COMBUSTION 9**

Heat: Conduction, convection, radiation- effects of heat- effects of flames – different fire gases and their effects –effects of smoke on humans– Smoke movement control and venting

**Unit-IV BUILDING FIRE SAFETY 9**

Objectives of fire safe building design, Fire load, fire resistant material and fire testing – concept of egress design -exits – width calculations -– fire safety requirements for high rise buildings – Behavior of materials & structures infire – Concrete and steel. Flame spread in high rise building – Statutory requirements

**Unit-V FUNDAMENTALS OF EXPLOSION 9**

Introduction – Explosion fundamentals – Types – - Effects of explosion – Negative pressure wave – Fragmentation –Physical, Boiling Liquid Expanding Vapour Explosion, Chemical explosion – Vapour cloud explosion – Dust explosion

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Purandare D.D., Abhay D. Purandare | Hand Book on Industrial Fire Safety | P & A Publications | 2006. |
| 2 | Jain V.K | Fire Safety in Building | Taylor & Francis, 2nd edition | 2016. |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Gupta, R | Hand Book of Fire Technology | Orient Longman Bombay, | 2010 |
| 2 | Dinko Tuhtar | Fire and explosion protection – A system approach | ", Ellis Horwood Ltd | 1989 |
| 3 | - | "Fire Prevention Hand Book", | NFPA, 20th edition | 1988 |

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| 23CEE36 | BASICS OF INTERIOR DESIGN | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**

- The fundamentals related to the interior design
- The principles of interior design
- The uses of materials in interior design
- The utilization of furniture in various rooms.
- Various types of staircases

**Course Outcomes:**

23CEE36.CO1 Apply the concepts of interior design into practice

23CEE36.CO2 Analyse the fundamentals of interior design based on site conditions.

23CEE36.CO3 Practice the interior design using locally available materials

23CEE36.CO4 Design the rooms elegantly with various type of furniture styles

23CEE36.CO5 Apply the fundamental concepts in the choice of staircases

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEE36.CO1 | x | x | x | x | x | x | - | x | x | - | x | - | x | x | x |
| 23CEE36.CO2 | x | x | x | x | x | x | - | x | x | - | x | - | x | x | x |
| 23CEE36.CO3 | x | x | x | x | x | x | - | x | x | - | x | - | x | x | x |
| 23CEE36.CO4 | x | x | x | x | x | x | x | x | x | - | x | x | x | x | x |
| 23CEE36.CO5 | x | x | x | x | x | x | x | x | x | - | x | x | x | x | x |

**Unit-I ELEMENTS OF INTERIOR DESIGN 9**

Drawing instruments - Materials used - Care and maintenance - Introduction to code of practice - General Interior and Interior drawings - Definitions - Construction of plan - Elevation - Section - Use anthropometrics in interiors

**Unit-II PRINCIPLES OF INTERIOR DESIGN 9**

Introduction - Basic interiors - Elements - Principles of design - Color and color scheme – Choice and use of colours -Balance – Order

**Unit-III MATERIALS UTILIZATION IN INTERIOR DESIGN 9**

Introduction - Properties of materials - Types of ceramic materials - Glasses and plywood - Their utilization in interior design

**Unit-IV INTERIOR LAYOUT 9**

Space selection - Furniture styles - Selection of furniture - Use of furniture templates - Design of furniture – Different purposes – Bedrooms, dining hall, kitchen and office space - Measurement of drawing as per design

**Unit-V STAIRCASES 9**

Materials - Plan and design of staircase - Details of construction - Bricks - Stone - R.C.C – Mezzinine floor - Elegance -Order in choice of staircase

**Total Periods: 45**

| Text Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Pratap R M | Interior Design principles and practice | Standard publishers distribution, Delhi | 2012 |
| 2 | Faulkner S and Faulkner R | Inside Today's Home | Rine hart publishing company, Newyork | 2005 |

| Reference Books: | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Author(s)** | **Title of the Book** | **Publisher** | **Year of Publication** |
| 1 | Seetharaman, P and Pannu, P | Interior Design and Decoration | CBS publishers and Distributors, New Delhi | 2017 |
| 2 | Binggeli, Corky | Materials for Interior Environments | Bloomsbury Academic | 2016 |
| 3 | Ching, Francis D. K., and Corky Binggeli | Interior Design Illustrated. 6th ed. | John Wiley and Sons, Inc | 2018 |
| 4 | Arora and Bindra | Building Construction | Dhanpatrai &Sons | 2012 |

| 23CEG01 | DESIGN COMPREHENSIVE PROJECT | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 4 | 2 |

**Course Objective:**

- The objective of this course is to impart and improve the design & experimental capability of the student. At the end of the course the group should submit a complete report on the design or Experimental problem consisting of the data given, the design calculations, specifications if any and complete set of drawings or methodology which will be followed by the design and / or experimental results.

**Course Outcomes:**

23CEG01.CO1 To prepare plan for various types of structures.

23CEG01.CO2 To Analyze and design various components of structures using software.

23CEG01.CO3 To prepare the working and approval drawings for Civil engineering structures

23CEG01.CO4 To apply suitable software for the projects.

23CEG01.CO5 To prepare the project reports in the prescribed formats.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEG01.CO1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEG01.CO2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEG01.CO3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEG01.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEG01.CO5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

The design project involves the following:

- Preparation of plan of a Civil engineering structure.
- Analysis and design of the structure
- Preparation of detailed drawings
- Consolidated report preparation

**EVALUATION PROCEDURE**

The method of evaluation will be as follows:

1. Internal Marks: 40 marks

(Decided by conducting 3 reviews by the Project Coordinator appointed by the HoD)

2. Evaluation of Project Report: 60 marks

(Evaluated by the examiner appointed by the HoD with the approval of HoD)

**Total Periods: 60**

**Total Marks: 100**

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| 23CEG02 | PROJECT WORK PHASE - I | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 6 | 3 |

**Course Objective:**

- To develop the ability to solve the civil engineering related problems.
- To solve the various literature review suggestions.
- To Create a new or modern ideas to solve the social issues and developments.
- To able to work as team and contribution of work in the team.
- To train the students in preparing project reports and to face reviews and viva voce examination.

The objective of this course is to impart and improve the design capability of the student. This course conceives purely a design problem in any one of the disciplines of Civil Engineering; e.g., Design of an RC structure, Design of a waste water treatment plant, Design of a foundation system, Design of traffic intersection etc. The design problem can be allotted to either an individual student or a group of students comprising of not more than four. At the end of the course the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.

**Course Outcomes:**

23CEG02.CO1 To prepare plan for various types of structures.

23CEG02.CO2 To Analyze and design various components of structures using software.

23CEG02.CO3 To prepare the working and approval drawings for Civil engineering structures

23CEG02.CO4 To apply suitable software for the projects.

23CEG02.CO5 To prepare the project reports in the prescribed formats.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEG02.CO1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEG02.CO2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEG02.CO3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEG02.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEG02.CO5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

**EVALUATION PROCEDURE**

The method of evaluation will be as follows:

1. Internal Marks : 20 marks
   (Decided by conducting 3 reviews by the guide appointed by the Institution)
2. Evaluation of Project Report : 30 marks
   (Evaluated by the external examiner appointed the University).
   Every student belonging to the same group gets the same mark
3. Viva voce examination : 50 marks
   (Evaluated by the internal examiner appointed by the HOD with the approval of HOI, external examiner appointed by the University and Guide of the course – with equal Weight age)

**Total Periods: 90**

**Total Marks: 100**

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RASIPURAM - 637 408.

| 23CEG03 | PROJECT WORK PHASE - II | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 18 | 9 |

**Course Objective:**

- To develop the ability to solve the civil engineering related problems.
- To solve the various literature review suggestions.
- To Create a new or modern ideas to solve the social issues and developments.
- To able to work as team and contribution of work in the team.
- To train the students in preparing project reports and to face reviews and viva voce examination.

The objective of the project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to Civil Engineering. Every project work shall have a guide who is a member of the faculty of Civil Engineering of the college. The hours allotted for this course shall be utilized by the students to receive directions from the guide, library reading, laboratory work, computer analysis or field work. The student should also to present the periodical seminars about the progress made in the project. Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusions. This experience of project work shall help the student in expanding his / her knowledge base and also provide opportunity to utilize the creative ability and inference capability.

**Course Outcomes:**

| | |
|---|---|
| 23CEG03.CO1 | Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability. |
| 23CEG03.CO2 | Able to function on multidisciplinary teams |
| 23CEG03.CO3 | Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice. |
| 23CEG03.CO4 | Able to understand the role of Civil Engineers and ethical responsibility. |
| 23CEG03.CO5 | Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering. |

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 23CEG03.CO1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEG03.CO2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEG03.CO3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEG03.CO4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 23CEG03.CO5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

**EVALUATION PROCEDURE**

The method of evaluation will be as follows:

1. Internal Marks : 50 marks
(Decided by conducting 3 reviews)
2. Evaluation of Project Report : 20 marks
(Evaluated by the examiner appointed by the COE (Autonomous).
Every student belonging to the same group gets the same mark.
3. Viva Voce examination : 30 marks
Evaluated by the examiner appointed by the HOD with the approval of HOI,
External examiner appointed by the COE (Autonomous)

**Total Periods: 90**

**Total Marks: 100**

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