# NANDHA ENGINEERING COLLEGE

(An Autonomous Institution affiliated to Anna University Chennai and approved by AICTE, New Delhi)
Erode-638 052, Tamilnadu, India, Phone: 04294 – 225585

**Curriculum and Syllabi**

**for**

**B.E – Civil Engineering [R22]**

**[CHOICE BASED CREDIT SYSTEM]**

(This Curriculum and Syllabi are applicable to Students admitted of (2022-2026) and (2023-2027) Batches only)

**JULY 2024**

| INSTITUTE VISION AND MISSION | |
|---|---|
| **VISION** | • To be an Institute of excellence providing quality Engineering, Technology and Management education to meet the ever changing needs of the society. |
| **MISSION** | • To provide quality education to produce ethical and competent professionals with social Responsibility<br>• To excel in the thrust areas of Engineering, Technology and Entrepreneurship by solving real- world problems.<br>• To create a learner centric environment and improve continually to meet the changing global needs. |

| B.E – CIVIL ENGINEERING | |
|---|---|
| **VISION** | • To foster academic excellence by imparting knowledge in civil engineering and allied disciplines to meet the ever growing needs of the society. |
| **MISSION** | • To impart quality education to produce professionals with social responsibility.<br>• To excel in the thrust areas of civil and allied engineering to solve real world problems.<br>• To create a learner centric environment with continual progress to meet the global engineering needs. |
| **PROGRAMME EDUCATIONAL OBJECTIVES (PEO)** | The graduates of civil engineering will be<br>**PEO1: Core Competency:** Successful professionals with core competency and inter-disciplinary skills to satisfy the industrial needs.<br>**PEO2: Research, Innovation and Life-long Learning:** Capable of identifying technological requirements for the society and providing innovative ideas for real time problems.<br>**PEO3: Ethics, Human values and Entrepreneurship:** Able to demonstrate ethical practices and managerial skills through continuous learning. |
| **PROGRAMME SPECIFIC OUTCOMES (PSO)** | The students of civil engineering will be able to<br>• Plan, analyze, design and prepare technical reports for civil engineering structures<br>• Apply advanced techniques and management skills for the execution of civil engineering projects. |

**PROGRAM OUTCOMES:**

At the end of this programme the students will be able to

| a-l | GRADUATE ATTRIBUTES | PO No. | PROGRAMME OUTCOMES |
|---|---|---|---|
| a | Engineering Knowledge | PO1 | Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. |
| b | Problem Analysis | PO2 | Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. |
| c | Design and Development of Solutions | PO3 | 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. |
| d | Conduct Investigation of Complex Problems | PO4 | 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. |
| e | Modern Tool Usage | PO5 | 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. |
| f | The Engineer and Society | PO6 | 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. |
| g | Environment and Sustainability | PO7 | Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. |
| h | Ethics | PO8 | Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| i | Individual and Team Work. | PO9 | Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. |
| j | Communication | PO10 | 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. |
| k | Project Management and Finance | PO11 | Demonstrate knowledge and understanding of the engineering and 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. |
| l | Lifelong Learning | PO12 | Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. |

## MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the programme educational objectives and the programme outcomes is given in the following table

| PROGRAMME EDUCATIONAL OBJECTIVES | PROGRAMME OUTCOMES | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L |
| 1 | 3 | 1 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 3 |
| 2 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 |
| 3 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |

## MAPPING OF PROGRAM SPECIFIC OUTCOMES WITH PROGRAMME OUTCOMES

A broad relation between the program specific outcomes and the programme outcomes is given in the following table

| PROGRAM SPECIFIC OUTCOMES | PROGRAMME OUTCOMES | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L |
| 1 | 2 | 1 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 3 |
| 2 | 1 | 1 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 3 |

**Contribution 1: Reasonable 2: Significant 3: Strong**

**NANDHA ENGINEERING COLLEGE (AUTONOMOUS), ERODE – 638 052**

**REGULATIONS - 2022 CHOICE BASED CREDIT SYSTEM**

**B.E. CIVIL ENGINEERING**

| SEMESTER: I | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S. NO.** | **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **PRE REQUISITE** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| 1 | 22MAN01 | Induction Programme | MC | - | 0 | 0 | 0 | 0 | 0 |
| **THEORY** | | | | | | | | | |
| 2 | 22EYA01 | Professional Communication - I | HSMC | - | 4 | 2 | 0 | 2 | 3 |
| 3 | 22MYB01 | Calculus and Linear Algebra* | BSC | - | 4 | 3 | 1 | 0 | 4 |
| 4 | 22CYB02 | Chemistry for Engineers | BSC | - | 3 | 3 | 0 | 0 | 3 |
| 5 | 22EEC01 | Basic Electrical and Electronics Engineering | ESC | - | 3 | 3 | 0 | 0 | 3 |
| 6 | 22MEC01 | Engineering Graphics | ESC | - | 4 | 2 | 0 | 2 | 3 |
| 7 | 22GYA01 | தமிழர் மரபு / Heritage of Tamils | HSMC | - | 1 | 1 | 0 | 0 | 1 |
| **PRACTICAL** | | | | | | | | | |
| 8 | 22GEP01 | Engineering Practices Laboratory | ESC | - | 4 | 0 | 0 | 4 | 2 |
| 9 | 22CYP01 | Chemistry Laboratory* | BSC | - | 2 | 0 | 0 | 2 | 1 |
| **Mandatory Non Credit Courses** | | | | | | | | | |
| 10 | 22MAN02 | Soft/Analytical Skills - I | MC | - | 3 | 1 | 0 | 2 | 0 |
| 11 | 22MAN03 | Yoga - I* | MC | - | 1 | 0 | 0 | 1 | 0 |
| | | | | **TOTAL** | **29** | **15** | **1** | **13** | **20** |

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| SEMESTER: II | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S. NO.** | **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **PRE REQUI SITE** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| **THEORY** | | | | | | | | | |
| 1 | 22EYA02 | Professional Communication- II | HSMC | 22EYA01 | 4 | 2 | 0 | 2 | 3 |
| 2 | 22MYB02 | Partial Differential Equations and Transform Techniques* | BSC | - | 4 | 3 | 1 | 0 | 4 |
| 3 | 22PYB02 | Advanced Materials and Nanotechnology | BSC | - | 3 | 3 | 0 | 0 | 3 |
| 4 | 22CSC01 | Problem Solving and C Programming* | ESC | - | 3 | 3 | 0 | 0 | 3 |
| 5 | 22CEC01 | Fundamentals of Engineering Mechanics | ESC | - | 3 | 2 | 1 | 0 | 3 |
| 6 | 22CYB08 | Environment and Sustainability* | BSC | - | 2 | 2 | 0 | 0 | 2 |
| 7 | 22GYA02 | தமிழரும் தொழில்நுட்பமும் / Tamils and Technology | HSMC | - | 1 | 1 | 0 | 0 | 1 |
| **PRACTICAL** | | | | | | | | | |
| 6 | 22PYP01 | Physics Laboratory* | BSC | - | 2 | 0 | 0 | 2 | 1 |
| 7 | 22CSP01 | Problem Solving and C Programming Laboratory* | ESC | - | 4 | 0 | 0 | 4 | 2 |
| **Mandatory Non Credit Courses** | | | | | | | | | |
| 8 | 22MAN04 | Soft/Analytical Skills - II | MC | - | 3 | 1 | 0 | 2 | 0 |
| 9 | 22MAN05 | Yoga - II* | MC | - | 1 | 0 | 0 | 1 | 0 |
| | | | | **TOTAL** | **30** | **17** | **2** | **11** | **22** |

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| SEMESTER: III | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S. NO.** | **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **PRE REQUISITE** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| **THEORY** | | | | | | | | | |
| 1 | 22MYB03 | Statistics and Numerical Methods | BSC | - | 4 | 3 | 1 | 0 | 4 |
| 2 | 22CEC02 | Mechanics of Materials | ESC | 22CEC01 | 3 | 3 | 0 | 0 | 3 |
| 3 | 22CEC03 | Highway and Railway Engineering | PCC | - | 3 | 3 | 0 | 0 | 3 |
| 4 | 22CEC04 | Surveying | PCC | - | 3 | 3 | 0 | 0 | 3 |
| 5 | 22CEC05 | Construction Materials and Practices | PCC | - | 5 | 3 | 0 | 2 | 4 |
| 6 | 22CEC06 | Fluid Mechanics and Hydraulics Engineering | PCC | - | 5 | 3 | 0 | 2 | 4 |
| **PRACTICAL** | | | | | | | | | |
| 7 | 22CEP01 | Surveying Laboratory | PCC | - | 4 | 0 | 0 | 4 | 2 |
| 8 | 22CEP02 | Computer Aided Building Drawing - I | PCC | - | 4 | 0 | 0 | 4 | 2 |
| **Mandatory Non Credit Courses** | | | | | | | | | |
| 9 | 22MAN07# / 22MAN07R ## | Soft / Analytical Skills - III | MC | - | 3 | 1 | 0 | 2 | 0 |
| | | | | **TOTAL** | **34** | **19** | **1** | **14** | **25** |

# **Applicable for (2022-2026) Batch only**

## **Applicable for (2023-2027) Batch only**

*Ratified by twelfth Academic Council

| SEMESTER: IV | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S. NO.** | **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **PRE REQUI SITE** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| **THEORY** | | | | | | | | | |
| 1 | 22CEC07 | Structural Analysis | PCC | 22CEC02 | 4 | 3 | 1 | 0 | 4 |
| 2 | 22CEC08 | Water Resources and Irrigation Engineering | PCC | - | 3 | 3 | 0 | 0 | 3 |
| 3 | 22CEC09 | Soil Mechanics | PCC | - | 5 | 3 | 0 | 2 | 4 |
| 4 | 22CEC10 | Design of Reinforced Concrete Elements | PCC | - | 3 | 3 | 0 | 0 | 3 |
| 5 | 22CEC11 | Concrete Technology | PCC | 22CEC05 | 3 | 3 | 0 | 0 | 3 |
| 6 | 22CEC12 | Environmental Engineering | PCC | - | 5 | 3 | 0 | 2 | 4 |
| **PRACTICAL** | | | | | | | | | |
| 7 | 22CEP03 | Computer Aided Building Drawing - II | PCC | - | 4 | 0 | 0 | 4 | 2 |
| **Mandatory Non Credit Courses** | | | | | | | | | |
| 8 | 22MAN08#/ 22MAN08R## | Soft/Analytical Skills - IV | MC | | 3 | 1 | 0 | 2 | 0 |
| 9 | 22MAN09 | Indian Constitution | MC | - | 1 | 1 | 0 | 0 | 0 |
| 10 | 22GED01 | Personality and Character Development | EEC | - | 0 | 0 | 0 | 1 | 0 |
| | | | | **TOTAL** | **31** | **20** | **1** | **11** | **23** |

# **Applicable for (2022-2026) Batch only**

## **Applicable for (2023-2027) Batch only**

*Ratified by twelfth Academic Council

| SEMESTER: V | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S. NO.** | **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **PRE REQUISITE** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| **THEORY** | | | | | | | | | |
| 1 | 22CEC13 | Design of Reinforced Concrete Structures | PCC | 22CEC10 | 3 | 3 | 0 | 0 | 3 |
| 2 | 22CEC14 | Foundation Engineering | PCC | 22CEC09 | 3 | 3 | 0 | 0 | 3 |
| 3 | 22CEC15 | Design of Steel Structures | PCC | - | 3 | 3 | 0 | 0 | 3 |
| 4 | E1 | Elective (PEC) | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 5 | E2 | Elective (PEC) | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 6 | E3 | Elective (PEC) | PEC | - | 3 | 3 | 0 | 0 | 3 |
| **PRACTICAL** | | | | | | | | | |
| 7 | 22CEP04 | Concrete Technology Laboratory | PCC | - | 4 | 0 | 0 | 4 | 2 |
| 8 | 22CEP05 | Design and Drawing Laboratory | PCC | - | 4 | 0 | 0 | 4 | 2 |
| **Mandatory Non Credit Courses** | | | | | | | | | |
| 9 | 22MAN10R | Communication and Quantitative Reasoning | MC | - | 3 | 1 | 0 | 2 | 0 |
| | | | | **TOTAL** | **29** | **19** | **0** | **10** | **22** |

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| SEMESTER: VI | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S. NO.** | **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **PRE REQUI SITE** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| **THEORY** | | | | | | | | | |
| 1 | 22CEC16 | Estimating and Costing | PCC | - | 5 | 3 | 0 | 2 | 4 |
| 2 | 22CEC17 | Pre Engineering Buildings | PCC | - | 3 | 3 | 0 | 0 | 3 |
| 3 | E4 | Elective (PEC) | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 4 | E5 | Elective (PEC) | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 5 | E6 | Elective (PEC / OEC) | PEC / OEC | - | 3 | 3 | 0 | 0 | 3 |
| 6 | E7 | Elective (OEC) | OEC | - | 3 | 3 | 0 | 0 | 3 |
| **PRACTICAL** | | | | | | | | | |
| 7 | 22CEP06 | Computer Aided Structural Design Laboratory | PCC | - | 4 | 0 | 0 | 4 | 2 |
| 8 | 22CEP07 | Survey Camp | PCC | - | 2 | 0 | 0 | 2 | 1 |
| | | | | **TOTAL** | **26** | **18** | **0** | **8** | **22** |

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| SEMESTER: VII | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S. NO.** | **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **PRE REQUISITE** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| **THEORY** | | | | | | | | | |
| 1 | 22GEA01 | Universal Human Values | HSMC | - | 2 | 2 | 0 | 0 | 2 |
| 2 | EM1 | Elective (Management) | HSMC | - | 3 | 3 | 0 | 0 | 3 |
| 3 | E8 | Elective (PEC) | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 4 | E9 | Elective (PEC / OEC) | PEC / OEC | - | 3 | 3 | 0 | 0 | 3 |
| 5 | E10 | Elective (OEC) | OEC | - | 3 | 3 | 0 | 0 | 3 |
| **PRACTICAL** | | | | | | | | | |
| 6 | 22CED01 | Design Project | EEC | - | 4 | 0 | 0 | 4 | 2 |
| 7 | 22GED02 | Internship / Industrial Training | EEC | - | - | 0 | 0 | 0 | 2 |
| | | | | **TOTAL** | **18** | **14** | **0** | **4** | **18** |

| SEMESTER: VIII | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S. NO.** | **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **PRE REQUISITE** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| **PRACTICAL** | | | | | | | | | |
| 1 | 22CED02 | Project Work | EEC | - | 20 | 0 | 0 | 20 | 10 |
| | | | | **TOTAL** | **20** | **0** | **0** | **20** | **10** |

**(A) HSMC, BSC and ESC**

**(a) Humanities and Social Sciences including Management Courses (HSMC)**

| S. NO. | COURSE CODE | COURSE TITLE | CATEGORY | PRE REQUISITE | CONTACT PERIODS | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 22EYA01 | Professional Communication - I | HSMC | - | 4 | 2 | 0 | 2 | 3 |
| 2. | 22GYA01 | தமிழர் மரபு / Heritage of Tamils | HSMC | - | 1 | 1 | 0 | 0 | 1 |
| 3. | 22EYA02 | Professional Communication- II | HSMC | 22EYA01 | 4 | 2 | 0 | 2 | 3 |
| 4. | 22GYA02 | தமிழரும் தொழில்நுட்பமும் / Tamils and Technology | HSMC | - | 1 | 1 | 0 | 0 | 1 |
| 5. | 22GEA01 | Universal Human Values | HSMC | - | 2 | 2 | 0 | 0 | 2 |

**(b) Basic Science Courses (BSC)**

| S. NO. | COURSE CODE | COURSE TITLE | CATEGORY | PRE REQUISITE | CONTACT PERIODS | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 22MYB01 | Calculus and Linear Algebra | BSC | - | 4 | 3 | 1 | 0 | 4 |
| 2. | 22CYB02 | Chemistry for Engineers | BSC | - | 3 | 3 | 0 | 0 | 3 |
| 3. | 22CYP01 | Chemistry Laboratory | BSC | - | 2 | 0 | 0 | 2 | 1 |
| 4. | 22MYB02 | Partial Differential Equations and Transform Techniques | BSC | - | 4 | 3 | 1 | 0 | 4 |
| 5. | 22PYB02 | Advanced Materials and Nanotechnology | BSC | - | 3 | 3 | 0 | 0 | 3 |
| 6. | 22CYB08 | Environment and Sustainability | BSC | - | 2 | 2 | 0 | 0 | 2 |
| 7. | 22PYP01 | Physics Laboratory | BSC | - | 2 | 0 | 0 | 2 | 1 |
| 8. | 22MYB03 | Statistics and Numerical Methods | BSC | - | 4 | 3 | 1 | 0 | 4 |

| (c) Engineering Science Courses (ESC) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. NO. | COURSE CODE | COURSE TITLE | CATEGORY | PRE REQUI SITE | CONTACT PERIODS | L | T | P | C |
| 1. | 22EEC01 | Basic Electrical and Electronics Engineering | ESC | - | 3 | 3 | 0 | 0 | 3 |
| 2. | 22MEC01 | Engineering Graphics | ESC | - | 4 | 2 | 0 | 2 | 3 |
| 3. | 22GEP01 | Engineering Practices Laboratory | ESC | - | 4 | 0 | 0 | 4 | 2 |
| 4. | 22CSC01 | Problem Solving and C Programming | ESC | - | 3 | 3 | 0 | 0 | 3 |
| 5. | 22CEC01 | Fundamentals of Engineering Mechanics | ESC | - | 3 | 2 | 1 | 0 | 3 |
| 6. | 22CSP01 | Problem Solving and C Programming Laboratory | ESC | - | 4 | 0 | 0 | 4 | 2 |
| 7. | 22CEC02 | Mechanics of Materials | ESC | 22CEC01 | 3 | 3 | 0 | 0 | 3 |

| (B) Program Core Courses (PCC) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. NO. | COURSE CODE | COURSE TITLE | CATEGORY | PRE REQUI SITE | CONTACT PERIODS | L | T | P | C |
| 1. | 22CEC03 | Highway and Railway Engineering | PCC | - | 3 | 3 | 0 | 0 | 3 |
| 2. | 22CEC04 | Surveying | PCC | - | 3 | 3 | 0 | 0 | 3 |
| 3. | 22CEC05 | Construction Materials and Practices | PCC | - | 5 | 3 | 0 | 2 | 4 |
| 4. | 22CEC06 | Fluid Mechanics and Hydraulics Engineering | PCC | - | 5 | 3 | 0 | 2 | 4 |
| 5. | 22CEP01 | Surveying Laboratory | PCC | - | 4 | 0 | 0 | 4 | 2 |
| 6. | 22CEP02 | Computer Aided Building Drawing - I | PCC | - | 4 | 0 | 0 | 4 | 2 |
| 7. | 22CEC07 | Structural Analysis | PCC | 22CEC02 | 4 | 3 | 1 | 0 | 4 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8. | 22CEC08 | Water Resources and Irrigation Engineering | PCC | - | 3 | 3 | 0 | 0 | 3 |
| 9. | 22CEC09 | Soil Mechanics | PCC | - | 5 | 3 | 0 | 2 | 4 |
| 10. | 22CEC10 | Design of Reinforced Concrete Elements | PCC | - | 3 | 3 | 0 | 0 | 3 |
| 11. | 22CEC11 | Concrete Technology | PCC | 22CEC05 | 3 | 3 | 0 | 0 | 3 |
| 12. | 22CEC12 | Environmental Engineering | PCC | - | 5 | 3 | 0 | 2 | 4 |
| 13. | 22CEC13 | Design of Reinforced Concrete Structures | PCC | - | 3 | 3 | 0 | 0 | 3 |
| 14. | 22CEC14 | Foundation Engineering | PCC | 22CEC09 | 3 | 3 | 0 | 0 | 3 |
| 15. | 22CEC15 | Design of Steel Structures | PCC | - | 3 | 3 | 0 | 0 | 3 |
| 16. | 22CEP04 | Concrete Technology Laboratory | PCC | - | 4 | 0 | 0 | 4 | 2 |
| 17. | 22CEP05 | Design and Drawing Laboratory | PCC | - | 4 | 0 | 0 | 4 | 2 |
| 18. | 22CEC16 | Estimating and Costing | PCC | - | 5 | 3 | 0 | 2 | 4 |
| 19. | 22CEC17 | Pre Engineering Buildings | PCC | - | 3 | 3 | 0 | 0 | 3 |
| 20. | 22CEP06 | Computer Aided Structural Design Laboratory | PCC | - | 4 | 0 | 0 | 4 | 2 |
| 21. | 22CEP07 | Survey Camp | PCC | - | 2 | 0 | 0 | 2 | 1 |

| (C) EEC & MC | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **(a) Employability Enhancement Courses (EEC)** | | | | | | | | | |
| **S. NO.** | **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **PRE REQUISITE** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| 1. | 22CED01 | Design Project | EEC | - | 4 | 0 | 0 | 4 | 2 |
| 2. | 22GED02 | Internship / Industrial Training | EEC | - | - | 0 | 0 | 0 | 2 |
| 3. | 22CED02 | Project Work | EEC | - | 20 | 0 | 0 | 20 | 10 |
| **(b) Mandatory Courses (MC)** | | | | | | | | | |
| 1. | 22MAN01 | Induction Programme | MC | - | 0 | 0 | 0 | 0 | 0 |
| 2. | 22MAN02 | Soft/Analytical Skills - I | MC | - | 3 | 1 | 0 | 2 | 0 |
| 3. | 22MAN03 | Yoga - I | MC | - | 1 | 0 | 0 | 1 | 0 |
| 4. | 22MAN04 | Soft/Analytical Skills - II | MC | - | 3 | 1 | 0 | 2 | 0 |
| 5. | 22MAN05 | Yoga - II | MC | - | 1 | 0 | 0 | 1 | 0 |
| 6. | 22MAN07# / 22MAN07R ## | Soft / Analytical Skills - III | MC | - | 3 | 1 | 0 | 2 | 0 |
| 7. | 22MAN08#/ 22MAN08R## | Soft/Analytical Skills -IV | MC | - | 3 | 1 | 0 | 2 | 0 |
| 8. | 22MAN09 | Indian Constitution | MC | - | 1 | 1 | 0 | 0 | 0 |
| 9. | 22GED01 | Personality and Character Development | MC | - | 0 | 0 | 0 | 1 | 0 |
| 10. | 22MAN10R | Communication and Quantitative Reasoning | MC | - | 3 | 1 | 0 | 2 | 0 |

| (D) Programme Elective Courses (PEC) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S. NO.** | **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **PRE REQUISITE** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| **VERTICAL 1 - STRUCTURES** | | | | | | | | | |
| 1. | 22CEX01 | Advanced Steel Design | PEC | 22CEC15 | 3 | 3 | 0 | 0 | 3 |
| 2. | 22CEX02 | Prefabricated Structures | PEC | - | 3 | 3 | 0 | 0 | 3 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3. | 22CEX03 | Prestressed Concrete Structures | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 4. | 22CEX04 | Distress Monitoring and Rehabilitation of Structures | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 5. | 22CEX05 | Dynamics and Earthquake Resistant Structures | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 6. | 22CEX06 | Introduction to Finite Element Method | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 7. | 22CEX07 | Advanced Structural Analysis | PEC | 22CEC07 | 3 | 3 | 0 | 0 | 3 |
| 8. | 22CEX08 | Steel Concrete Composite Structures | PEC | - | 3 | 3 | 0 | 0 | 3 |
| **VERTICAL 2 - CONSTRUCTION ENGINEERING AND MANAGEMENT** | | | | | | | | | |
| 1. | 22CEX11 | Construction Equipment and Management | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 2. | 22CEX12 | Sustainable and Lean Construction | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 3. | 22CEX13 | Safety in Construction Practices | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 4. | 22CEX14 | Advanced Construction Techniques | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 5. | 22CEX15 | Energy Efficient Buildings | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 6. | 22CEX16 | Construction Planning and Scheduling | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 7. | 22CEX17 | Architecture and Town Planning | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 8. | 22CEX18 | Contract Management | PEC | - | 3 | 3 | 0 | 0 | 3 |
| **VERTICAL 3 - INFRASTRUCTURE ENGINEERING** | | | | | | | | | |
| 1. | 22CEX21 | Airports and Harbours | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 2. | 22CEX22 | Traffic Engineering and Management | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 3. | 22CEX23 | Urban Planning and Development | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 4. | 22CEX24 | Smart cities | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 5. | 22CEX25 | Intelligent Transport Systems | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 6. | 22CEX26 | Pavement Engineering | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 7. | 22CEX27 | Transportation Planning Process | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 8. | 22CEX28 | Transportation Economics | PEC | - | 3 | 3 | 0 | 0 | 3 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **VERTICAL 4 - ENVIRONMENT AND WATER RESOURCES** | | | | | | | | | |
| 1. | 22CEX31 | Climate Change Adaptation and Mitigation | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 2. | 22CEX32 | Air and Noise Pollution Control Engineering | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 3. | 22CEX33 | Environmental Impact Assessment | PEC | 22CEC12 | 3 | 3 | 0 | 0 | 3 |
| 4. | 22CEX34 | Industrial Wastewater Management | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 5. | 22CEX35 | Solid and Hazardous Waste Management | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 6. | 22CEX36 | Plumbing (Water & Sanitation) | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 7. | 22CEX37 | Transport and Environment | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 8. | 22CEX38 | Groundwater Engineering | PEC | - | 3 | 3 | 0 | 0 | 3 |
| **VERTICAL 5 - GEO TECHNICAL** | | | | | | | | | |
| 1. | 22CEX41 | Ground Improvement Techniques | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 2. | 22CEX42 | Engineering Geology | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 3. | 22CEX43 | Site Investigation and Soil Exploration | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 4. | 22CEX44 | Slope Stability and Landslides | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 5. | 22CEX45 | Rock mechanics | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 6. | 22CEX46 | Geo Environmental Engineering | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 7. | 22CEX47 | Offshore Engineering | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 8. | 22CEX48 | Advanced Foundation Engineering | PEC | - | 3 | 3 | 0 | 0 | 3 |
| **VERTICAL 6 - DIVERSIFIED COURSE** | | | | | | | | | |
| 1. | 22CEX51 | Green Buildings | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 2. | 22CEX52 | Building Information Modeling | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 3. | 22CEX53 | Advanced Surveying | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 4. | 22CEX54 | Remote Sensing and GIS | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 5. | 22CEX55 | AI in Civil Engineering | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 6. | 22CEX56 | Rainwater Harvesting | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 7. | 22CEX57 | Disaster Preparedness and Planning | PEC | - | 3 | 3 | 0 | 0 | 3 |
| 8. | 22CEX58 | Construction Economics and Finance | PEC | - | 3 | 3 | 0 | 0 | 3 |

| (E) Management Elective Courses | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S. NO.** | **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **PRE REQUI SITE** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| 1. | 22GEA02 | Principles of Management | HSMC | - | 3 | 3 | 0 | 0 | 3 |
| 2. | 22GEA03 | Total Quality Management | HSMC | - | 3 | 3 | 0 | 0 | 3 |
| 3. | 22GEA04 | Professional Ethics | HSMC | - | 3 | 3 | 0 | 0 | 3 |

| (F) Open Elective Courses (OEC) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S. NO.** | **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **PRE REQUI SITE** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| 1. | 22CEZ01 | Drinking Water Supply and Treatment | OEC | - | 3 | 3 | 0 | 0 | 3 |
| 2. | 22CEZ02 | Waste Management | OEC | - | 3 | 3 | 0 | 0 | 3 |
| 3. | 22CEZ03 | Building Services | OEC | - | 3 | 3 | 0 | 0 | 3 |
| 4. | 22CEZ04 | Energy Conservation in Buildings | OEC | - | 3 | 3 | 0 | 0 | 3 |

| (G) Minor Degree Courses | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S. NO.** | **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **PRE REQUI SITE** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| **ENVIRONMENT AND SUSTAINABILITY** | | | | | | | | | |
| 1. | 22CEM01 | Introduction to Sustainability | OEC | - | 3 | 3 | 0 | 0 | 3 |
| 2. | 22CEM02 | Environment Ecology | OEC | - | 3 | 3 | 0 | 0 | 3 |
| 3. | 22CEM03 | Environmental Health and Safety | OEC | - | 3 | 3 | 0 | 0 | 3 |
| 4. | 22CEM04 | Green Technology | OEC | - | 3 | 3 | 0 | 0 | 3 |
| 5. | 22CEM05 | Functional Efficiency in Buildings | OEC | - | 3 | 3 | 0 | 0 | 3 |
| 6. | 22CEM06 | Water Conservation and Sustainability | OEC | - | 3 | 3 | 0 | 0 | 3 |
| 7. | 22CEM07 | Sustainability and Lifecycle Assessment | OEC | - | 3 | 3 | 0 | 0 | 3 |
| 8. | 22CEM08 | Global Warming and Climate Change | OEC | - | 3 | 3 | 0 | 0 | 3 |

## SUMMARY

| Semester/ Category | HSMC | BSC | ESC | PCC | EEC | PEC | OEC | Total |
|---|---|---|---|---|---|---|---|---|
| **I** | 4 | 8 | 8 | | | | | **20** |
| **2** | 4 | 10 | 8 | | | | | **22** |
| **3** | | 4 | 3 | 18 | | | | **25** |
| **4** | | | | 23 | | | | **23** |
| **5** | | | | 13 | | 9 | | **22** |
| **6** | | | | 10 | | 6 | 6 | **22** |
| **7** | 5 | | | | 4 | 3 | 6 | **18** |
| **8** | | | | | 10 | | | **10** |
| **Total** | 13 | 22 | 19 | 64 | 14 | 18 | 12 | **162** |
| **%** | **8.0** | **13.6** | **11.7** | **39.5** | **8.6** | **11.1** | **7.5** | **100** |
| **AICTE Credits Recommended** | 06 | 24 | 20 | 62 | 16 | 20 | 12 | **160** |
| | **3.8%** | **15%** | **12.4%** | **38.8%** | **10%** | **12.5%** | **7.5%** | **100** |

| 22EYA01 - PROFESSIONAL COMMUNICATION I<br>(Common to All Branches) | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **2** | **0** | **2** | **3** |

**PREREQUISITE : NIL**

| **Course Objective:** | • To build essential English skills to address the challenges of communication<br>• To enhance communication employing LSRW skills |
|---|---|

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Communicate effectively in various work environments. | R | 20% |
| **CO2** | Involve in diverse discourse forms utilizing LSRW Skills. | U | 20% |
| **CO3** | Participate actively in communication activities that enhance the creative skill. | U | 20% |
| **CO4** | Associate with the target audience and contexts using varied types of communication. | Ap | 20% |
| **CO5** | Convey the ideas distinctly both in verbal and non-verbal communication in work culture. | U | 20% |

| **UNIT I - INTRODUCTORY SKILLS** | **(6+6)** |
|---|---|
| **Grammar** - Parts of Speech - Verb (Auxiliaries - Primary & Modal, Main Verb) - **Listening** - Listening to Short Conversations or Monologues - Listening to Experiences - Listening to Descriptions - **Speaking** - Introducing Oneself - Exchanging Personal information -Talking about food and culture - **Reading** - Reading for Interrogation - Reading Newspaper, Advertisements and Interpreting - **Writing** - Seeking Permission for Industrial Visit & In-plant Training | |
| **UNIT II - LANGUAGE ACUMEN** | **(6+6)** |
| **Grammar** - Word Formation - Tenses (Present Tense) - Synonyms & Antonyms - **Listening** - Listening to Announcements - Listening to Interviews - Listening and Note-taking - **Speaking** - Talking about Holidays & Vacations - Narrating Unforgettable Anecdotes - **Reading** - Skimming - Scanning (Short Texts and Longer Passages) - Critical Reading - **Writing** - Instruction - Process Description | |
| **UNIT III - COMMUNICATION ROOTERS** | **(6+6)** |
| **Grammar** - Cause and Effect -Tenses (Past Tense) - Discourse Markers - **Listening** - Listening to Telephonic Conversations - Listening to Podcasts - **Speaking** - Talking about neoteric Technologies - Eliciting information to fill a form - **Reading** - Book Reading(Motivational) - Practicing Speed Reading (reading newspaper reports & biographies) - **Writing** - Checklist - Circular, Agenda & Minutes of the Meeting | |
| **UNIT IV - DISCOURSE FORTE** | **(6+6)** |
| **Grammar** - Tenses (Future Tense) - Yes/No & WH type questions - Negatives - **Listening** - Listening to TED/ Ink talks -**Speaking** - Participating in Short Conversations - **Reading** - Reading Comprehension (Multiple Choice / Short / Open Ended Questions) - **Writing** - E-Mail Writing | |

| UNIT V - LINGUISTIC COMPETENCIES | (6+6) |
|---|---|
| **Grammar** - Articles - Homophones & Homonyms - Single line Definition - Phrasal Verb - **Listening** - Intensive listening to fill in the gapped text - **Speaking** - Expressing opinions through Situations & Role play **Reading** - Cloze Texts - **Writing** - Paragraph Writing | |

**LIST OF SKILLS ASSESSED IN THE LABORATORY**

1. Grammar
2. Listening Skills
3. Speaking Skills
4. Reading Skills
5. Writing Skills

**TOTAL (L:30, P:30) = 60 PERIODS**

**TEXT BOOK:**

1. Shoba K N., Deepa Mary Francis. "English for Engineers and Technologists", Volume 1, 3rd Edition, Orient BlackSwan Pvt.Ltd, Telangana, 2022.

**REFERENCES:**


1. Koneru, Aruna," English Language Skills" Tata McGraw Hill Education (India) Private Limited, Chennai, 2006.
2. Hewings, M. Advanced English Grammar. Cambridge University Press, Chennai, 2000.
3. Jack C Richards, Jonathan Hull and Susan Proctor. Interchange. Cambridge University Press, New Delhi, 2015 (Reprint 2021).


**WEB REFERENCE:**

1. https://youtu.be/f0uqUzEf3A8?si=vyzu5KGIfbu35_IQ

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | | | | | | | | | 2 | 3 | | | | 2 |
| 2 | | | | | | | | | 2 | 3 | | | | |
| 3 | | | | | | | | | 2 | 3 | | | | |
| 4 | | | | | | | | | 2 | 3 | | | | 2 |
| 5 | | | | | | | | | 2 | 3 | | | | |
| CO (W.A) | | | | | | | | | **2** | **3** | | | | **2** |

## 22MYB01-CALCULUS AND LINEAR ALGEBRA
*(Common to All Branches)*

| | L | T | P | C |
|---|---|---|---|---|
| | 3 | 1 | 0 | 4 |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To understand the mathematical concepts of matrices and analytical geometry in real time problems.<br>• To formulate differential and integral equations to model physical, biological, and engineering systems |

| **Course Outcomes** The Student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply the concepts of matrix theory for find solutions to complex problems efficiently. | Ap | 20% |
| **CO2** | Analyze the geometric configurations and relationships by using Analytical geometry. | An | 20% |
| **CO3** | Interpret the partial derivatives which involve heat conduction problems modeled by the heat equation. | Ap | 20% |
| **CO4** | Apply the differential and integral techniques to solve the differential equations and multiple integrals in heat conduction, fluid mechanics and potential theory. | Ap | 40% |
| **CO5** | Demonstrate the importance of matrix theory, analytical geometry and integral methods using programming tools. | Ap | Internal Assessment |

| | |
|---|---|
| **UNIT I - MATRICES** | **(9+3)** |
| Characteristic Equation - Eigen values and Eigen vectors of a matrix - Cayley Hamilton Theorem (excluding proof) and its applications - Quadratic form-Reduction of a Quadratic form to canonical form by orthogonal transformation. | |
| **UNIT II - ANALYTICAL GEOMETRY OF THREE DIMENSIONS** | **(9+3)** |
| Equation of plane - Angle between two planes - Equation of straight lines - Coplanar lines - Equation of sphere - Orthogonal spheres. | |
| **UNIT III - GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS** | **(9+3)** |
| Curvature - Curvature in Cartesian co-ordinates - Centre and Radius of curvature - Circle of curvature - Evolutes and Involutes. | |
| **UNIT IV - FUNCTIONS OF SEVERAL VARIABLES** | **(9+3)** |
| Partial derivatives - Euler's theorem on homogeneous function - Jacobian - Maxima and Minima of functions of two variables - Constrained Maxima and Minima by Lagrange's multiplier method. | |
| **UNIT V - MULTIPLE INTEGRALS** | **(9+3)** |
| Double integration in Cartesian Co-ordinates - Change of order of integration - Area as double integral - Triple integration in Cartesian Co-ordinates - Volume as triple integrals. | |
| **TOTAL (L:45+T:15) :60 PERIODS** | |

**LIST OF PROGRAMS USING MATLAB (**Assignment/Online Test**)**:

1. Introduction to MATLAB
2. Matrix operations - Addition, Multiplication, Transpose and Inverse
3. Characteristic equation of a Matrix
4. Eigen values and Eigen vectors of Higher order Matrices.
5. Curve Tracing
6. Determining Maxima and Minima of a function of one variable.
7. Determining Maxima and Minima of a function of two variables.
8. Evaluating double integrals
9. Evaluating triple integrals
10. Finding area between two curves.

**TEXT BOOKS:**


1. Dr.B.S.Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna publications, 2012.
2. Erwin Kreyszig , "Advanced Engineering Mathematics", 9th Edition, John Wiley & sons, 2013
3. Veerarajan.T, "Engineering Mathematics of Semester I & II", 3rd Edition, Tata McGraw Hill., 2016


**REFERENCES:**


1. N.P.Bali, Manish Goyal, "A Text book of Engineering Mathematics - Sem - II", 6th Edition, Laxmi Publications, 2014.
2. Kandasamy.P, Thilagavathy.K, Gunavathy .K, "Engineering Mathematics for First Year", 9th Rev.Edition, S.Chand & Co Ltd, 2013.
3. Glyn James, "Advanced Engineering Mathematics", 7th Edition, Wiley India, 2007.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | 2 |
| 2 | | 2 | | | | | | | | | | | | |
| 3 | | 2 | | | | | | | | | | | | |
| 4 | 3 | | | | | | | | | | | | | |
| 5 | 3 | | | | 2 | | | | 3 | | | 2 | | 2 |
| CO (W.A) | 3 | 2 | | | 2 | | | | 3 | | | 2 | | 2 |

*Ratified by Eleventh Academic Council

| 22CYB02 - CHEMISTRY FOR ENGINEERS<br>(Common to CIVIL and MECH Branches) | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **3** | **0** | **0** | **3** |

**PREREQUISITE : NIL**

| **Course Objective:** | • To make the students conversant with water treatment, boiler feed water techniques, energy storage devices and corrosive nature of metals.<br>• To impart knowledge on the basic principles, preparatory methods of nanomaterials and combustion nature of fuels. |
|---|---|

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Predict the nature, oxidation and reduction potential of an electrode. | An | 20% |
| **CO2** | Investigate on renewable energy sources like nuclear, solar, wind energy and also on storage devices. | E | 20% |
| **CO3** | Identify the types of hardness in water and its removal by various water treatment techniques. | Ap | 20% |
| **CO4** | Explore the type of corrosion and its control measures. | An | 20% |
| **CO5** | Recommend suitable fuels for engineering processes and applications. | E | 20% |

| **UNIT I - ELECTROCHEMISTRY** | **(9)** |
|---|---|
| Electrode potential - Nernst equation - derivation and problems - reference electrodes - standard hydrogen electrode - calomel electrode - electrochemical series - significance - Types of cell - electrolytic and electrochemical cells - reversible and irreversible cells - potentiometric titrations (redox) - conductometric titrations (acid-base). | |
| **UNIT II - ENERGY SOURCES AND STORAGE DEVICES** | **(9)** |
| Nuclear energy - nuclear fission - nuclear fusion - light water nuclear power plants - breeder reactor - solar energy conversion - solar cells - solar water heater - Recent developments in solar cell materials - wind energy - batteries - types of batteries - lead acid storage battery - lithium-ion battery, Electric vehicles - working principles. | |
| **UNIT III - WATER TECHNOLOGY AND NANO MATERIALS** | **(9)** |
| Municipal water treatment - disinfection methods (uv, ozonation, chlorination) - desalination of brackish water - reverse osmosis - boiler troubles (scale, sludge , priming, foaming and caustic embrittlement) - treatment of boiler feed water - internal treatment (carbonate, phosphate and calgon conditioning) - external treatment - demineralization process. Nanomaterials - synthesis (laser ablation, and chemical vapour deposition method) and applications of nanomaterials. | |
| **UNIT IV - CORROSION AND ITS CONTROL** | **(9)** |
| Corrosion - types - chemical corrosion - pilling bedworth rule - electrochemical corrosion - mechanism-galvanic corrosion - differential aeration corrosion - factors influencing corrosion - corrosion control - sacrificial anode and impressed cathodic current methods - corrosion inhibitors - protective coatings - paints - constituents and their functions | |

| UNIT V - FUELS AND COMBUSTION | (9) |
|---|---|
| Fuels: Introduction: Classification of fuels: Coal and coke: Analysis of coal (Proximate) - Carbonization - Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process) - Knocking - octane number - diesel oil - cetane number: Power alcohol and biodiesel.<br>Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Flue gas analysis - ORSAT method. CO2 emission and carbon foot print. | |
| **TOTAL (L:45) : 45 PERIODS** | |

**TEXT BOOKS:**

1. Dr.Ravikrishnan, A,"Engineering Chemistry I & Engineering Chemistry II", Sri Krishna Hitech Publishing chem., Co. Pvt Ltd., 13th Edition, Chennai, 2020.
2. S.S. Dara," A Text book of Engineering Chemistry", S.Chand & Co.Ltd. New Delhi, 2019.

**REFERENCES:**

1. P.C.Jain and Monica Jain, "Engineering Chemistry", Vol I &II, Dhanpat Rai Pub, Co, New Delhi, 15th Edition, 2018.
2. B.Sivasankar, "Engineering Chemistry", Tata McGraw- Hill Pub.Co.Ltd., New Delhi, 2018

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | 2 | | | | | |
| 2 | | 2 | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | 2 |
| 4 | | | 2 | | | | 2 | | | | | | | |
| 5 | | 2 | | | | 2 | | | | | | 2 | | |
| CO (W.A) | 3 | 2 | 2 | | | 2 | 2 | | 2 | | | 2 | | 2 |

| 22EEC01 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING<br>*(Common to CHEMICAL and CIVIL Branches)* | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **3** | **0** | **0** | **3** |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To impart knowledge on the concepts of electrical circuit laws, measuring instruments, AC and DC machines.<br>• To Gain information on the basic principles of semiconductor devices with applications and digital systems. |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply principles of semiconductor physics to predict the behavior of electrical circuits, diodes, bipolar junction transistors (BJTs) in different circuit configurations and basics of digital systems using logic gates. | Ap | 25% |
| **CO2** | Illustrate the operation and types of electrical circuits and machines including measuring instruments. | Ap | 25% |
| **CO3** | Analyze the Characteristics for various diodes, AC machines and DC machines. | An | 25% |
| **CO4** | Design digital circuits that meet specified needs with appropriate consideration and develop a simple electronic circuit using diodes and transistors | Ap | 25% |
| **CO5** | Achieve as an independent learner in a team to build an authentic application of electrical and electronics engineering and make an effective oral presentation. | C | Internal Assessment (Seminar) |

| **UNIT I - ELECTRICAL CIRCUITS AND MEASURMENTS** | **(9)** |
|---|---|
| Introduction to DC circuits - Ohm's Law - Kirchhoff's Laws - Resistive circuits - Resistors in Series and parallel - Introduction to AC circuits - Power and Power factor - Classification of measuring instruments - Dynamometer type wattmeter - Induction type energy meter | |
| **UNIT II - DC MACHINES** | **(9)** |
| DC Generator: Construction, Types, Principle of operation, EMF equation, Characteristics. DC Motor: Principle of operation, Types, Torque equation, Characteristics and Applications. | |
| **UNIT III - AC MACHINES** | **(9)** |
| Single phase induction motor: Construction, Types, working principle - Three phase induction motor: Construction, Types, Torque - Slip Characteristics - Synchronous motor: Construction, working principle. | |
| **UNIT IV - SEMICONDUCTOR DEVICES AND ITS APPLICATIONS** | **(9)** |
| Introduction - Characteristics of PN junction diode and Zener diode - Half wave rectifier - Bipolar junction transistor: CB, CE, CC configurations and characteristics. | |
| **UNIT V - DIGITAL SYSTEMS** | **(9)** |
| Number System - Binary, Decimal, Octal, Hexadecimal - Binary arithmetic - Boolean Algebra - Logic Gates - Applications: Half Adder. | |
| | **TOTAL (L:45) : 45 PERIODS** |

**TEXT BOOKS:**

1. D P Kothari and I.J Nagarath, "Basic Electrical Engineering", McGraw Hill Education (India) Private Limited, 4th Edition, Third Reprint, 2019.
2. R Muthusubramaian, S.Salivahanan and K.A.Muraleedharan, "Basic Electrical, Electronics and Computer Engineering", 2nd Edition, Tata McGraw Hill publishers, New Delhi, 2012

**REFERENCES:**

3. Jr.,William H. Hayt,Kemmerly, Jack E.Phillips, Jamie D.Durbin, Steven M. "Engineering Circuits Analysis," 9th Edition, Tata McGraw Hill publishers, New Delhi, 2020
4. S.K.Bhattacharya, "Basic Electrical and Electronics Engineering", 2nd Edition, Pearson India, New Delhi, 2017.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | 2 |
| 2 | 3 | | | | | | | | | | | | | 2 |
| 3 | | 3 | | | | | | | | | | | | 2 |
| 4 | 3 | | | | | | | | | | | | | |
| 5 | | | | | | | | | 3 | 3 | 3 | 3 | | |
| **CO (W.A)** | **3** | **3** | | | | | | | **3** | **3** | **3** | **3** | | **2** |

| 22MEC01 - ENGINEERING GRAPHICS<br>*(Common to AGRI, CIVIL, CHEMICAL and EEE Branches)* | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **2** | **0** | **2** | **3** |

**PREREQUISITE : Nil**

| | |
|---|---|
| **Course Objective:** | • To Construct various plane curves<br>• To Construct the concept of projection of points, lines and plane<br>• To Develop the projection of solids<br>• To Solve problems in sectioning of solids and developing the surfaces<br>• To Apply the concepts of orthographic and isometric |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply the knowledge of engineering drawing standards to drawn 2D Engineering drawings. | Ap | 40% |
| **CO2** | Apply the knowledge of engineering drawing standards to solve the given 2D problem using first angle of projection. | Ap | 20% |
| **CO3** | Apply the knowledge of engineering drawing standards solve the 3D problem using first angle of projection | Ap | 20% |
| **CO4** | Analyze the given problem to create 3D drawing | An | 20% |
| **CO5** | Engage independent study as a member of team and make effective oral presentation on engineering graphics | U | Internal Assessment |

| **CONCEPTS AND CONVENTIONS (Not for Examination)** | |
|---|---|
| Importance of graphics in engineering applications - use of drafting instruments - BIS conventions and specifications - size, layout and folding of drawing sheets - lettering and dimensioning - scales. | |
| **UNIT I - PLANE CURVES** | **(6+6)** |
| Basic geometrical constructions, curves used in engineering practices - conics - construction of ellipse, parabola and hyperbola by eccentricity method - construction of cycloid - construction of involutes of square and circle - drawing of tangents and normal to the above curves - theory of projection - principle of multi-view orthographic projection - profile plane and side views - multiple views - representation of three dimensional objects - layout of views. | |
| **UNIT II - PROJECTION OF POINTS, LINES AND PLANES** | **(6+6)** |
| Principal planes - first angle projection - projection of points - projection of straight lines (only first angle projections) inclined to both the principal planes - determination of true lengths and true inclinations by rotating line method - projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method. | |
| **UNIT III - PROJECTION OF SOLIDS** | **(6+6)** |
| Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to anyone of the principal plane and parallel to another by rotating object method. | |
| **UNIT IV - SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES** | **(6+6)** |
| Sectioning of solids (prism, cube, pyramid, cylinder and cone) in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other - obtaining true shape of section - development of lateral surfaces of simple and sectioned solids - prisms, pyramids cylinder and cone. | |

| UNIT V - ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS | (6+6) |
|---|---|
| Principles of isometric projection - isometric scale - isometric projections of lines, plane figures, simple solids and truncated solids - prisms, pyramids, cylinders, cones – free hand sketching of orthographic views from isometric views of objects. | |
| **TOTAL (L:30+P:30) : 60 PERIODS** | |

**TEXT BOOKS:**

1. K.Venugopal and V.Prabhu Raja, "Engineering Graphics", New Age International (P) Limited, 2022.
2. N.S Parthasarathy and Vela Murali, "Engineering Drawing", Oxford University Press, 2015.

**REFERENCES:**

1. N.D.Bhatt and V.M.Panchal, "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2014.
2. K.R.Gopalakrishna, "Computer Aided Engineering Drawing" (Vol I and II combined) Subhas Stores, Bangalore, 2017.
3. K. V.Natarajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
4. Luzzader, Warren.J, and Duff, John M, "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production", Eastern Economy Edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005.
5. M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson, 2nd Edition, 2009.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | 3 | | | | | | | | 1 | 3 | |
| 2 | 3 | | | 3 | | | | | | | | 1 | 3 | |
| 3 | 3 | | | 3 | | | | | | | | 1 | 3 | |
| 4 | 3 | | | 3 | | | | | | | | 1 | 3 | |
| 5 | 3 | | | 3 | | | | | 2 | | | 1 | 3 | |
| **CO (W.A)** | **3** | | | **3** | | | | | **2** | | | **1** | **3** | |

| 22GEP01 - ENGINEERING PRACTICES LABORATORY<br>*(Common to AGRI, BME, CHEM, CIVIL, ECE, EEE and MECH Branches)* | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **0** | **0** | **4** | **2** |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To provide hands on training on various basic engineering practices in civil engineering<br>• To provide hands on training on welding in mechanical engineering<br>• To provide hands on training on various basic engineering practices in mechanical engineering<br>• To understand the basic working principle of electric components<br>• To understand the basic working principle of electronic components |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** |
|---|---|---|
| **CO1** | Design new layouts of civil work for residential and industrial buildings. | Ap |
| **CO2** | Apply the concepts of welding in repairing works and making various components | Ap |
| **CO3** | Design new components using machining processes in real life and industries | Ap |
| **CO4** | Apply the skills of basic electrical engineering for wiring in different areas and Measure various electrical quantities | Ap |
| **CO5** | Apply electronic principles to measure various parameters of a signal. | Ap |

## GROUP-A (MECHANICAL AND CIVIL ENGINEERING)

### I - CIVIL ENGINEERING PRACTICE (15)

**Buildings:**

a. Study of plumbing and carpentry components of residential and industrial buildings, Safety aspects

**Plumbing:**

a. Study of tools and operations
b. Hands-on-exercise: External thread cutting and joining of pipes

**Carpentry:**

a. Study of tools and operations
b. Hands-on-exercise: "L" joint and "T" joint

### II - MECHANICAL ENGINEERING PRACTICE (15)

**Welding:**

a. Study of arc welding, gas welding tools and equipments
b. Arc welding- Butt joints, Lap joints and Tee joints
c. Practicing gas welding

**Basic Machining:**

a. Study of lathe and drilling machine
b. Facing and turning
c. Drilling and Tapping

**Sheet Metal Work:**

a. Study of tools and operations
b. Rectangular tray
c. Cone

**GROUP - B (ELECTRICAL AND ELECTRONICS)**

| **I - ELECTRICAL ENGINEERING PRACTICE** | **(15)** |
|---|---|

a. Residential house wiring using Switches ,fuse, indicator and lamp
b. Fluorescent lamp wiring
c. Stair Case Wiring
d. Measurement of electrical quantities - Voltage, current ,power in R Circuit
e. Study of Electrical apparatus-Iron box & water heater
f. Study of Electrical Measuring instruments - Megger

| **II - ELECTRONICS ENGINEERING PRACTICE** | **(15)** |
|---|---|

a. Study of Electronic components and various use of multi meter.
b. Measurement of AC signal parameter (peak-peak, RMS period, frequency) using CRO.
c. Study of logic gates AND, OR, XOR and NOT.
d. Study of Clock Signal.
e. Soldering practice -Components Devices and Circuits - Using general purpose PCB.
f. Study of Half Wave Rectifier (HWR) and Full Wave Rectifier (FWR).
g. Study of Telephone, FM Radio and Cell Phone.

**TOTAL (P: 60) = 60 PERIODS**

**Mapping of COs with POs / PSOs**

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | 3 | | | | | | | | | | | | | |
| **2** | | 3 | | | | | | | | | | | | |
| **3** | | | 2 | | | | | | | | | | | |
| **4** | 3 | | | | | | | | | | | | 1 | |
| **5** | 3 | | | | | | | | | | | | 1 | |
| **CO (W.A)** | **3** | **3** | **2** | | | | | | | | | | 1 | |

| 22CYP01 CHEMISTRY LABORATORY<br>(Common to AGRI, BME, CHEM, CIVIL, ECE, EEE and MECH Branches) | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **0** | **0** | **2** | **1** |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To determine the copper in brass in the given solution and explain the origin of hardness, alkalinity, chloride and dissolved oxygen in water.<br>• To perform a potentiometric, conductometric titration and pH of an acidic solution of known Normality. |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** |
|---|---|---|
| **CO1** | Predict the various water quality parameters by volumetric analysis. | An |
| **CO2** | Evaluate the amount of copper in the given solution by titration method. | E |
| **CO3** | Analyze the conductance and emf of the different solutions. | An |
| **CO4** | Analyze and gain experimental skill about potential of hydrogen ion. | An |
| **CO5** | Examine the pH of various acidic, basic and neutral solutions. | An |

**LIST OF EXPERIMENTS ( Any Five)**

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of alkalinity in water sample.
3. Determination of chloride content of water sample by Argentometric method.
4. Determination of DO content of water sample by Winkler's method.
5. Estimation of copper in brass by EDTA.
6. Conductometric titration of strong acid Vs strong base.
7. Estimation of iron content of the given solution using potentiometer.
8. Determination of strength of given hydrochloric acid using pH meter.

**Total (P:30) = 30 periods**

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | | | | | 3 | | | | | | | | | |
| 2 | | | | | | | 2 | | | | | | | |
| 3 | | | | | | | 2 | | | | | | | |
| 4 | | | | | 3 | | | | | | | | | |
| 5 | | | | | | | 2 | | | | | | | |
| **CO (W.A)** | | | | | **3** | | **2** | | | | | | | |

- Ratified by Eleventh Academic Council

## 22MAN01 INDUCTION PROGRAMME
*(For Common To All Branches)*

| | L | T | P | C |
|---|---|---|---|---|
| | - | - | - | - |

**PRE REQUISITE : NIL**

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. "

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

**(i) Physical Activity**

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

**(ii) Creative Arts**

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

**(iii) Universal Human Values**

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

**(iv) Literary Activity**

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

**(v) Proficiency Modules**

This would address some lacunas that students might have, for example, English, computer familiarity etc.

**(vi) Lectures by Eminent People**

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

**(vii) Visits to Local Area**

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

**(viii) Familiarization to Dept./Branch & Innovations**

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

**(ix) Department Specific Activities**

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

**Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.**

**REFERENCE:**

1.Guide to Induction program from AICTE

| 22MAN02 - SOFT/ANALYTICAL SKILLS - I<br>(Common to All Branches) | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **1** | **0** | **2** | **0** |
| **PREREQUISITE : NIL** | | | | |
| **Course Objective:** | • To understand the basic concepts of grammar and apply them in a structured Manner<br>• To solve mathematical problems and thereby reducing the time taken for performing job functions | | | |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of Continuous Assessment Test** |
|---|---|---|---|
| **CO1** | Recognize and apply fundamental grammatical rules in both written and spoken contexts. | U | 40% |
| **CO2** | Solve real-time problems for performing job functions easily. | Ap | 30% |
| **CO3** | Enhance their aptitude round clearing ability in interview process. | An | 30% |

| **UNIT I - VERBAL ABILITY** | **(5+10)** |
|---|---|
| Tenses - One Word Substitution- Articles - Preposition - Conjunction | |
| **UNIT II - BASIC APTITUDE** | **(5+10)** |
| Percentage - Ratio and Proportion - Blood Relations - Analogy | |
| **UNIT III - LOGICAL REASONING** | **(5+10)** |
| Probability - Profit and Loss - Syllogism - Statement Assumptions. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**REFERENCES:**


1. Murphy, Raymond. "English Grammar in Use", Fourth Edition, Cambridge University, 2012.
2. Dr. R.S. Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand and Company Limited, New Delhi, 2014.
3. Aggarwal, Ashish. "Quick Arithmetic", S Chand and Company Limited, New Delhi, 2014.

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | | | | | | | | | 2 | 3 | | | | |
| **2** | | 2 | | 2 | | | | | | | | | | |
| **3** | | 2 | | 2 | | | | | | | | | | |
| **CO (W.A)** | | **1** | | **1** | | | | | **1** | **1** | | | | |

| 22MAN03 YOGA – I<br>(For Common To All Branches) | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **0** | **0** | **I** | **0** |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To make students in understanding the importance of yoga in shaping mental and physical wellness.<br>• To provide awareness about the significance of leading a peaceful life by following yoga exercises and principles.<br>• To develop mental wellbeing through meditation and breathing exercises.<br>• To strengthen the body through physical exercises.<br>• To inculcate the knowledge about different types of Asanas and their benefits |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Understand the importance of yoga for physical and mental goodness. | U | Internal Assessment |
| **CO2** | Perform the yoga exercises for hand, leg, eye and sun salutation etc. | Ap | |
| **CO3** | Learn and practice meditation techniques for keeping good mental health | Ap | |
| **CO4** | Develop their body by performing yoga exercises. | Ap | |
| **CO5** | Demonstrate different types of yoga Asanas for improving their personal fitness. | Ap | |

| **UNIT I - INTRODUCTION TO YOGA** | **(3)** |
|---|---|
| Meaning and Importance of Yoga - Elements of Yoga - Introduction - Asanas, Pranayama, Meditation and Yogic Kriyas - Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana and Shashankasana) - Relaxation Techniques for improving concentration - Yog-nidra. | |
| **UNIT II - YOGA AND LIFE STYLE** | **(3)** |
| Asanas as Preventive measures - Hypertension:Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana - Obesity: Procedure, Beneits and contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana - Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana - Diabetes: Procedure, Benefits and contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana - Asthema: Procedure, Benfits and contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana. | |
| **UNIT III - MIND EXERCISES** | **(3)** |
| Naadi sudhi - Thanduvada sudhi - Breathing meditation - Silent meditation - Relax meditation. | |
| **UNIT IV - PHYSICAL EXERCISES (PART- I)** | **(3)** |
| Hand Exercises - Leg Exercises - Eye Exercises - Sun Salutation. | |
| **UNIT V - ASANAS (PART-I)** | **(3)** |
| Asanas - Tadasana - Yegapadhasana - Chakrasana - Udkaddasana - Thirikosana - Thandasana - Paschimottanasana. | |
| **TOTAL (P:15) : 15 PERIODS** | |

| TEXT BOOK / REFERENCE: |
|---|
| 1. Light on Yoga by B.K.S. Iyengar. |

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | POs | | | | | | | | | | | | PSOs | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | | | | | | | | 3 | 2 | | | 3 | | |
| 2 | | | | | | | | 3 | 2 | | | 3 | | |
| 3 | | | | | | | | 3 | 2 | | | 3 | | |
| 4 | | | | | | | | 3 | 2 | | | 3 | | |
| 5 | | | | | | | | 3 | 2 | | | 3 | | |
| CO (W.A) | | | | | | | | 3 | 2 | | | 3 | | |

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| 22EYA02- PROFESSIONAL COMMUNICATION- II<br>(Common to All Branches) | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **2** | **0** | **2** | **3** |
| **PREREQUISITE : 22EYA01** | | | | |
| **Course Objective:** | • To enhance the students with necessary English language skills<br>• To enable students to communicate effectively in an academic setting | | | |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Frame sentences both in written and spoken forms with accuracy and fluency. | R | 20% |
| **CO2** | Use linguistic structures to read and understand well-structured texts encountered in academic or social contexts. | U | 20% |
| **CO3** | Gain essential competency to express one's thoughts orally and in writing in a meaningful way. | U | 20% |
| **CO4** | Attain and enhance competence in the four modes of literacy: Listening, Speaking, Reading and Writing. | Ap | 20% |
| **CO5** | Perform various tasks, such as role plays, debates, group discussions apart from the use of correct spelling and punctuation. | U | 20% |

| **UNIT I - LANGUAGE RUDIMENTS** | **(6+6)** |
|---|---|
| **Grammar** - Active and Passive Voice - Impersonal Passive Voice - Numerical Expressions - **Listening** - Listening for Specific Information and Match / Choose / Fill in the texts - **Speaking** - Describing a Person - Making Plans -**Reading** - Intensive Reading -**Writing** - Job Application with Resume | |
| **UNIT II - RHETORIC ENHANCERS** | **(6+6)** |
| **Grammar** - Reported Speech – Infinitive and Gerund - **Listening** - Listening to Iconic Speeches and making notes - Listening news / documentaries - **Speaking** -Talking over Phone - Narrating Incidents - **Reading** - Extensive Reading (Motivational Books) - **Writing** - Recommendation | |
| **UNIT III -TECHNICAL CORRESPONDENCE** | **(6+6)** |
| **Grammar** - If Conditionals - Blended Words - **Listening** - Listening to business conversation on audio and video of Short Films, News, Biographies - **Speaking** - Synchronous communication and Asynchronous communication - Opportunities and threats in using digital platform - **Reading** - Finding key information in a given text - **Writing** - Netiquettes - Inviting Dignitaries - Accepting & Declining Invitation | |
| **UNIT IV - CORPORATE COMMUNICATION** | **(6+6)** |
| **Grammar** - Concord - Compound Words - **Listening** - Listening to Roles and Responsibilities in Corporate - Listening to technical videos - **Speaking** - Introduction to Technical Presentation - Story Telling - **Reading** - Reading and Understanding Technical Articles - **Writing** - Report Writing (Accident, Survey and feasibility) | |
| **UNIT V - LANGUAGE BOOSTERS** | **(6+6)** |
| **Grammar** - Idiomatic Expressions – Relative Clauses - Confusable words - **Listening** - Listening to different kinds of Interviews - Listening to Group Discussion - **Speaking** - Group Discussion - **Reading** - Reading and Interpreting Visual Materials - **Writing** - Analytical Paragraph Writing | |

**LIST OF SKILLS ASSESSED IN THE LABORATORY**

1. **Grammar**
2. **Listening Skills**
3. **Speaking Skills**
4. **Reading Skills**
5. **Writing Skills**

**TOTAL (L:30 , P:30 ) = 60 PERIODS**

**TEXT BOOK:**


1. Sudharshana, N.P and Saveetha.C, "English for Technical Communication", Cambridge University Press, New Delhi, 2016 (Reprint 2017).


**REFERENCES:**


1. Rizvi, M Ashraf, "Effective Technical Communication", 2nd Edition, McGraw Hill Education India Pvt Ltd, 2017.
2. Rodney Huddleston, Geoffrey K. Pullum and Brett Reynolds, "A Student's Introduction to English Grammar", 2nd Edition, Cambridge University Press, New Delhi, 2022


**WEB REFERENCE:**

1. http://youtu.be/URtdGiutVew

**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | | | | | | | | | 2 | 3 | | | | |
| 2 | | | | | | | | | 2 | 3 | | | | |
| 3 | | | | | | | | | 2 | 3 | | | | 2 |
| 4 | | | | | | | | | 2 | 3 | | | | 2 |
| 5 | | | | | | | | | 2 | 3 | | | | |
| CO (W.A) | | | | | | | | | 2 | 3 | | | | 2 |

| 22MYB02 - PARTIAL DIFFERENTIAL EQUATIONS AND TRANSFORM TECHNIQUES<br>*(Common to AGRI,CIVIL,CHEMICAL, MECH Branches)* | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **3** | **I** | **0** | **4** |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To make the conversant with concepts of Laplace transforms, Fourier series, Fourier Transforms to represent periodical physical problems in engineering analysis.<br>• To provide adequate knowledge in partial differential equation and to analyze the boundary value problems. |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply the various techniques of Fourier series to obtain solution for different functions. | Ap | 20% |
| **CO2** | Interpret the methods of partial differential equations in fluid mechanics and water resource management. | Ap | 20% |
| **CO3** | Solve the initial and boundary value problems by using Fourier series. | Ap | 20% |
| **CO4** | Analyze the concepts of Transform Techniques to solve the problems in stability analysis, Structural Analysis, control system design and analysis. | An | 40% |
| **CO5** | Demonstrate the importance of Transform Techniques and partial differential equations in engineering using modern tools. | Ap | Internal Assessment |

| **UNIT I - FOURIER SERIES** | **(9+3)** |
|---|---|
| Dirichlet's condition - Fourier series: Half range sine series - Half range cosine series - Parseval's identity for half range series - Root mean square value of a function - Harmonic analysis. | |
| **UNIT II - PARTIAL DIFFERENTIAL EQUATIONS** | **(9+3)** |
| Formulation of partial differential equations by eliminating arbitrary constants and functions - Solution of standard types first order partial differential equations of the type f(p,q)=0,Clairaut's form - Lagrange's linear equations - Linear partial differential equation of second and higher order with constant coefficient of homogeneous types. | |
| **UNIT III - APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS** | **(9+3)** |
| Classification of second order quasi linear partial differential equations - Solution of one dimensional wave equation (Zero and non-zero velocity) - One dimensional heat equation (Temperature reduced to zero and non zero boundary conditions) - Steady state solution of two dimensional heat equation(Finite and infinite plate). | |
| **UNIT IV - FOURIER TRANSFORM** | **(9+3)** |
| Fourier integral theorem(Statement only) - Fourier transform pair - Sine and Cosine transforms - Properties -Transforms of simple functions – Convolution theorem - Parseval's identity(Excluding proof). | |
| **UNIT V - LAPLACE TRANSFORM** | **(9+3)** |
| Condition for existence - Transforms of Elementary functions - Basic Properties - First & Second Shifting Theorems (Statement only) - Initial and Final value Theorems. Inverse Laplace transforms - Convolution theorem (Excluding proof) - Solution of linear second order ordinary differential equations with constant coefficients using Laplace transform. | |
| **TOTAL (L:45+T:15) : 60 PERIODS** | |

**TEXT BOOKS:**

1. Veerarajan.T, "Engineering Mathematics (for semester III)", 3rd Edition, Tata McGraw Hill, New Delhi.
2. Kandasamy.P, Thilagavathy.K, and Gunavathy.K., "Engineering Mathematics; Volume III", S.Chand&Coltd., 2008.
3. GrewalB.S,"Higher Engineering Mathematics", 42nd Edition, Khanna publishers, New Delhi, 2012.

**REFERENCES:**

1. Goyal Manish and Bali.N.P, "A Text book of Engineering mathematics", 6th Edition, Laxmi Publication (P) Ltd, New Delhi, 2012.
2. Kreyszig, Erwin, "Advanced Engineering Mathematics", 9th Edition, Wiley Publications, New Delhi, 2006.
3. Singaravelu.A,"Transforms and Partial Differential Equations", Reprint Edition 2013, Meenakshi Publications, Tamilnadu.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | | 2 | | | | | | | | | | | | |
| 2 | 3 | | | | | | | | | | | | | |
| 3 | 3 | | | | | | | | | | | | | 2 |
| 4 | 3 | | | | | | | | | | | | | 2 |
| 5 | 3 | | | | 2 | | | | 3 | | | 3 | | |
| **CO (W.A)** | **3** | **2** | | | **2** | | | | **3** | | | **3** | | **2** |

- Ratified by Eleventh Academic Council

| 22PYB02 - ADVANCED MATERIALS AND NANO TECHNOLOGY<br>(Common to CIVIL, CHEM & AGRI) | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **3** | **0** | **0** | **3** |

**PREREQUISITE:NIL**

| | |
|---|---|
| **Course Objective:** | • To gain adequate information about the properties of matter and nanomaterials.<br>• To expose the concepts of Photonics, fiber optics and Advanced new engineering materials. |

| **Course Outcomes**<br>The student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Correlate the stress and strain ratio to apply the elasticity for spring materials. | An | 20% |
| **CO2** | Discriminate the thermal conductivity of the medium to employing in instrument applications. | An | 20% |
| **CO3** | Articulate the role of nanotechnology in environmental sustainability for the field of agriculture. | Ap | 20% |
| **CO4** | Operate the optical fibers in sensor devices. | Ap | 20% |
| **CO5** | Appraise the classification of composites in the applications of aerospace components, automotive parts, and sports equipment. | Ev | 20% |

| **UNIT I -PROPERTIES OF MATTER** | **(9)** |
|---|---|
| Elasticity - Hooke's law Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength - torsional stress and deformations - twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment - cantilever: theory and experiment - uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams. | |
| **UNIT II -THERMAL PHYSICS** | **(9)** |
| Mode of heat transfer-thermal conductivity-Newton 's law of cooling - thermal conduction through compound media (bodies in series and parallel) - Thermal conductivity of a good conductor - Forbe's method - Thermal conductivity of bad conductor - Lee's disc - Hazards - Cyclone and flood hazards - Fire hazards and fire protection, fire - proofing of materials, fire safety regulations and firefighting equipment. Prevention and safety measures. | |
| **UNIT III -SYNTHESIS AND PROPERTIES OF NANOSTRUCTURES** | **(9)** |
| Introduction to Nanoscience - Types of nanostructure and properties of Nanomaterials - Synthesis and preparation of Nanomaterials - Nanosensors - Biosensors - Nanoscience and Environment. | |
| **UNIT IV - PHOTONICS AND FIBER OPTICS** | **(9)** |
| **Photonics:** Population of energy levels - Einstein's A and B coefficients derivation – Resonant cavity - Types of lasers - solid state laser (Neodymium) - gas laser ($CO_2$) Applications of lasers in science - Engineering - Medicine.<br>**Fibre optics:** Principle, numerical aperture and acceptance angle - Types of optical fibres (Material, refractive index and mode) -Losses in optical fibre - Fibre optic communication Fibre optic sensors (pressure and displacement). | |

| UNIT V - ADVANCED NEW ENGINEERING MATERIALS | (9) |
|---|---|
| Ceramics - Types and applications - Composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics - Metallic glasses: types, glass forming ability of alloys, melt spinning process, applications - Shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy and application - Bio material - applications. | |
| **TOTAL(L:45) = 45 PERIODS** | |

**TEXT BOOKS:**


1. Dattuprasad, Ramanlal Joshi, "Engineering Physics" Tata McGraw hill education, 2019.
2. V.Rajendran, "Engineering Physics", Tata McGraw-Hill. New Delhi.2017.
3. Marikani, "Materials Science", PHI Learning Private Limited, Eastern Economy Edition, 2018.


**REFERENCES:**


4. Subrahmanyam N, Brijlal, "A Text Book of Optics" S.Chand& Co. Ltd, New Delhi, 2017.
5. Kongbamchandramanisingh, "Basic Physics", PHI, 2018.
6. M.N.Avathanalu, P.G.Kshirsagar "A text book of engineering physics" S.Chand&company Ltd, 2017.


**WEB LINKS:**

1. https://bayanbox.ir/view/7764531208313247331/Kleppner-D.-Kolenkow-R.J.-Introduction-to-Mechanics-2014.pdf.
2. https://physicaeducator.files.wordpress.com/2017/11/electricity_and_magnetism-by-purcell-3ed-ed.pdf.
3. https://rajeshvcet.home.blog/regulation-2021/ph3151-engineering-physics-study-materials/
4. https://zenodo.org/record/243407#.ZEgPZXZBzIU
5. https://farside.ph.utexas.edu/teaching/qmech/qmech.pdf.
6. https://web.pdx.edu/~pmoeck/phy381/workbook%20nanoscience.pdf.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | 2 | | | | | | | | | | | | 2 |
| 2 | 3 | 2 | | | | | | | | | | | | 2 |
| 3 | 3 | | | | | | 2 | | | | | | | |
| 4 | 3 | | 2 | | | | | | | | | | | |
| 5 | 3 | | | | | 2 | 2 | | | | | 2 | | 2 |
| **CO (W.A)** | **3** | **2** | **2** | | | **2** | **2** | | | | | **2** | | **2** |

| 22CSC01 - PROBLEM SOLVING AND C PROGRAMMING<br>*(Common to All Branches)* | | | | | |
|---|---|---|---|---|---|
| | | **L** | **T** | **P** | **C** |
| | | **3** | **0** | **0** | **3** |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objectives:** | • To equip students with the essential skills and knowledge to solve computational problems using the C programming language. | | | | |

| **Course Outcomes**<br>The student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply basic syntax and semantics of C language to write clear and structured code. | Ap | 20% |
| **CO2** | Make use of both conditional statements and iterative control structures for developing applications. | Ap | 20% |
| **CO3** | Apply knowledge of arrays and strings to solve computational problems. | Ap | 20% |
| **CO4** | Identify modular solutions that integrate problem-solving techniques to solve complex computational problems. | An | 20% |
| **CO5** | Analyze the performance implications using pointers and to manage file operations efficiently. | An | 20% |

| **UNIT I - PROBLEM SOLVING AND C PROGRAMMING BASICS** | **(9)** |
|---|---|
| **General Problem Solving:** Algorithms, Flowcharts and Pseudo-codes, implementation of algorithms<br>**Basics of C Programming** : Introduction to C - Structure of C program - Programming Rules - Compilation - Errors - C Declarations: Tokens - keywords - identifiers - constants - data types - variable declaration and initialization - type conversion - constant and volatile variables - operators and expressions. | |
| **UNIT II - DECISION CONTROL STATEMENTS** | **(9)** |
| Managing Input and Output operations, Decision Control Statements: Decision control statements, Selection/conditional branching Statements: if, if-else, nested if, if-elif-else statements. Basic loop Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops break and continue statements. | |
| **UNIT III - ARRAYS AND STRINGS** | **(9)** |
| Introduction to Array - Definition - Array initialization - Characteristics - One Dimensional Array - Array operations -Two dimensional arrays -Strings and String handling functions. | |
| **UNIT IV - FUNCTIONS** | **(9)** |
| Functions: Basics - definition - Elements of User defined Functions - return statement, Function types, Parameter Passing Techniques, Function returning more values - Passing Array to Functions - Recursion - Storage classes. | |
| **UNIT V - POINTERS AND FILE MANAGEMENT** | **(9)** |
| Pointer concepts - Pointers & Arrays, Structure concepts - Defining, Declaring, Accessing Member Variables, Structure within Structure - Union - File Management in C- Dynamic Memory Allocation. | |
| | **TOTAL (L:45) = 45 PERIODS** |

| TEXT BOOKS: |
|---|
| 1. Ashok N. Kamthane, "Programming in C", 2nd Edition, Pearson Education, 2013.<br>2. Sumitabha Das, "Computer Fundamentals and C Programming", 1st Edition, McGraw Hill, 2018. |
| **REFERENCES:** |
| 1. R. G. Dromey, "How to Solve it by Computer", Pearson Education India; 1st Edition, ISBN10: 8131705625, ISBN-13: 978-8131705629<br>2. Maureen Spankle, "Problem Solving and Programming Concepts", Pearson; 9th Edition, India, ISBN-10: 9780132492645, ISBN-13: 978- 0132492645<br>3. Yashavant Kanetkar, "Let us C", 16th Edition, BPB Publications, 2018.<br>4. ReemaThareja., "Programming in C ", 2nd Edition, Oxford University Press, New Delhi, 2018.<br>5. Balagurusamy E., "Programming in ANSI C", 7th Edition, Mc Graw Hill Education, 2017. |

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | 3 | | | | | | | | | | | | | |
| **2** | 3 | | | | | | | | | | | | | |
| **3** | 3 | | | | | | | | | | | 3 | | 2 |
| **4** | | 3 | | | | | | | | | | 3 | | |
| **5** | | 3 | | | | | | | | | | | | |
| **CO (W.A)** | **3** | **3** | | | | | | | | | | **3** | | **2** |

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| 22CEC01 - FUNDAMENTALS OF ENGINEERING MECHANICS<br>*(Common to All Branches)* | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **2** | **1** | **0** | **3** |
| **PREREQUISITE : NIL** | | | | |
| **Course Objectives:** | • To apply the principles of engineering mechanics to analyze and solve problems in statics and dynamics, including the calculation of forces, moments, and motions, and the design of simple mechanical systems. | | | |

| **Course Outcomes**<br>The student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply the principles of equilibrium to analyze forces acting on a particle. | Ap | 20% |
| **CO2** | Apply the knowledge of free body diagrams to solve problems involving the equilibrium of rigid bodies in two dimensions. | Ap | 20% |
| **CO3** | Analyze the properties of various sections using standard formulas. | An | 20% |
| **CO4** | Evaluate impacts due friction and solving complex problems involving different types of frictional interactions. | An | 20% |
| **CO5** | Analyze the motion of objects in various contexts to understand the relationships between these quantities. | An | 20% |

| **UNIT I - BASICS AND STATICS OF PARTICLES** | **(6+3)** |
|---|---|
| Introduction - Units and Dimensions - Laws of Mechanics - Lame's theorem, Parallelogram and triangular Law of forces - Principle of Transmissibility - Coplanar Forces - Resolution and Composition of forces - Equilibrium of a particle - Forces in space - Equilibrium of a particle in space - Equivalent systems of forces. | |
| **UNIT II - EQUILIBRIUM OF RIGID BODIES** | **(6+3)** |
| Free body diagram - Types of supports and their reactions - requirements of stable equilibrium - Moments - Moment of a force about a point and about an axis - Varignon's theorem - Equilibrium of Rigid bodies in two dimensions. | |
| **UNIT III - PROPERTIES OF SURFACES AND SOLIDS** | **(6+3)** |
| Determination of Areas and Volumes - Centre of Gravity - First moment of area, Second moment of area and Centroid of sections - Rectangle, circle, triangle from 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. | |
| **UNIT IV - FRICTION** | **(6+3)** |
| Surface Friction - Frictional force - Laws of Coulomb friction - Angle of friction - cone of friction - Simple contact friction - Ladder friction - Rolling Resistance - Problems involving the equilibrium of rigid bodies with frictional forces. | |

| UNIT V - DYNAMICS OF PARTICLES | (6+3) |
|---|---|
| Kinematics - Relative motion - Curvilinear motion, Kinetics - Displacements, Velocity and acceleration, their relationship - Newton's laws of motion - Work Energy Equation. | |
| **TOTAL (L:30+T:15) = 45 PERIODS** | |

**TEXTBOOKS:**

1. N. Koteeswaran, "Engineering Mechanics", Sri Balaji Publications, 2017.
2. R. K. Bansal, "A Textbook of Engineering Mechanics", Laxmi Publications (P) Ltd, New Delhi, 6th Edition, 2015

**REFERENCES:**

1. Beer Ferdinand P., Russel Johnston Jr., David F. Mazure, Philip J. Cornwell, Sanjeev Sanghi, "Vector Mechanics for Engineers: Statics and Dynamics", 12th Edition, McGraw Hill Education, Chennai, 2019.
2. Irving H. Shames, " Engineering Mechanics - Statics and Dynamics", 4th Edition, Pearson Education Asia Pvt. Ltd., 2005
3. M. S. Palanisamy and S. Nagan, "Engineering Mechanics - Statics & Dynamics", TMH Publishing Company, 2005

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | |
| 2 | 3 | | | | | | | | | | | 2 | | |
| 3 | 3 | 3 | 2 | | | | | | | | | 3 | 2 | 2 |
| 4 | | 3 | | | | | | | | | | | | 2 |
| 5 | | 2 | | | | | | | | | | | | 2 |
| **CO (W.A)** | **3** | **2.7** | **3** | | | | | | | | | **2.5** | **2** | **2** |

| 22CYB08 - ENVIRONMENT AND SUSTAINABILITY | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 2 | 0 | 0 | 2 |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To impart knowledge on ecosystem, biodiversity, environmental pollution and familiarize about sustainable development, carbon credit and green materials.<br>• To make the students conversant with the global and Indian scenario of renewable resources, causes of their degradation and measures to preserve them. |

| | **Course Outcomes**<br>The Student will be able to | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Illustrate the values and conservation methods of biodiversity | Ap | 20% |
| **CO2** | Predict the causes, effects of environmental pollution and contribute the preventive measures to the society. | An | 20% |
| **CO3** | Analyse the renewable and non-renewable resources and preserve them for future generations. | An | 20% |
| **CO4** | Examine the different goals of sustainable development and apply them for suitable technological advancement and societal development. | An | 20% |
| **CO5** | Execute the sustainability practices, identify green materials and energy cycles. | Ap | 20% |

| | |
|---|---|
| **UNIT I - ENVIRONMENT AND BIODIVERSITY** | **(6)** |
| Environment - scope and importance - Eco-system: Structure and function of an ecosystem - types of biodiversity - genetic - species and ecosystem diversity - values of biodiversity - hot-spots of biodiversity – conservation of biodiversity: In-situ and ex-situ. | |
| **UNIT II - ENVIRONMENTAL POLLUTION** | **(6)** |
| Pollution - Causes - Effects and Preventive measures of Water, Air and noise pollution - Solid waste management: methods of disposal of solid waste - Environmental protection act: Air act - Water act. | |
| **UNIT III - RENEWABLE SOURCES OF ENERGY** | **(6)** |
| Energy management and conservation - New Energy Sources: Different types of new energy sources - Solar energy - wind energy - Applications of Hydrogen energy, Ocean energy resources, Tidal energy conversion. | |
| **UNIT IV - SUSTAINABILITY AND MANAGEMENT** | **(6)** |
| Development - Factors affecting development - advantages - disadvantages - GDP - Sustainability - needs - concept - concept of carbon credit - carbon footprint - Environmental management. | |
| **UNIT V - SUSTAINABILITY PRACTICES** | **(6)** |
| Zero waste and R concept - ISO 14000 Series - Environmental Impact Assessment - Sustainable energy: Energy Cycles- carbon cycle and carbon emission - Green Engineering: Sustainable urbanization. | |
| **TOTAL (L:30) : 30 PERIODS** | |

**TEXT BOOKS:**

1. Dr. A.Ravikrishan, "Envrionmental Science and Engineering", Sri Krishna Hitech Publishing co. Pvt.Ltd., Chennai,15th Edition, 2023.
2. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers, 2018.

**REFERENCES:**

1. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, Third Edition, 2015.
2. Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

**WEBLINK:**

1. http://www.jnkvv.org/PDF/08042020215128Amit1.pdf
2. https://www.conserve-energy-future.com/types-of-renewable-sources-of-energy.php
3. https://ugreen.io/sustainability-engineering-addressing-environmental-social-and-economic-issues/

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | | 2 | | | | | | | | | | | | |
| 2 | | | 2 | | | | 3 | | | | | | | |
| 3 | 2 | | | | | | | 2 | | | | | | |
| 4 | | | | | | | 3 | | | | | | | |
| 5 | | | | | | 3 | | | 2 | | | 2 | | 2 |
| **CO (W.A)** | **2** | **2** | **2** | | | **3** | **3** | **2** | **2** | | | **2** | | **2** |

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| 22PYP01 - PHYSICS LABORATORY<br>(Common to All Branches) | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **0** | **0** | **2** | **1** |
| **PREREQUISITE : NIL** | | | | |

| | |
|---|---|
| **Course Objective:** | • To infer the practical knowledge by applying the experimental methods to correlate with the Physics theory.<br>• To introduce different experiments to test basics of physics concepts applied in optics and electronics |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** |
|---|---|---|
| **CO1** | Examine the effects of material type and loading conditions on the results of the non-uniform bending experiment. | An |
| **CO2** | Utilize principles of light interaction to determine the particle size of materials using laser diffraction techniques. | Ap |
| **CO3** | Evaluate the accuracy of the wavelength of different colors with the accepted values in the literature | Ev |
| **CO4** | Measure the effectiveness of the solar cell based on its V-I characteristics. | Ev |
| **CO5** | Analyze the principles underlying the air wedge method for the determination of the thickness of a thin wire, | An |

**LIST OF EXPERIMENTS:**

1. Determination of Young's modulus by non-uniform bending method
2. Determination of (a) wavelength and (b) particle size using Laser.
3. Determination of thermal conductivity of a bad conductor - Lee's Disc method.
4. Determination of wavelength of mercury spectrum - spectrometer grating
5. Determination of band gap of a semiconductor.
6. Determination of thickness of a thin wire - Air wedge method.
7. Determination of V-I characteristics of solar cell.

**TOTAL (P:30) : 30 PERIODS**

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | 3 | 3 | | | | | | | | | | | | |
| **2** | 3 | | | | | | | | | | | 2 | | |
| **3** | 3 | 3 | | | | | | | | | | | | |
| **4** | 3 | | | | | | | | | | | 2 | | |
| **5** | 3 | 3 | | | | | | | | | | | | |
| **CO (W.A)** | **3** | **3** | | | | | | | | | | **2** | | |

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| 22CSP01 - PROBLEM SOLVING AND C PROGRAMMING LABORATORY<br>*(Common to All Branches)* | | | | | |
|---|---|---|---|---|---|
| | | **L** | **T** | **P** | **C** |
| | | **0** | **0** | **4** | **2** |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To develop programs to solve basic problems by understanding basic concepts in C language | | | | |

| **Course Outcomes**<br>The student will be able to | | **Cognitive Level** |
|---|---|---|
| **CO1** | Formulate the algorithms for simple problems | Ap |
| **CO2** | Apply the concept of pointers of different types | Ap |
| **CO3** | Apply and manipulate data with arrays, strings and structures | Ap |
| **CO4** | Apply the concept of functions and dynamic memory allocation | Ap |
| **CO5** | Analyse and correct logical errors encountered during execution | An |

## C - Programming:

1. Draw the flowchart for the following using Raptor tool.
    a) Simple interest calculation
    b) Greatest among three numbers
    c) Find the sum of digits of a number
2. Programs for demonstrating the use of different types of operators like arithmetic, logical, relational and ternary operators (Sequential and Selection structures)
3. Programs for demonstrating repetitive control statements like 'for', 'while' and 'do-while' (Iterative structures)
4. Programs for demonstrating one-dimensional and two-dimensional numeric array
5. Programs to demonstrate modular programming concepts using functions
6. Programs to implement various character and string operations with and without built-in library functions.
7. Programs to demonstrate the use of pointers
8. Programs to illustrate the use of user-defined data types
9. Programs to implement various file management.
10. Program Using Dynamic memory allocation functions

**HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:**

**Hardware:**

- LAN System with 33 nodes (OR) Standalone PCs – 33 Nos.
- Printers – 3 Nos.

**Software:**

- RAPTOR Tool
- Compiler – C

**TOTAL (P:60) : 60 PERIODS**

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | |
| 2 | 3 | | | | | | | | | | | | | |
| 3 | 3 | | | | | | | | | | | | | |
| 4 | 3 | | | | | | | | | | | | | |
| 5 | | 3 | | | 2 | | | | | | | 2 | | 2 |
| **CO (W.A)** | **3** | **3** | | | **2** | | | | | | | **2** | | **2** |

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| 22MAN04 - SOFT/ANALYTICAL SKILLS – II<br>(Common to All Branches) | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **1** | **0** | **2** | **0** |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To acquire satisfactory competency in verbal reasoning.<br>• To develop skill to meet the competitive examinations for better job opportunity. |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of Continuous Assessment test** |
|---|---|---|---|
| **CO1** | Enhance vocabulary which in turn will help in developing language competency. | U | 40% |
| **CO2** | Solve the problems easily by using Short-cut method with time management. | Ap | 30% |
| **CO3** | Analyze the problems logically and approach the problems in a different manner. | An | 30% |

| **UNIT I - VERBAL COMPETENCY** | **(5+10)** |
|---|---|
| Voice - Modal Verbs - Synonyms & Antonyms - Confusable Words | |
| **UNIT II - NUMERICAL REPRESENTATION** | **(5+10)** |
| Average - Data Interpretation - Simple Interest and Compound Interest - Venn Diagram. | |
| **UNIT III - RESOLUTION TENDENCY** | **(5+10)** |
| Time and Work - Pipes and Cistern - Number Series and Odd man Out - Cube Problems | |
| **TOTAL (L:45) = 45 PERIODS** | |

**REFERENCES:**


1. Murphy, Raymond. "English Grammar in Use", Fourth Edition, Cambridge University, 2012.
2. Dr. R.S. Aggarwal. "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand and Company Limited, New Delhi, 2014.
3. Aggarwal, Ashish. "Quick Arithmetic", S Chand and Company Limited, New Delhi, 2014.


**Mapping of COs with POs / PSOs**

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | | | | | | | | | 2 | 3 | | | | |
| **2** | | 2 | | 2 | | | | | | | | | | |
| **3** | | 2 | | 2 | | | | | | | | | | |
| **CO (W.A)** | | **2** | | **2** | | | | | **2** | **3** | | | | |

| 22MAN05 - YOGA – II<br>(For Common To All Branches) | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **0** | **0** | **I** | **0** |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To strengthen the body through physical exercises.<br>• To understand the importance of value system and ethics.<br>• To know the life philosophy of yogis and maharishis.<br>• To understand the nature laws, cause and effect theory.<br>• To inculcate knowledge about different types of Asanas and their benefits. |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Perform physical exercises like spine exercises, massage and acupressure. | Ap | Internal Assessment |
| **CO2** | Learn the human values, ethics, time management and the importance of introspection. | U | |
| **CO3** | Analyze various life philosophies of yogi's and rishi's. | An | |
| **CO4** | Understand life lessons and nature laws. | U | |
| **CO5** | Demonstrate different types of yoga Asanas and improve their personal fitness. | Ap | |

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|---|---|
| **UNIT I - PHYSICAL EXCERCISES (PART-II)** | **(3)** |
| Breathing Exercises - Kapalapathi - Maharasanam (Spine Exerices) - Massage and Acupressure. | |
| **UNIT II - HUMAN VALUE** | **(3)** |
| Divine power - Life force (Bio magnetism) - Importance of Introspection - Time management - Punctuality - self confidence - mind control. | |
| **UNIT III - PHILOSOPHY OF LIFE** | **(3)** |
| Basic needs for life - Hunger and thirst - climatic/weather changes - Body wastes - pressure of excretory organs - safety measures - protection from natural disaster - protection from enmity - protection from accidents - ethics - morality - duty - charity - Wisdom of perfection stages - faith - understanding - realization. | |
| **UNIT IV - NATURE'S LAW OF CAUSE AND EFFECT** | **(3)** |
| Food transformation into seven minerals - Natural actions - pattern - precision - regularity - Required skills - planned work - awareness - introspection. | |
| **UNIT V - ASANAS (PART-II)** | **(3)** |
| Ustrasana - Vakrasana - Komugasana - Padmasana - Vajrasana - Sukhasana - Yogamudra - Mahamudra. | |
| **TOTAL (P:45) : I5 PERIODS** | |

**TEXT BOOK/REFERENCES:**

1. Light on Yoga by B.K.S. Iyengar.

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | | | | | | | | 3 | 2 | | | 3 | | |
| **2** | | | | | | | | 3 | 2 | | | 3 | | |
| **3** | | | | | | | | 3 | 2 | | | 3 | | |
| **4** | | | | | | | | 3 | 2 | | | 3 | | |
| **5** | | | | | | | | 3 | 2 | | | 3 | | |
| **CO (W.A)** | | | | | | | | **3** | **2** | | | **3** | | |

- Ratified by Eleventh Academic Council

| 22GYA01 HERITAGE OF TAMILS<br>*(For Common To All Branches)* | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **I** | **0** | **0** | **I** |
| **PRE REQUISITE : NIL** | | | | |

| **UNIT I - LANGUAGE AND LITERATURE** | **(3)** |
|---|---|
| Language Families in India - Dravidian Languages – Tamil as aClassical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan. | |
| **UNIT II - HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE** | **(3)** |
| Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils. | |
| **UNIT III - FOLK AND MARTIAL ARTS** | **(3)** |
| Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils. | |
| **UNIT IV - THINAI CONCEPT OF TAMILS** | **(3)** |
| Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas. | |
| **UNIT V - CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE** | **(3)** |
| Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books. | |
| **TOTAL (L:15) : 15 PERIODS** | |

**TEXT-CUM-REFERENCE BOOKS**


1. தமிழக வரலாறு – மக்களும் பண்பாடும் –கே.கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

| 22GYA01 தமிழர் மரபு<br>(அனைத்து பாடப்பிரிவினருக்கும்) | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 1 | 0 | 0 | 1 |
| முன் தேவை: இல்லை | | | | |

| அலகு 1 மொழி மற்றும் இலக்கியம் | (3) |
|---|---|
| இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை– சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு. | |
| **அலகு 2 மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக்கலை:** | **(3)** |
| நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள்– தேர் செய்யும் கலை– சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு. | |
| **அலகு 3 நாட்டுப்பறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:** | **(3)** |
| தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டாம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள். | |
| **அலகு 4 தமிழர்களின் திணைக் கோட்பாடுகள்:** | **(3)** |
| தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளின் சோழர்களின் வெற்றி. | |
| **அலகு 5 இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:** | **(3)** |
| இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் –இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு, கல்வெட்டுகள், கையெழுத்துப்படிகள் – தமிழ் புத்தக்களின் அச்சு வரலாறு. | |
| **TOTAL (L:15) : 15 PERIODS** | |

**TEXT-CUM-REFERENCE BOOKS**

1. தமிழக வரலாறு – மக்களும் பண்பாடும் –கே.கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

| 22GYA02 TAMILS AND TECHNOLOGY<br>*(For Common To All Branches)* | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **I** | **0** | **0** | **I** |
| **PRE REQUISITE : NIL** | | | | |

| **UNIT I - WEAVING AND CERAMIC TECHNOLOGY** | **(3)** |
|---|---|
| Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries. | |
| **UNIT II - DESIGN AND CONSTRUCTION TECHNOLOGY** | **(3)** |
| Designing and Structural construction House & Designs n household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period. | |
| **UNIT III - MANUFACTURING TECHNOLOGY** | **(3)** |
| Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting,steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram. | |
| **UNIT IV - AGRICULTURE AND IRRIGATION TECHNOLOGY** | **(3)** |
| Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society. | |
| **UNIT V - SCIENTIFIC TAMIL & TAMIL COMPUTING** | **(3)** |
| Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project. | |
| **TOTAL (L:15) : 15 PERIODS** | |

**TEXT-CUM-REFERENCE BOOKS**


1. தமிழக வரலாறு – மக்களும் பண்பாடும் –கே.கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
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8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

| 22GYA02 தமிழரும் தொழில்நுட்பமும்<br>(அனைத்து பாடப்பிரிவினருக்கும்) | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | I | 0 | 0 | I |
| முன் தேவை: இல்லை | | | | |

| அலகு 1 நெசவு மற்றும் பானைத் தொழில்நுட்பம்: | (3) |
|---|---|
| சங்ககாலத்தில் நெசவுத்தொழில் – பானைத் தொழிலநுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள். | |
| **அலகு 2 வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:** | **(3)** |
| சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் மற்றும் சங்ககாலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு – சங்ககாலத்தில் கட்டுமான பொருட்களும் நடுக்கல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ–சாரோசெனிக் கட்டிடக் கலை. | |
| **அலகு 3 உற்பத்தி தொழில் நுட்பம்:** | **(3)** |
| கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எக்கு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத் துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள். | |
| **அலகு 4 வேளாண்மை மற்றும் நீர்பாசனத் தொழில் நுட்பம்:** | **(3)** |
| அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம். | |
| **அலகு 5 அறிவியல் தமிழ் மற்றும் கணித்தமிழ்:** | **(3)** |
| அறிவியல் தமிழின் வளர்ச்சி – கணித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின் பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம். | |
| **TOTAL (L:15) : 15 PERIODS** | |

**TEXT-CUM-REFERENCE BOOKS**

1. தமிழக வரலாறு – மக்களும் பண்பாடும் –கே.கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

| 22MYB03 - STATISTICS AND NUMERICAL METHODS<br>*(Common to AGRI, AI&DS,CSE,IT,IOT,CS(Cyber security)CIVIL,CHEMICAL,EEE,MECH Branches)* | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **3** | **I** | **0** | **4** |
| **PREREQUISITE : NIL** | | | | |
| **Course Objective:** | • To understand the concept of testing of hypothesis for small and large samples and design of experiments.<br>• To provide adequate knowledge in numerical techniques to solving ordinary differential equations and numerical integration which plays an important role in engineering and technology disciplines. | | | |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Interpret the principles and techniques in experimental design to solve the variance | Ap | 20% |
| **CO2** | Apply the fundamental numerical techniques used to solve various types of mathematical problems on solution of equations, interpolation and numerical integration. | Ap | 40% |
| **CO3** | Determine the statistics based on the data and related to the testing of hypothesis. | An | 20% |
| **CO4** | Solve the real-world problems using numerical methods for IVPs, demonstrating their applicability and limitations. | Ap | 20% |
| **CO5** | Demonstrate the importance of interpolation and approximation techniques to solve real-world problems in various disciplines of Engineering using modern tools. | Ap | Internal Assessment |

| **UNIT I - TESTING OF HYPOTHESIS** | **(9+3)** |
|---|---|
| Sampling Distributions-Tests for single mean, difference of means (Large and Small samples) Using z, t - distribution, F - distribution- Chi-square - Test for independence of attributes and Goodness of fit. | |
| **UNIT II - DESIGN OF EXPERIMENTS** | **(9+3)** |
| Analysis of variance - Completely randomized design - Randomized block design - Latin square design. | |
| **UNIT III - SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS** | **(9+3)** |
| Solution of algebraic and transcendental equations - Fixed point iteration method - Newton Raphson method- Solution of linear system of equations Gauss elimination method - Iterative methods of Gauss Jacobi and Gauss Seidel Methods- Eigen values of a matrix by Power method. | |
| **UNIT IV - INTERPOLATION AND APPROXIMATION** | **(9+3)** |
| Lagrange's and Newton's divided difference interpolations - Newton's forward and backward difference interpolation - Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules - Romberg's Methods. | |

| UNIT V - NUMERICAL DIFFERENTIATION AND INTEGRATION | (9+3) |
|---|---|
| Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations. | |
| **TOTAL (L:45+T:15) : 60 PERIODS** | |

**TEXT BOOKS:**


1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
3. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.


**REFERENCES:**


1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | |
| 2 | 3 | | | | | | | | | | | | | |
| 3 | | 2 | | | | | | | | | | | | |
| 4 | 3 | | | | | | | | | | | | | 2 |
| 5 | 3 | | | | 2 | | | | 3 | | | 2 | | 2 |
| **CO (W.A)** | **3** | **2** | | | **2** | | | | **3** | | | **2** | | **2** |

## 22CEC02 - MECHANICS OF MATERIALS

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**PREREQUISITE : 22CEC01**

| | |
|---|---|
| **Course Objective:** | To impart knowledge about stresses, strains, shear force, bending moment, slope and deflection in beams and concept of torsion in circular shaft. |

| Course Outcomes<br>The students will be able to | | Cognitive Level | Weightage of COs in End Semester Examination |
|---|---|---|---|
| **CO1** | Calculate simple stresses and strains in various structural members. | Ap | 20% |
| **CO2** | Draw and interpret shear force and bending moment diagrams. | Ap | 20% |
| **CO3** | Examine the effects of various loads on beams by analyzing their slope and deflection under standard loading configurations. | An | 20% |
| **CO4** | Apply beam theory principles to predict structural behavior under various loading conditions. | An | 20% |
| **CO5** | Examine the behavior of beams due to and cylinders subjected to bending stress. | An | 20% |

| | |
|---|---|
| **UNIT I - SIMPLE AND COMPOUND STRESSES** | **(9)** |
| Stresses in simple and compound bars - Elastic constants - Thin cylindrical and spherical shells - Biaxial state of stress - Principal stresses and principal planes - Torsion on circular shafts. | |
| **UNIT II - BENDING OF BEAMS** | **(9)** |
| Types of beams and transverse loadings - Shear force and bending moment for simply supported, cantilever and over-hanging beams - Theory of simple bending - Bending stress distribution - Shear stress distribution. | |
| **UNIT III - DEFLECTION OF BEAMS** | **(9)** |
| Double Integration method - Macaulay's method - Area moment method - Conjugate beam method - Strain energy method for determinate beams | |
| **UNIT IV - INDETERMINATE BEAMS** | **(9)** |
| Propped Cantilever and Fixed Beams - Fixed end moments reactions, slope and deflection for standard cases of loading - Continuous beams - support reactions and moments - Theorem of three moments - Shear Force and Bending Moment Diagrams. | |
| **UNIT V - ADVANCED TOPICS** | **(9)** |
| Bending stress in beams subjected to Unsymmetrical bending - Curved beams - Winkler Bach Theory - Rectangular, Circular, Trapezoidal sections - Thick cylinders - Compound cylinders. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**


1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 2018.
2. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures (SMTS) Vol - II", Laxmi Publishing Pvt Ltd, New Delhi 2017.
3. Vazirani.V.N, Ratwani. M.M, Duggal S.K, "Analysis of Structures: Analysis, Design and Detailing of Structures-Vol.I", Khanna Publishers, New Delhi 2014.


**REFERENCES:**


1. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2017
2. William A .Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series, Tata McGraw Hill Publishing company, 2017.
3. Singh. D.K., " Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2021
4. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2015
5. Beer. F.P. and Johnston E.R. "Mechanics of Materials", Tata McGraw Hill, Sixth Edition, New Delhi 2010.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | |
| 2 | 3 | | | | | | | | | | | | 2 | 2 |
| 3 | 2 | 3 | | 2 | | | | | | | | | 2 | 2 |
| 4 | 2 | 2 | | | | | | | | | | | | |
| 5 | | 2 | | | | | | | | | | | | 2 |
| CO (W.A) | 2.5 | 2.3 | | 2 | | | | | | | | | 2 | 2 |

## 22CEC03 - HIGHWAY AND RAILWAY ENGINEERING

| | L | T | P | C |
|---|---|---|---|---|
| | 3 | 0 | 0 | 3 |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To identify key principles and terminology in highway and railway engineering, including design standards and materials used in infrastructure. |

| | Course Outcomes<br>The students will be able to | Cognitive Level | Weightage of COs in End Semester Examination |
|---|---|---|---|
| **CO1** | Apply fundamental principles of highway and railway engineering to develop new infrastructure projects including design standards. | Ap | 40% |
| **CO2** | Implement construction practices for pavements ensuring compliance with IS standards. | Ap | 20% |
| **CO3** | Apply design criteria to create geometric layouts for highway elements. | Ap | 20% |
| **CO4** | Apply the construction techniques and maintenance of track laying and railway stations. | Ap | 20% |
| **CO5** | Analyze and present a real-world highway / railway project to evaluate its design approaches, construction methods, and project outcomes. | An | Internal Assessment |

| | |
|---|---|
| **UNIT I - HIGHWAY ENGINEERING** | **(9)** |
| Classification of highways - Institutions for Highway planning, design and construction at different levels - factors influencing highway alignment - Typical cross sections of Urban and Rural roads - Engineering surveys for alignment - Conventional and Modern method | |
| **UNIT II - DESIGN OF HIGHWAY ELEMENTS** | **(9)** |
| Cross sectional elements - Horizontal curves, super elevation, transition curves, widening of curves - Sight distances - Vertical curves, gradients - pavement components and their role - Design practice for flexible and rigid pavements (IRC methods only). | |
| **UNIT III - HIGHWAY CONSTRUCTION AND MAINTENANCE** | **(9)** |
| Bitumen, material testing and properties - Construction practice of flexible and concrete pavement - Highway drainage - Evaluation and Maintenance of pavements. | |
| **UNIT IV - RAILWAY PLANNING AND CONSTRUCTION** | **(9)** |
| Elements of permanent way - Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails - Route alignment surveys, conventional and modern methods - Geometric design of railway, gradient, super elevation, widening of gauge on curves (Problems) - Railway drainage. | |
| **UNIT V - RAILWAY TRACK CONSTRUCTION MAINTENANCE AND OPERATION** | **(9)** |
| Points and Crossings - Design of Turnouts, Working Principle -Track Circuiting - Construction and Maintenance - Conventional, Modern methods and Materials, Lay outs of Railway Stations and Yards, Rolling Stock, Tractive Power, Track Resistance - Role of Indian Railways in National Development - Railways for Urban Transportation - LRT & MRTS Feasibility study, Planning and construction. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**


1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2014.
2. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", SciTech Publications (India), Chennai, 2010
3. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications, 6th Edition Delhi, 2015.
4. C. Venkatramaiah., "Transportation Engineering - Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels", Universities Press (India) Private Limited, Hyderabad, 2015.


**REFERENCES:**


1. Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Nineth Impression, South Asia,2012
2. Ian D. Walsh, "ICE manual of highway design and management", ICE Publishers, Ist Edition, USA,2011
3. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi,2010
4. IRC 37 - 2012,"The Indian roads Congress, Guidelines for the Design of Flexible Pavements", New Delhi
5. IRC 58 -2012, "The Indian Road Congress, Guidelines for the Design of Rigid Pavements for Highways", New Delhi
6. Saxena Subhash, C. and Satyapal Arora, "A Course in Railway Engineering", Dhanapat Rai and Sons, Delhi, 1998.


**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | 2 |
| 2 | 3 | | | | | | | | | | | | | |
| 3 | 3 | | 2 | | | | | | | | | | 2 | 3 |
| 4 | 3 | | | | | | | | | | | | | 2 |
| 5 | | | | | | | | 2 | 3 | | | 3 | | |
| CO (W.A) | 2.8 | | 2 | | | | | 2 | 3 | | | 3 | 2 | 2.3 |

| 22CEC04 - SURVEYING | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To learn the use of various surveying instruments and apply surveying techniques to real-world problems. | | | | |

| Course Outcomes<br>The students will be able to | | Cognitive Level | Weightage of COs in End Semester Examination |
|---|---|---|---|
| **CO1** | Calculate various parameters of linear, direction, angular measurement of objects. | Ap | 40% |
| **CO2** | Analyse and evaluate the measurements in leveling to obtain reduced levels and locate the contours. | An | 20% |
| **CO3** | Apply hydrographic surveying techniques and analyse the data for mapping and charting water bodies. | Ap | 20% |
| **CO4** | Apply the fundamental principles and advanced technologies in surveying. | Ap | 20% |
| **CO5** | Create and Present their own maps based on surveyed data. | C | Internal Assessment |

| **UNIT I - CHAIN AND COMPASS SURVEYING** | **(9)** |
|---|---|
| Definition- Classifications - Plane and Geodetic Surveying - Basic principles - Equipment and accessories for ranging and chaining - Methods of ranging - well conditioned triangles - Compass - Types - Bearing - System and conversions - Sources of errors and Local attraction - Magnetic declination - Dip - Compass traversing and plotting - Closing error adjustment. | |
| **UNIT II - LEVELING AND CONTOURING** | **(9)** |
| Level line - Horizontal line - Datum - Bench marks - temporary and permanent adjustments - Methods of levelling - Fly levelling - Check levelling - Contouring - Methods - Characteristics and uses of contours. - Problems by using height of collimation and rise and fall method. | |
| **UNIT III - THEODOLITE AND TACHEOMETRIC SURVEYING** | **(9)** |
| Theodolite - Types - Horizontal and vertical angle measurements - Temporary and permanent adjustments -Tacheometric systems - Tangential and stadia methods - Stadia systems - Determination of stadia constants | |
| **UNIT IV - HYDROGRAPHIC SURVEYING** | **(9)** |
| Introduction to Hydrographic surveying - Tides - Mean Sea Level - Vertical depth measurements - Soundings - Methods of locating soundings | |
| **UNIT V - DIGITAL SURVEYING** | **(9)** |
| Introduction, aerial photogrammetry, types of EDM instruments. Total station - Principles of remote sensing and its applications. | |
| | **TOTAL (L:45) = 45 PERIODS** |

**TEXTBOOKS:**

1. Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain, "Surveying Vol. I & II", Lakshmi Publications Pvt Ltd, New Delhi, Sixteenth Edition, 2016.
2. Duggal R.K, "Surveying Vol. I & II", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2004.

**REFERENCES:**


1. R. Subramanian, "Surveying and Levelling", Oxford University Press, Second Edition, 2012.
2. Bannister and S. Raymond, "Surveying", Seventh Edition, Longman 2004.
3. S. K. Roy, "Fundamentals of Surveying", Second Edition, Prentice Hall of India 2010.
4. K. R. Arora, "Surveying Vol I & II", Standard Book house, Twelfth Edition 2013.
5 C. Venkatramaiah, "Textbook of Surveying", Universities Press, Second Edition, 2011.


**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | 2 | | | | | | | | | | 2 | 3 |
| 2 | 3 | 2 | 2 | | | | | | | | | | 3 | 3 |
| 3 | 3 | 2 | | | | | | | | | | | 3 | 3 |
| 4 | 2 | | | | 3 | | | | | | | | 3 | 3 |
| 5 | 3 | | | | 2 | 2 | | | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO (W.A)** | **2.8** | **2** | **2** | | **2.5** | **2** | | | **3** | **3** | **2** | **3** | **2.8** | **3** |

## 22CEC05 - CONSTRUCTION MATERIALS AND PRACTICES

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 2 | 4 |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To impart knowledge on the materials used for construction and the construction techniques implemented in construction industry.<br>• To evaluate sustainable practices, safety measures, and economic considerations in selecting and using materials. |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Identify suitable building materials for a construction project. | Ap | 40% |
| **CO2** | Select and apply appropriate binding agents and composite materials for a specific construction project. | Ap | 20% |
| **CO3** | Interpret the various construction practices and techniques adopted in building construction. | An | 20% |
| **CO4** | Select equipment that meets the requirements of a construction project. | Ap | 20% |
| **CO5** | Design and develop a construction project that demonstrates the application of construction materials and practices, and document the process in a comprehensive report. | E | Laboratory Assessment |

| **UNIT I - BUILDING MATERIALS** | **(9)** |
|---|---|
| Introduction and types of building materials - Properties - Physical and mechanical properties. Stones and Rocks: Classification of Rocks - Qualities of good stones - Uses. Bricks: Constituents - Qualities of good brick - Classification - Uses. Cement: Ingredients - Qualities of good cement - Types and Uses of cement. | |
| **UNIT II - MORTAR, CONCRETE AND STEEL** | **(9)** |
| Mortar: Types of Mortars - Properties - Uses - Selection of mortar. Concrete: Ingredients - Types of Concrete - Properties - Uses - Reinforced concrete. Steel: Steel sections - steel as a reinforcing material - Types of reinforcing steels. | |
| **UNIT III - OTHER MATERIALS** | **(9)** |
| Timber: Characteristics of timber - Seasoning of timber - Properties and uses - Common forms of timber - Plywood - Veneer - False ceiling materials - Aluminum - Uses - Market forms - Glass - Ceramics - Refractories - Composite Materials - Types and applications - FRP - Fibre textiles - Geomembranes and Geotextiles for earth reinforcement. | |
| **UNIT IV - CONSTRUCTION PRACTICES AND SERVICE REQUIREMENTS** | **(9)** |
| Types of Foundations - Shallow and Deep Foundations - Stone Masonry - Brick Masonry - Plastering and Pointing - Cavity Walls - Diaphragm Walls - Formwork - Centering and Shuttering - Shoring - Scaffolding - Underpinning - Roofing - Flooring - Joints in concrete - Contraction/Construction/Expansion joints - Fire Protection - Thermal Insulation - Ventilation and Air conditioning - Acoustics and Sound Insulation - Damp Proofing. | |

| UNIT V - CONSTRUCTION EQUIPMENTS | (9) |
|---|---|
| Selection of equipment for earthwork excavation, concreting, material handling and erection of structures - Dewatering and pumping equipment. | |

**LIST OF EXPERIMENTS:**

1. Determination of Tension on mild steel rod.
2. Determination of Compression strength on Bricks and Blocks.
3. Determination of Water Absorption Test on Bricks and Blocks.
4. Determination of Izod and Charpy impact test on metal specimens.
5. Finding out the Rockwell Hardness Number on metal Specimens.
6. Finding out the Brinell hardness test on metal Specimens.
7. Determination of Torsional strength of steel specimen.

**TOTAL (L:45+P:30) = 75 PERIODS**

**TEXTBOOK:**


1. Palanichamy M.S., "Basic Civil Engineering", 4th Edition, McGraw-Hill Education, New Delhi, 2020.


**REFERENCES:**


1. Navaneethakrishnan P., "Basic of Civil and Mechanical Engineering", 1st Edition, McGraw-Hill Education, New Delhi, 2016
2. Duggal S.K., "Building Materials", 5th Edition, New Age Publishers, 2021.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | 3 | 3 |
| 2 | 3 | | | | | | | | | | | | | 3 |
| 3 | | 3 | | 2 | | | | | | | | | 2 | 2 |
| 4 | 2 | | | | | | | | | | | | | 2 |
| 5 | 3 | | 2 | 2 | | | | | 3 | 2 | | 3 | 3 | 3 |
| CO (W.A) | 2.8 | 3 | 2 | 2 | | | | | 3 | 2 | | 3 | 2.7 | 2.6 |

## 22CEC06 - FLUID MECHANICS AND HYDRAULICS ENGINEERING

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 2 | 4 |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To apply fluid mechanics principles to analyze and solve engineering problems related to fluid flow, hydraulic systems, and fluid machinery.<br>• To demonstrate proficiency in designing and evaluating hydraulic structures and systems for practical applications. |

| Course Outcomes<br>The students will be able to | | Cognitive Level | Weightage of COs in End Semester Examination |
|---|---|---|---|
| **CO1** | Calculate the properties and characteristics of fluids. | Ap | 20% |
| **CO2** | Apply concept of fluid measurement and pipe flows in engineering problems. | Ap | 40% |
| **CO3** | Classify different types of flow and apply the concepts to design efficient channel systems. | Ap | 20% |
| **CO4** | Evaluate the dimensional and model parameters to solve complex fluid problems. | Ap | 20% |
| **CO5** | Apply theoretical concepts to practical problems, analyze and evaluate the performance of various hydraulic systems and interpret the data. | E | Laboratory Assessment |

| **UNIT I - FLUID PROPERTIES, STATICS AND KINEMATICS** | **(9)** |
|---|---|
| Properties of fluids - Types of fluids- Hydrostatic law - Pascal's law- Types and measurement of pressure - Hydrostatic pressure -Total pressure - Centre of pressure - Buoyancy - Metacentre - Equilibrium conditions. | |
| **UNIT II - FLUID DYNAMICS** | **(9)** |
| Classification and types of flow - flow lines and Path lines - Continuity equation - Velocity potential function and Stream function - Flow net - Euler's equation of motion - Bernoulli's equation and its applications | |
| **UNIT III - OPEN CHANNEL FLOW** | **(9)** |
| Types of flow- Specific energy - Critical flow - Velocity measurements by Manning's and Chezy' formula - Most economical sections - Characteristics and types of flow profiles - Back water and draw down curves - Surface profile calculations | |
| **UNIT IV - FLOW THROUGH PIPES AND BOUNDARY LAYER** | **(9)** |
| Flow through Pipes in series and parallel - Darcy Weisbach's formula - Moody diagram - Hydraulic Jumps - Surges. Boundary layer concept, thickness and classification. | |
| **UNIT V - DIMENSIONAL AND MODEL ANALYSIS** | **(9)** |
| Dimensional analysis - Dimensional parameters - Rayleigh's method and Buckingham's Pi theorem - Model analysis - Hydraulic structures - Similitude - Scale effect - Distorted and undistorted models. | |

**LIST OF EXPERIMENTS:**

1. Determination of Co-efficient of discharge of Orifice meter,
2. Determination of Co-efficient of discharge of Venturi meter.
3. Determination of friction loss in pipes
4. Determination of various types of minor losses in pipes
5. Evaluation of the performance characteristics of Pelton turbine
6. Evaluation of the performance characteristics of Francis / Kaplan turbine
7. Determination of Metacentric height of floating bodies
8. Evaluation of the performance characteristics of submersible pump

**TOTAL (L:45+P:30) = 75 PERIODS**

**TEXTBOOK:**


1. Bansal R.K., "A Textbook of Fluid Mechanics and Hydraulic Machines", 10th Edition, Laxmi Publications, New Delhi, 2018.


**REFERENCES:**


1. Modi P.M., and Seth S.M., "Hydraulics and Fluid Mechanics including Hydraulic Machines", 21st Edition, Standard Book House, New Delhi, 2017.
2. Victor L. Streeter, Benjamin E. Wylie and Bedford K.W., "Fluid Mechanics", 9th Edition, McGraw-Hill, India, 2010.


**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | 2 | |
| 2 | 3 | | | | | | | | | | | | 2 | |
| 3 | | 2 | | 2 | | | | | | | | | | 2 |
| 4 | 2 | 2 | | | | | | | | | | | | 2 |
| 5 | | 2 | | 2 | | | | | 2 | | | 2 | | 2 |
| CO (W.A) | 2.7 | 2 | | 2 | | | | | 2 | | | 2 | 2 | 2 |

| 22CEP01- SURVEYING LABORATORY | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 0 | 0 | 4 | 2 |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To impart knowledge in linear/angular measurement using various surveying instruments.<br>• To provide an exposure on the use of minor and modern instruments in surveying |

| Course Outcomes<br>The Student will be able to | | Cognitive Level |
|---|---|---|
| **CO1** | Apply the usage of basic surveying instruments in the field. | Ap |
| **CO2** | Compute area of field using linear and angular measurements. | An |
| **CO3** | Determine the elevations of different points using various methods | Ap |
| **CO4** | Construct the control points and carry-out the appropriate error corrections for the survey data points. | C |
| **CO5** | Represent the concept and principle of modern surveying. | Ap |

**LIST OF EXPERIMENTS:**

1. Measurement of bearings of sides of a traverse with prismatic compass
2. Fixing bench mark with respect to temporary bench mark with dumpy level by fly leveling.
3. Contour plan of given area.
4. Determination of elevation of various points using dumpy level by rise and fall method.
5. Determination of elevation of various points using dumpy level by Height of Collimation Method.
6. Measurements of Horizontal Angles by method of repetition.
7. Study on Setting up of Total Station.
8. Remote elevation Measurement using Total Station
9. Missing Line Measurement Using Total Station
10. Area measurement using Total Station
11. Study on layout preparation using total station

**TOTAL (P:60) = 60 PERIODS**

**REFERENCES:**


1. Dr. B. C. Punmia, Ashok K. Jainand Arun K Jain, "Surveying Vol. I & II", Lakshmi Publications Pvt Ltd, New Delhi, 17th Edition, 2016.
2. David Clark, "Plane and Geodetic Surveying for Engineers, Volume I", Constable and Company Ltd, London, CBS, 6th Edition, 2004.
3. S. K. Roy, "Fundamentals of Surveying", Second Edition, Prentice Hall of India 2004
4. K. R. Arora, "Surveying Vol. I & II", Standard Book house, Eleventh Edition, 2013.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | 2 | |
| 2 | | 2 | 3 | | | | | | | | | | 3 | |
| 3 | 3 | 2 | | 2 | | | | | | | | | | 2 |
| 4 | | 3 | | 2 | | | | | | | | | | |
| 5 | 3 | | | | 3 | | | | | | | 3 | | 2 |
| **CO (W.A)** | **3** | **2.3** | **3** | **2** | **3** | | | | | | | **3** | **2.5** | **2** |

| 22CEP02 - COMPUTER AIDED BUILDING DRAWING - I | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 0 | 0 | 4 | 2 |

**PREREQUISITE : NIL**

| **Course Objective:** | • To imparts knowledge about the preparation of plan, section and elevation of different types of buildings as per specifications. |
|---|---|

| **Course Outcomes** The Student will be able to | | **Cognitive Level** |
|---|---|---|
| **CO1** | Apply the various basic commands for drafting and know the types of coordinate systems. | Ap |
| **CO2** | Draw and label the various building elements. | Ap |
| **CO3** | Plan buildings based on NBC specifications and building bye-laws. | Ap |
| **CO4** | Draw the detailed working drawing for residential building. | C |
| **CO5** | Prepare detailed drawings to include the plan, elevation, and sectional views of the load-bearing structure. | C |

**LIST OF EXPERIMENTS:**

1. Introduction to AutoCAD and basic drafting tools /commands
2. Building Planning - NBC provisions and Bye-laws -Terminologies, Orientation, Ventilation & Lighting
3. Preparation of key plan and site plan
4. Draw the Building Elements - Foundations, Super structure
5. Draw the Building Elements - Types of Roofs and Staircase
6. Draw the Building Elements - Types of Doors and Windows
7. Preparation of approval plan for a Residential Building
8. Drawing the Plan, Elevation and Section of a residential Building with Load Bearing Wall (Flat roof )
9. Draw a Plan, Elevation and Section of sloped roof residential building with load bearing wall
10. Draw a Single floor residential building - Plan, Section and Elevation

**TOTAL (P:60) = 60 PERIODS**

**REFERENCES/ MANUAL /SOFTWARE:**


1. Reference manual for AutoCAD
2. Sikka V.B., "A course in Civil Engineering Drawing", 4th Edition, S.K.Kataria and Sons, 2015.
3. Bhavikatti, S.S and Chitawadagi, M.V., "Building Planning and Drawing", I.K. International Publishing House Pvt. Ltd. New Delhi,2019


**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | |
| 2 | 3 | | | | | | | | | | | | | |
| 3 | 3 | | | | | | | | | 2 | | 3 | | 3 |
| 4 | 3 | | | | 2 | | | | | 3 | 3 | 3 | 3 | 3 |
| 5 | 3 | | | | 2 | | | | | 3 | 3 | 3 | 3 | 3 |
| CO (W.A) | 3 | | | | 2 | | | | | 2.7 | 3 | 3 | 3 | 3 |

| 22MAN07 - SOFT / ANALYTICAL SKILLS – III<br>(Common to All Branches and Applicable for (2022-2026) Batch only) | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **1** | **0** | **2** | **0** |

**PREREQUISITE : NIL**

| **Course Objective:** | • Improving overall language proficiency for personal or professional reasons<br>• To develop problem solving skills across all levels |
|---|---|

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of Continuous Assessment Test** |
|---|---|---|---|
| **CO1** | Write grammatically correct and coherent sentences. | U | 40% |
| **CO2** | Develop problem solving skills across all levels. | Ap | 30% |
| **CO3** | Solve reasoning problems with ease. | An | 30% |

| **UNIT I - VERBAL COMPETENCY** | **(5+10)** |
|---|---|
| Sentence Selection - Paragraph Formation - Sentence Correction - Spellings. | |
| **UNIT II - APTITUDE** | **(5+10)** |
| Clocks, Calendar, Age Problems - Problem on Trains - Problems on Numbers - Partnerships. | |
| **UNIT III - LOGICAL & REASONING** | **(5+10)** |
| Coding & Decoding - Logical Equivalent - Venn Diagram Problem. | |
| **TOTAL (L:15, P:30) : 45 PERIODS** | |

**REFERENCES:**


1. Murphy, Raymond. "English Grammar in Use". Fourth Edition, Cambridge University, 2012.
2. Dr. R.S. Aggarwal. "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand and Company Limited, New Delhi, 2014.
3. Aggarwal, Ashish. "Quick Arithmetic", S Chand and Company Limited, New Delhi, 2014.

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | | | | | | | | | 2 | 3 | | | | |
| **2** | | 2 | | 2 | | | | | | | | | | |
| **3** | | 2 | | 2 | | | | | | | | | | |
| **CO (W.A)** | | **1** | | **1** | | | | | **1** | **1** | | | | |

| 22MAN07R - SOFT/ANALYTICAL SKILLS - III<br>*(Common to All Branches and Applicable for (2023-2027) Batch only)* | | | | |
|---|---|---|---|---|
| **L** | **T** | **P** | **C** |
| **1** | **0** | **2** | **0** |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To improve language proficiency for personal or professional reasons<br>• To enhance students' mathematical problem-solving and critical thinking skills |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of COs in Continuous Assessment Test** |
|---|---|---|---|
| **CO1** | Demonstrate effective communication skills by listening actively, speaking clearly, reading critically, and writing coherently in contexts. | U | 40% |
| **CO2** | Develop proficiency in applying mathematical concepts of time, speed, distance, and financial calculations involving simple and compound interest. | Ap | 30% |
| **CO3** | Analyse logical reasoning skills through various forms of statements. | An | 30% |

| **UNIT I - VERBAL ABILITY** | **(5+10)** |
|---|---|
| **Grammar** - Concord - Relative Clause - **Listening** - IELTS Listening (Advanced) and Gap Filling - **Speaking** - Introducing Others - Formal Conversations - **Reading** - Reading Comprehension - **Writing** - Hints Development. | |
| **UNIT II - APTITUDE** | **(5+10)** |
| Simple and Compound Interest - Time, Speed and Distance - Problems on Trains - Boats and Streams - Chain Rule - Time and Work - Pipe and Cisterns. | |
| **UNIT III - REASONING** | **(5+10)** |
| Seating Arrangements - Syllogism - Statement and Conclusion - Statement and Assumption - Statement and Course of Action. | |
| **TOTAL (L:15, P:30) : 45 PERIODS** | |

**REFERENCES:**


1. Rizvi, M.Ashraf. "Effective Technical Communication", Tata McGraw-Hill Education, 2017.
2. Aggarwal R S. "Quantitative Aptitude for Competitive Examinations". S. Chand Publishing Company Ltd(s)., 2022.
3. Sharma, Arun. "How to Prepare for Quantitative Aptitude for the CAT", Tata McGraw - Hill Publishing, 2022.
4. Praveen R V. "Quantitative Aptitude and Reasoning", PHI Learning Pvt. Ltd., 2016.

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | | | | | | | | | 2 | 3 | | | | |
| **2** | | 2 | | 2 | | | | | | | | | | |
| **3** | | 2 | | 2 | | | | | | | | | | |
| **CO (W.A)** | | **1** | | **1** | | | | | **1** | **1** | | | | |

| 22CEC07 - STRUCTURAL ANALYSIS | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 1 | 0 | 4 |
| **PREREQUISITE : 22CEC02** | | | | | |
| **Course Objective:** | • To provide knowledge on various methods for the analysis of determinate and indeterminate structures.<br>• To impart knowledge on moving loads and influence line diagrams.<br>• To understand the approximate methods for analyzing multi-storey frames | | | | |

| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Determine member forces including moments and shears in beams. | Ap | 20% |
| **CO2** | Analyze the multistory frames using approximate methods. | An | 20% |
| **CO3** | Apply flexibility matrix method to analyze the beams, frames and truss system. | Ap | 20% |
| **CO4** | Analyze the beams, frames and truss system using stiffness matrix method. | An | 20% |
| **CO5** | Analyze the response in structural elements for the moving loads using method of influence line diagram. | An | 20% |

| **UNIT I - SLOPE DEFLECTION METHOD** | **(9+3)** |
|---|---|
| Introduction to displacement method of analysis - Sign conventions - Development of slope deflection equations - Analysis of continuous beams - Analysis of continuous beams with support settlement - Analysis of non-sway frames - Analysis of sway frames. | |
| **UNIT II - MOMENT DISTRIBUTION METHOD** | **(9+3)** |
| Introduction to moment distribution method - Stiffness factor - Carryover factor and distribution Factor - Analysis of continuous beams - Sinking of supports - Analysis of non-sway frames - Analysis of sway frames. | |
| **UNIT III - FLEXIBILITY MATRIX METHOD** | **(9+3)** |
| Introduction - Static and kinematic indeterminacy - Equilibrium and compatibility conditions - Primary structure - Element and global flexibility matrix - Applications - Analysis of indeterminate beams, frames and trusses (Redundancy restricted to two). | |
| **UNIT IV - STIFFNESS MATRIX METHOD** | **(9+3)** |
| Introduction to matrix methods of analysis - Displacement and force transformation matrices - Element and global stiffness matrix - Applications - Analysis of indeterminate beams - Analysis of portal frames - Analysis of trusses (Redundancy restricted to two). | |
| **UNIT V - MOVING LOADS AND INFLUENCE LINES** | **(9+3)** |
| Influence lines for reactions in statically determinate structures - Influence lines for member forces in pin-jointed frames - Influence lines for shear force and bending moment in beam sections - Muller Breslau's principle - Influence lines for continuous beams (2 - degree redundant structures) | |
| **TOTAL (L:45+T:15) = 60 PERIODS** | |

**TEXTBOOKS:**


1. Devdas Menon, "Structural Analysis", 2nd Edition, Narosa Publishing House, New Delhi, 2018.
2. Vaidyanathan, R and Perumal, P., "Comprehensive Structural Analysis Volume I and II", Laxmi Publications Pvt. Ltd., Chennai, 4th Edition, 2016.
3. S.S.Bhavikatti, "Structural Analysis - Vol. I & II", Vikas Publishing Pvt Ltd., New Delhi, 4th ed., 2013.


**REFERENCES:**


1. Hibbeler, R.C, "Structural Analysis", 10th Edition, Pearson India, Bengaluru, 2018.
2. Punmia.B.C, Ashok K.Jain, ArunK.Jain, "Theory of Structures", 13th Edition, Laxmi Publications, New Delhi, 2017


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | |
| 2 | 3 | 3 | | | | | | | | | | | 2 | |
| 3 | 3 | | | | | | | | | | | | | |
| 4 | 3 | 3 | | 2 | | | | | | | | | | 2 |
| 5 | 3 | 3 | | 2 | | | | | | | | | 2 | 2 |
| CO (W.A) | 3 | 3 | | 2 | | | | | | | | | 2 | 2 |

| 22CEC08 - WATER RESOURCES AND IRRIGATION ENGINEERING | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To provide knowledge of water resources, irrigation engineering concepts, and national water policy.<br>• To impart the required knowledge on reservoir management and Irrigation management practices. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Identify the components of water storage structures along with its functions. | Ap | 20% |
| **CO2** | Identify the suitable method of irrigation and estimate the water requirements of irrigation scheduling. | An | 40% |
| **CO3** | Apply the principles of canal alignment in the design of irrigation canals. | Ap | 20% |
| **CO4** | Assess water quality parameters and proposing strategies to maintain or improve water quality. | An | 20% |
| **CO5** | Design and develop an irrigation project and document the process in a comprehensive report. | Ap | Internal Assessment |

| **UNIT I - WATER RESOURCES** | **(9)** |
|---|---|
| Need for water resources - Water resources of Tamil Nadu and India - Planning of water resources - Assessment of water requirement for drinking and irrigation purposes - Reservoirs - Single and multipurpose reservoir - Multi objective - Storage capacity of reservoirs - Reservoir operation strategies - Design flood level - levees and flood walls. | |
| **UNIT II - WATER RESOURCE MANAGEMENT** | **(9)** |
| Financial aspects of water resources planning - National Water Policy - Consumptive and non - consumptive water use - Water quality - Scope and aims of master plan - Idea of basin as a unit for development - Water budget - Conjunctive use of surface and ground water. | |
| **UNIT III - IRRIGATION ENGINEERING** | **(9)** |
| Need - Advantages and Disadvantages - Connection between Duty, Delta and Base period - Causes affecting duty - Problems - Irrigation efficiencies - problems - Seasonal crops of India - Crop water Requirement - Evaluation of Consumptive use of water. | |
| **UNIT IV - CANAL IRRIGATION** | **(9)** |
| Types of impounding structures: Gravity dam - Diversion Head works - Canal drop - Cross drainage works - Canal regulations - Canal outlets - Canal classifications - Alignment of canals - River Training works - Kennedy's and Lacey's Regime theory. | |

| UNIT V - IRRIGATION METHODS AND MANAGEMENT | (9) |
|---|---|
| Types of Irrigation - Lift irrigation - Tank irrigation - Well irrigation - Irrigation methods: Surface and Sub - Surface and Micro irrigation - Merits and demerits - Irrigation scheduling - Water distribution - Participatory irrigation management with a case study - On farm development works - Participatory irrigation management - Case study. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**


1. Garg S.K., "Water Resources Engineering Vol. II Irrigation Engineering and Hydraulic Structures", 34th Edition, Khanna Publishers,New Delhi, 2016.
2. Punmia B.C. and Pande B.B .Lal," Irrigation and Water Power Engineering", Laxmi Publishing, New Delhi, 2007
3. Asawa G.L., "Irrigation and Water Resources Engineering", 1st Edition, New Age International Publishers, New Delhi, 2005.


**REFERENCES:**


1. Suresh Ukarande, "Irrigation Engineering and Hydraulic Structures", 3rd Edition, Ane Books Pvt. Ltd., New Delhi, 2015.
2. Sharma R.K. "Irrigation Engineering", S.Chand and Co. 2007.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | |
| 2 | 2 | | | 2 | | | | | | | | | | |
| 3 | 3 | | | | | | | | | | | | | 2 |
| 4 | | 2 | | 2 | | | | | | | | | | 2 |
| 5 | 3 | | | | | | | | 2 | 3 | | 3 | | 2 |
| CO (W.A) | 2.5 | 2 | | 2 | | | | | 2 | 3 | | 3 | | 2 |

| 22CEC09 - SOIL MECHANICS | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 2 | 4 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To understand the role of water in soil behavior and how soil stresses, permeability and quantity of seepage under various loading conditions. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply weight-volume relations and index properties of soils to characterize soil behavior and properties for engineering applications. | Ap | 20% |
| **CO2** | Estimate soil stresses and for various types of foundation loads. | An | 40% |
| **CO3** | Apply the principles and techniques to achieve optimal density and stability in engineering constructions. | Ap | 20% |
| **CO4** | Apply the concepts of shear strength in the analysis of stability of slopes, foundations, and earth structures. | An | 20% |
| **CO5** | Conduct standard soil tests analyze the results to determine soil properties. | E | Laboratory Assessment |

| **UNIT I - WEIGHT VOLUME RELATIONS AND INDEX PROPERTIES** | **(9)** |
|---|---|
| Soil formation -Three phase diagram - Weight-volume relations - Index properties of soils - Atterberg's limits - Classification of soils - BIS System. | |
| **UNIT II - SOIL WATER AND PERMEABILITY** | **(9)** |
| Soil water - Effective and neutral stresses - Flow of water through soils - Permeability - Laboratory methods - Darcy's law - Seepage and flow-nets - Quick sand. | |
| **UNIT III - STRESS DISTRIBUTION IN SOILS** | **(9)** |
| Vertical pressure distribution - Boussinesq's equation for point load and uniformly distributed loads - New mark's influence chart - Westergaard's equation -Isobar diagram - Pressure bulb - Contact pressure distribution. | |
| **UNIT IV - CONSOLIDATION AND COMPACTION** | **(9)** |
| Compressibility - e-log p curve - Preconsolidation pressure - Primary consolidation - Terzaghi's consolidation theory - Compaction - factors affecting soil compaction - Laboratory compaction tests - dry density and moisture content relationship - field compaction. | |
| **UNIT V - SHEAR STRENGTH OF SOIL** | **(9)** |
| Shear strength of soils - Stress analysis by Mohr's circle - Mohr's strength theory - Mohr-Coloumb strength envelope - Measurement of shear strength - Direct shear test - Triaxial compression - Unconfined compression test - Vane shear test - Shear strength of saturated cohesive soils - Shear strength of cohesionless soils. | |

**LIST OF EXPERIMENTS**:

1. Determination of specific gravity of soil.
2. Determination of moisture content of soil.
3. Determination of grain size distribution using sieve analysis.
4. Determination of plasticity index of soil.
5. Determination of field density by sand replacement method
6. Determination of field density by core cutter method
7. Determination of moisture - density relationship using Standard Proctor Method
8. Determination of shear strength of soil by direct shear test

**TOTAL (L:45+P:30) = 75 PERIODS**

**TEXTBOOKS:**


1. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 2005.
2. Gopal Ranjan and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age Ltd. International Publisher New Delhi (India) 2006.
3. Arora K.R"Soil Mechanics and Foundation Engineering ", Standard Publishers and Distributors, New Delhi, 2005.


**REFERENCES:**


1. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations". Prentice-Hall, 2006.
2. Das, B.M., "Principles of Geotechnical Engineering". Brooks / Coles / Thompson Learning Singapore, 8th Edition, 2013.
3. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2015.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | 2 | | | | 3 | | | | | 3 | 3 |
| 2 | | 3 | | | | | | | | | | | | 2 |
| 3 | | 3 | | 2 | | | | | | | | | | 2 |
| 4 | 3 | | | | | | | 3 | | | | | | 2 |
| 5 | 3 | | | | | | | 3 | | | | 3 | 3 | 3 |
| CO (W.A) | 3 | 3 | | 2 | | | | 3 | | | | 3 | 3 | 2.4 |

| 22CEC10 - DESIGN OF REINFORCED CONCRETE ELEMENTS<br>*(IS 456 and SP 16 code books are permitted)* | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **3** | **0** | **0** | **3** |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To understand and apply the fundamental principles of reinforced concrete design, including the behavior of concrete and steel under load, to ensure safety and durability in structures. |

| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply limit state principles to the design and analysis of structural components. | Ap | 20% |
| **CO2** | Apply relevant design codes and specifications in the design of structural elements, ensuring compliance with IS standards. | Ap | 20% |
| **CO3** | Design slab and staircase using appropriate codes and standards, ensuring structural safety and serviceability. | An | 20% |
| **CO4** | Categorize the column and apply the appropriate design procedure. | An | 20% |
| **CO5** | Analyze and design foundations to safely transmit loads to the soil. | An | 20% |

| **UNIT I - DESIGN PHILOSOPHY** | **(6)** |
|---|---|
| Concept of Elastic method, ultimate load method and limit state method - Advantages of Limit State Method over other methods - Design codes and specification - Limit State philosophy as detailed in IS code. | |
| **UNIT II - DESIGN OF BEAM** | **(12)** |
| Analysis and design of singly and doubly reinforced rectangular beam and Flanged beams (T- Beams only) - Use of design aids for Flexure - Behaviour of RC members in Shear, Bond and Anchorage - Design requirements as per current code - Behaviour of rectangular RC beams in shear and torsion. | |
| **UNIT III - DESIGN OF SLAB AND STAIRCASE** | **(9)** |
| Analysis and design of cantilever, one way simply supported and continuous slabs and supporting beams - Two way slab - Design of simply supported and continuous slabs using IS code coefficients - Types of Staircases - Design of dog-legged Staircase. | |
| **UNIT IV - DESIGN OF COLUMN** | **(9)** |
| Types of columns - Braced and unbraced columns - Design of short rectangular and circular columns for axial, uniaxial and biaxial bending. | |

| UNIT V - DESIGN OF FOOTING | (9) |
|---|---|
| Design of wall footing - Design of axially and eccentrically loaded rectangular pad and sloped footings - Design of combined footing. | |
| **TOTAL (L: 45) = 45 PERIODS** | |

**TEXTBOOKS:**


1. Gambhir.M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
2. Krishnaraju.N, "Design of Reinforced Concrete Structures ", CBS Publishers & Distributors


**REFERENCES:**


1. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2017.
2. Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., 2021
3. Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publication Pvt. Ltd., New Delhi, 2016
4. Shah V L Karve S R., "Limit State Theory and Design of Reinforced Concrete", Structures Publilcations, Pune, 2013
5. IS 456 - Indian Standard Plain and Reinforced Concrete - Code of Practice. 2000
6. SP 16 :Design Aids for Reinforced Concrete to IS : 456- 1978


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | |
| 2 | 3 | 3 | 3 | | | | | 3 | | | | 3 | 3 | 3 |
| 3 | | 3 | 3 | | | | | 3 | | | | 3 | 3 | 3 |
| 4 | | 3 | 3 | | | | | 3 | | | | 3 | 3 | 3 |
| 5 | | 3 | 3 | | | | | 3 | | | | 3 | 3 | 3 |
| CO (W.A) | 3 | 3 | 3 | | | | | 3 | | | | 3 | 3 | 3 |

| 22CEC11- CONCRETE TECHNOLOGY<br>*(IS 456 and IS 10262-2019 code books are permitted)* | | | | | |
|---|---|---|---|---|---|
| | | **L** | **T** | **P** | **C** |
| | | **3** | **0** | **0** | **3** |
| **PREREQUISITE : 22CEC05** | | | | | |
| **Course Objective:** | • To imparts knowledge about the various ingredients and properties of materials used for concrete and mix design for concrete. | | | | |

| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply principles of concrete mix design to select appropriate constituents and proportions to achieve desired properties. | Ap | 40% |
| **CO2** | Evaluate the concrete's properties and interpret with IS standards. | Ap | 20% |
| **CO3** | Evaluate concrete's durability performance through standard tests and assessments. | An | 20% |
| **CO4** | Identify and apply suitable special concretes in construction projects. | An | 20% |
| **CO5** | Prepare comprehensive reports and presentations including experimental results, design rationale and recommendations. | C | Internal Assessment |

| **UNIT I - CONSTITUENTS OF CONCRETE** | **(9)** |
|---|---|
| Cement - Manufacturing Process - Types of cement - Properties - Heat of Hydration - Field and Laboratory Test on cement; Aggregates - Fine and Coarse aggregates - Properties - Classifications - Testing methods of Fine and Coarse aggregates; Admixtures - Mineral and Chemical admixtures; Water - Quality of water for use in concrete. | |
| **UNIT II - MIX DESIGN OF CONCRETE** | **(9)** |
| Concrete Mix Proportioning - Methods of IS concrete mix proportion - Guidelines for normal concrete - Concrete - Concepts variables in proportioning - Concepts of Self Compacting Concrete (SCC) mix design. | |
| **UNIT III - FRESH AND HARDENED CONCRETE PROPERTIES** | **(9)** |
| Workability - measurement of workability - Statistical and quality control of concrete; Properties of fresh concrete - Test on fresh concrete - Test on hardened concrete - modulus of elasticity of concrete- Elasticity - Creep, Shrinkage and temperature effects - Stress and Strain characteristics - Non Destructive Tests for concrete. | |
| **UNIT IV - DURABILITY PROPERTIES OF CONCRETE** | **(9)** |
| Durability of concrete - Tests for durability - Strength and durability relationship - Factors affecting durability of concrete - Permeability- Rapid Chloride Permeability Test (RCPT) - Sorptivity - Alkali Aggregate Reaction - Chemical attack - Corrosion tests - Cracks in Concrete- Performance based durability design | |

| UNIT V - SPECIAL CONCRETES | (9) |
|---|---|
| Introduction to Polymer concrete, High performance concrete, High strength concrete, Fibre reinforced concrete, Light weight concrete, Ready mix concrete and pumping of concrete, Slurry Infiltrated Fiber Concrete (SIFCON), Permeable concrete, Self compacting concrete, Geo-polymer Concrete, Ferrocement. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**


1. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
2. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003


**REFERENCES:**


1. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London,1995
2. Gambhir.M.L. ''Concrete Technology'', Fifth Edition, McGraw Hill Education, 2017.
3. Job Thomas., ''Concrete Technology'', Cencage learning India Private Ltd, New Delhi, 2015.
4. IS10262-2019,'' Recommended Guidelines for Concrete Mix Design'', Bureau of Indian Standards, New Delhi.
5. IS : 12269-1987,''Specification for 53 grade OPC'', BIS, New Delhi
6. IS : 383 - 2016, ''Coarse and Fine Aggregate - Specification's, BIS, New Delhi
7. IS: 456-2000, ''Plain and Reinforced Concrete - Code of Practice'', BIS, New Delhi.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | 3 | 3 | 3 | | | | 3 | | 3 | 3 | 3 | 3 | 3 |
| 2 | | 3 | | | | | | 3 | | 3 | | 3 | 3 | 3 |
| 3 | | | | | | | | 3 | | | | | | 3 |
| 4 | | 3 | | | | | | | | | | 3 | 2 | 3 |
| 5 | 3 | | | 3 | | | | 3 | | 3 | 3 | 3 | 3 | 3 |
| **CO (W.A)** | **3** | **3** | **3** | **3** | | | | **3** | | **3** | **3** | **3** | **2.8** | **3** |

| 22CEC12 - ENVIRONMENTAL ENGINEERING | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 2 | 4 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To impart knowledge on water and sewage occurrence, distribution, treatment and disposal techniques. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Identify the water supply system, water sources and water quality characteristics and standards. | Ap | 20% |
| **CO2** | Design various water treatment units. | Ap | 20% |
| **CO3** | Design efficient wastewater treatment systems to minimize environmental impact. | An | 40% |
| **CO4** | Identify suitable treatment units for disposal of sewage and sludge. | An | 20% |
| **CO5** | Analyze and interpret the results of water quality tests to assess the condition of water samples and determine their suitability for various applications. | An | Laboratory Assessment |

| **UNIT I - SOURCES AND CONVEYANCE OF WATER** | **(9)** |
|---|---|
| Objectives of Public Water supply system - Intakes - Channels and pipes for conveying water - Planning, Design period, Population forecasting - water demand -Sources of water - Surface and Ground water - Characteristics of water | |
| **UNIT II - WATER TREATMENT** | **(11)** |
| Water treatment Objectives - Unit operations and processes in surface water treatment - Principles, functions and design of flash mixers, flocculators, sedimentation tanks and sand filters - Aeration - iron and manganese removal, defluoridation. | |
| **UNIT III - PRIMARY SEWAGE TREATMENT** | **(9)** |
| Characteristics of sewage, Primary treatment: Principles, functions and design of screen, grit chambers and primary sedimentation tanks - Layout of Sewage Treatment Plant. | |
| **UNIT IV - SECONDARY SEWAGE TREATMENT** | **(9)** |
| Activated Sludge Process and Trickling filter (no design); Other treatment methods - oxidation ditches, UASB -Waste Stabilization Ponds - Anaerobic Stabilization units - Septic tanks. | |
| **UNIT V - DISPOSAL OF SEWAGE AND SLUDGE** | **(7)** |
| Dilution - Self-purification of surface water bodies - Oxygen sag curve - Sewage farming - characteristics of Sludge -Thickening - Sludge digestion - Sludge disposal - Environmental Pollution Act. | |

**LIST OF EXPERIMENTS:**

1. Determination of Turbidity by using Nephlometer
2. Measurement of pH and conductivity of water sample
3. Determination of Hardness by EDTA method
4. Determination of Alkalinity
5. Determination of Acidity in water
6. Determination of Chlorides
7. Determination of Optimum Coagulant by Jar test
8. Determination of Total, Dissolved and Suspended solids
9. Determination of Available chlorine in bleaching powder
10. Determination of COD for given sample

**TOTAL (L:45+P:30) = 75 PERIODS**

**TEXTBOOKS:**


1. Garg, S.K., "Environmental Engineering Vol. I and II", Khanna Publishers, New Delhi, 2010.
2. Modi, P.N. "Water Supply Engineering Vol. I", Standard Book House, New Delhi, 2010.
3. Punmia, B.C., Ashok K Jain and Arun K Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2013


**REFERENCES:**


1. Metcalf and Eddy, " Waste Water Engineering: Treatment and Reuse", 4th Edition, McGraw-Hill, New Delhi, 2017.
2. Duggal K.N., "Elements of Environmental Engineering" S. Chand and Co. Ltd., New Delhi, 2014.
3. George Tchobanoglous, Franklin Louis Burton, H. David Stensel, Metcalf and Eddy, "Wastewater Engineering, Treatment and Reuse", Tata McGraw-Hill Edition, 4th Edition, New Delhi, 2009.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | |
| 2 | 3 | | 2 | | | | | | | | | | | 2 |
| 3 | | 3 | 3 | | | | 3 | 3 | | | | | 2 | 2 |
| 4 | | 2 | | 2 | | | | 2 | | | | | 2 | 2 |
| 5 | | 3 | | 3 | | | | 3 | 3 | | | 3 | 3 | 3 |
| CO (W.A) | 2.5 | 2.7 | 2.5 | 2.5 | | | 3 | 2.7 | 3 | | | 3 | 2.3 | 2.3 |

| 22CEP03 - COMPUTER AIDED BUILDING DRAWING - II | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 0 | 0 | 4 | 2 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To imparts knowledge about the preparation of plan, section and elevation of different types of buildings as per specifications. | | | | |
| **Course Outcomes** The Student will be able to | | **Cognitive Level** | | | |
| **CO1** | Plan buildings based on NBC specifications and building bye-laws. | Ap | | | |
| **CO2** | Draw the detailed working drawing for residential building. | C | | | |
| **CO3** | Prepare detailed drawings to include the plan, elevation, and sectional views of the multi-storied structure. | C | | | |
| **CO4** | Prepare detailed plans, sections, and elevations for different types of buildings. | C | | | |
| **CO5** | Present residential building designs in three dimensions for spatial relationships, materials, and finishes. | C | | | |

**LIST OF EXPERIMENTS:**

1. Draw the Plan, Elevation and Section of an Industrial Building
2. Draw the Plan, Elevation and Section of a School Building with Framed structure
3. Draw the multi-Storied residential building with Dog legged staircase - Plan, Section and Elevation
4. Draw a Primary Health Center - Plan, Section and Elevation
5. Draw a Hostel Building - Plan, Section and Elevation
6. Draw a plan for Shopping Mall
7. Draw a Plan for Apartment Building
8. Layout Preparation for Individual Villas
9. Preparation of approval plan for a Commercial Building
10. 3D view for Residential Building

**TOTAL (P:60) = 60 PERIODS**

**REFERENCES/ MANUAL /SOFTWARE:**


1. Reference manual for AutoCAD
2. Sikka V.B., "A course in Civil Engineering Drawing", 4th Edition, S.K.Kataria and Sons, 2015.
3. Bhavikatti, S.S and Chitawadagi, M.V., "Building Planning and Drawing", I.K. International Publishing House Pvt.Ltd. New Delhi,2019


| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cos** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | 3 | | | | | | | | | | | 3 | 3 | 3 |
| **2** | 2 | | | | 2 | | | | | 3 | | 3 | 3 | 3 |
| **3** | | | 3 | | 3 | | | | | 3 | | 3 | 3 | 3 |
| **4** | | | 3 | | 3 | | | | | 3 | | 3 | 3 | 3 |
| **5** | | | 3 | | 3 | | | | | 3 | | 3 | 3 | 3 |
| **CO (W.A)** | **2.5** | | **3** | | **3** | | | | | **3** | | **3** | **3** | **3** |

| 22MAN08 - SOFT / ANALYTICAL SKILLS – IV<br>*(Common to All Branches and Applicable for (2022-2026) Batch only )* | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **1** | **0** | **2** | **0** |

**PREREQUISITE : NIL**

| **Course Objective:** | • To recollect the functional understanding of basic grammar and its structure<br>• To enrich their knowledge and to develop their logical reasoning ability |
|---|---|

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of Continuous Assessment test** |
|---|---|---|---|
| **CO1** | Construct the sentences with basic grammar. | U | 40% |
| **CO2** | Analyze quantitative aptitude problems and find solutions. | Ap | 30% |
| **CO3** | Develop the ability to solve problems through logical reasoning. | An | 30% |

| **UNIT I - VERBAL** | **(5+10)** |
|---|---|
| Articles - Fill in the blanks - Grammatical Error - Sentence improvement | |
| **UNIT II - APTITUDE** | **(5+10)** |
| Speed and Distance - Time and Work - Mixture And Alligations - Permutation and Combinations | |
| **UNIT III - LOGICAL AND REASONING** | **(5+10)** |
| Seating Arrangement - Directions and Distance - Nonverbal Reasoning | |
| **TOTAL (L:15, P:30) : 45 PERIODS** | |

**REFERENCES:**


1. Murphy, Raymond. *English Grammar in Use*. Fourth Edition, Cambridge University, 2012.
2. Dr. R.S. Aggarwal. A Modern Approach to Verbal & Non-Verbal Reasoning. S Chand and Company Limited, New Delhi, 2014.
3. Aggarwal, Ashish. Quick Arithmetic. S Chand and Company Limited, New Delhi, 2014.

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cos** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | | | | | | | | | 2 | 3 | | | | |
| **2** | | 2 | | 2 | | | | | | | | | | |
| **3** | | 2 | | 2 | | | | | | | | | | |
| **CO (W.A)** | | **1** | | **1** | | | | | **1** | **1** | | | | |

| 22MAN08R - SOFT/ANALYTICAL SKILLS - IV<br>*(Common to All Branches and Applicable for (2023-2027) Batch only )* | | | | | |
|---|---|---|---|---|---|
| | | **L** | **T** | **P** | **C** |
| | | **1** | **0** | **2** | **0** |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To enhance the ability to communicate coherently and effectively across contexts.<br>• To develop quantitative aptitude and analytical reasoning skills. | | | | |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of COs in Continuous Assessment Test** |
|---|---|---|---|
| **CO1** | Develop proficiency to communicate accurately, fluently, and appropriately in various academic, professional and social contexts. | U | 40% |
| **CO2** | Solve quantitative aptitude problems with more confidence. | Ap | 30% |
| **CO3** | Draw valid conclusions, identify patterns, and solve problems. | An | 30% |

| **UNIT I - VERBAL ABILITY** | **(15)** |
|---|---|
| **Grammar** - Sentence Completion – Sentence Improvement - Error Spotting - **Listening** - TOEFL Listening Practice Tests - **Speaking** – Interview Skills - **Reading** - GRE Reading Passages - **Writing** - Paragraph Writing. | |
| **UNIT II - APTITUDE** | **(15)** |
| Probability - Permutations and Combinations - Data Interpretation on Multiple Charts - Mensuration - Area, Shapes, Perimeter - Races and Games. | |
| **UNIT III - REASONING** | **(15)** |
| Data Sufficiency - Mathematical Operations - Pattern Completion - Cubes - Embedded Images. | |
| **TOTAL (L:15, P:30) : 45 PERIODS** | |

**REFERENCES:**


1. Rizvi, M.Ashraf. *Effective Technical Communication.* Tata McGraw-Hill Education, 2017.
2. Aggarwal R S. *Quantitative* Aptitude for Competitive Examinations. S.Chand Publishing Company Ltd(s)., 2022.
3. Sharma, Arun. *How to Prepare for Quantitative Aptitude for the CAT*. Tata McGraw – Hill Publishing, 2022.
4. Praveen R V. *Quantitative Aptitude and Reasoning.* PHI Learning Pvt. Ltd., 2016.

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | | | | | | | | | 2 | 3 | | | | |
| **2** | | 2 | | 2 | | | | | | | | | | |
| **3** | | 2 | | 2 | | | | | | | | | | |
| **CO (W.A)** | | **1** | | **1** | | | | | **1** | **1** | | | | |

| 22MAN09 - INDIAN CONSTITUTION<br>(Common to All Branches) | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **I** | **0** | **0** | **0** |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To educate students to learn about the Constitutional Law of India.<br>• To motivate students to understand the role of Union Government.<br>• To make students to understand about State Government.<br>• To understand about District Administration, Municipal Corporation and Zila Panchayat.<br>• To encourage students to Understand about the election commission. |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Gain Knowledge about the Constitutional Law of India. | U | Internal Assessment |
| **CO2** | Know the Union Government and role of President and Prime Minister. | R | |
| **CO3** | Gain knowledge about State Government and role of Governor, Chief Minister. | U | |
| **CO4** | Understand the District Administration, Municipal Corporation and Zila Panchayat. | U | |
| **CO5** | Understand the role and function of election commission. | U | |

| **UNIT I - THE CONSTITUTION INTRODUCTION** | **(9)** |
|---|---|
| The History of the Making of the Indian Constitution - Preamble and the Basic Structure, and its interpretation - Fundamental Rights and Duties and their interpretation - State Policy Principles. | |
| **UNIT II - UNION GOVERNMENT** | **(9)** |
| Structure of the Indian Union - President - Role and Power - Prime Minister and Council of Ministers - Lok Sabha and Rajya Sabha | |
| **UNIT III - STATE GOVERNMENT** | **(9)** |
| Governor - Role and Power - Chief Minister and Council of Ministers - State Secretariat | |
| **UNIT IV - LOCAL ADMINISTRATION** | **(9)** |
| District Administration - Municipal Corporation - Zila Panchayat | |
| **UNIT V - ELECTION COMMISSION** | **(9)** |
| Role and Functioning - Chief Election Commissioner - State Election Commission | |
| **TOTAL (L:45) : 45 PERIODS** | |

**TEXT BOOKS:**

1. Rajeev Bhargava, "Ethics and Politics of the Indian Constitution", Oxford University Press, New Delhi, 2008.
2. B.L. Fadia, "The Constitution of India", Sahitya Bhawan; New edition (2017).
3. DD Basu, "Introduction to the Constitution of India", Lexis Nexis; Twenty-Third 2018 edition.

**REFERENCES:**

1. Steve Blank and Bob Dorf, "The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company", K & S Ranch ISBN – 978-0984999392
2. Eric Ries, "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses" , Penguin UK ISBN - 978-0670921607
3. Adrian J. Slywotzky with Karl Weber, "Demand: Creating What People Love Before They Know They Want It", Headline Book Publishing ISBN - 978-0755388974
4. Clayton M. Christensen, "The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business", Harvard business ISBN: 978-142219602.

**REFERENCES: Web link**

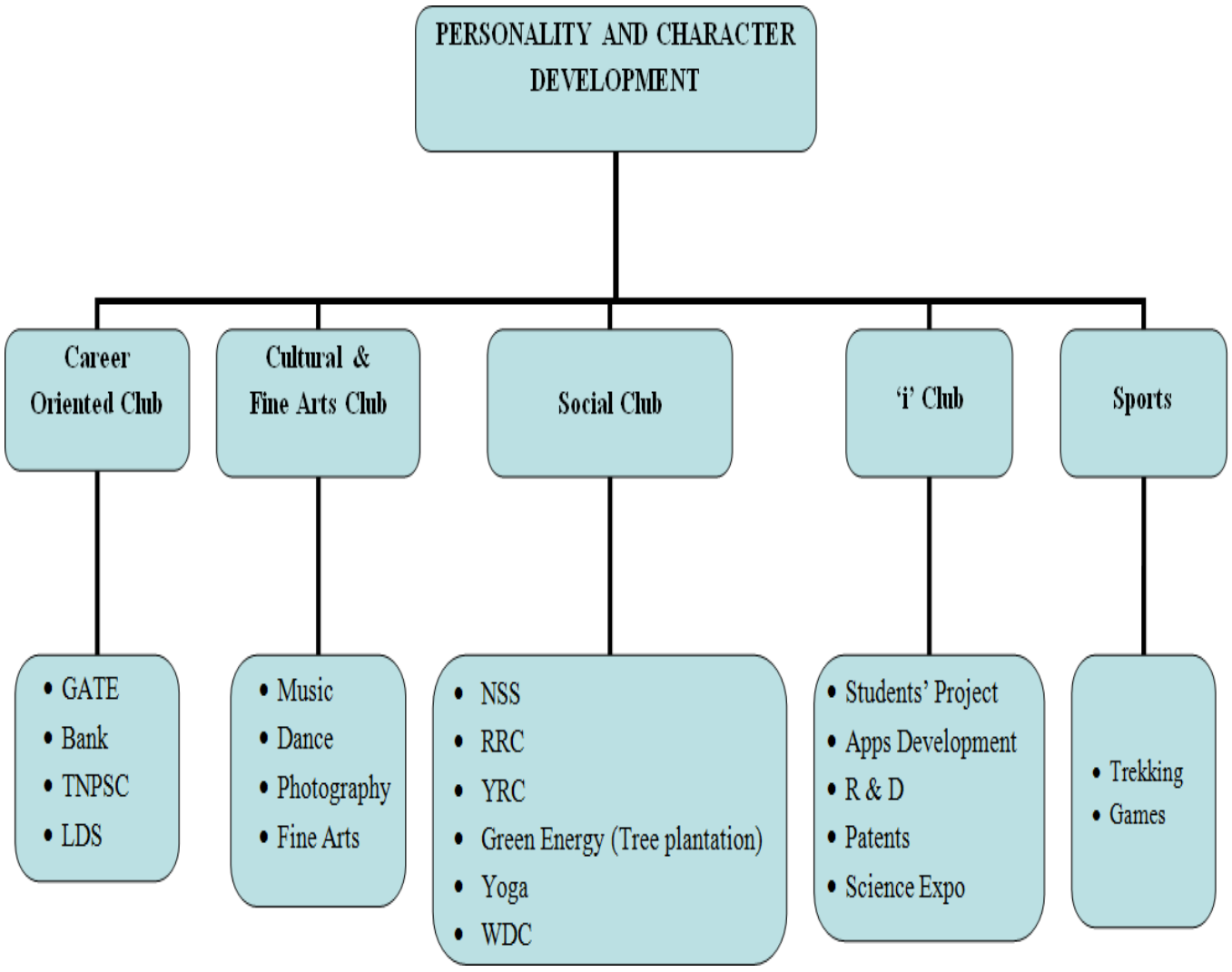
1. https://www.fundable.com/learn/resources/guides/startup
2. https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate- structure/
3. https://www.finder.com/small-business-finance-tips
4. https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | | | | | | 3 | | 3 | | 2 | | 3 | | |
| 2 | | | | | | 3 | | 3 | | 2 | | 3 | | |
| 3 | | | | | | 3 | | 3 | | 2 | | 3 | | |
| 4 | | | | | | 3 | | 3 | | 2 | | 3 | | |
| 5 | | | | | | 3 | | 3 | | 2 | | 3 | | |
| **CO (W.A)** | | | | | | **3** | | **3** | | **2** | | **3** | | |

## 22GED01 - PERSONALITY AND CHARACTER DEVELOPMENT

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | I | 0 |




*LDS - Leadership Development Skills

| OBJECTIVES : | | | | |
|---|---|---|---|---|
| **Career Oriented Club** | **Cultural & Fine Arts Club** | **Social Club** | **'i' club** | **Sports** |
| • To provide support for identifying specific career field of interests and career path<br>• To provide support for preparing for competitive exams | • To bring out the hidden talent of students in music, dance and other fine arts.<br>• To promote photography skill among the students<br>• To develop and enhance the performance of students by participating in various events<br>• To inculcatemanagerial capabilities such as event management and stage organization | • To create social awareness and develop a sense of social and civic responsibility<br>• To inculcate socially and environmentally sound practices and be aware of the benefits<br>• To encourage the students to work along with the people in rural areas, thereby developing their character, social consciousness, commitment, discipline and being helpful towards the community. | • To inculcate the basic concepts of innovation<br>• To foster the networking between students, build teams, exchange ideas, do projects and discuss entrepreneurial opportunities<br>• To enrich the academic experience, buildcompetencies andrelationships beyond the classroom | • To provide opportunities to excel at sports<br>• To promote an understanding of physical and mental well-being through an appreciation of stress, rest and relaxation.<br>• To develop an ability to observe, analyze and judge the performance of self and peers in sporting activities.<br>• To develop leadership skills and nurture the team building qualities.<br>**Trekking:**<br>• To provide opportunities to explore nature and educating about the purity of nature<br>• To improve physical and mental health. |

| **OUTCOMES :** At the end of this course, the students will be able to | | | | |
|---|---|---|---|---|
| • Find a better career of their interest.<br>• Make use of their knowledge during competitive exams and interviews. | • Take part in various events<br>• Develop team spirit, leadership and managerial qualities | • Develop socially responsive qualities by applying acquired knowledge<br>• Build character, social consciousness, commitment and discipline | • Apply the acquired knowledge in creating better solutions that meet new requirements and market needs<br>• Develop skills on transforming new knowledge or new Technology into viable products and services on commercial markets as a team | • Demonstrate positive leadership skills that contribute to the organizational effectiveness<br>• Take part an active role in their personal wellness (emotional, physical, and spiritual) that supports a healthy lifestyle<br>• Create inclination towards outdoor activity like nature study and Adventure. |

**TOTAL [2 x (P: 15)]: 30 PERIODS**

**(Cumulatively for Two Semesters)**

| 22CEC13 - DESIGN OF REINFORCED CONCRETE STRUCTURES<br>[IS 456, SP 16 and IS 3370 Code Books are to be permitted] | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **3** | **0** | **0** | **3** |
| **PREREQUISITE : 22CEC10** | | | | |
| **Course Objective:** | • To understanding the behavior, design and detailing of reinforced concrete flat slab, retaining walls and storage structures according to the Indian standard building code requirements. | | | |

| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Design retaining walls to resist lateral earth pressure in various engineering projects. | Ap | 20% |
| **CO2** | Design water tanks to determine dimensions and reinforcement details for safe storage of water. | An | 20% |
| **CO3** | Design reinforced concrete slab systems without beams as per IS standards. | Ap | 20% |
| **CO4** | Analyze and design various types of slabs using yield line theory. | An | 20% |
| **CO5** | Design slender columns to resist bending moments as per IS code provisions. | An | 20% |

| **UNIT I - RETAINING WALLS** | **(9)** |
|---|---|
| Functions of a Retaining Wall - Design of Cantilever and Counterfort Retaining walls. | |
| **UNIT II - WATER TANKS** | **(9)** |
| Design of rectangular underground water tank and design of rectangular, circular water tanks resting on ground. | |
| **UNIT III - FLAT SLABS** | **(9)** |
| Design of flat slabs (Problems) - Design of Raft foundation, Design principles of Box culvert and Road Bridges. | |
| **UNIT IV - YIELD LINE THEORY** | **(9)** |
| Assumptions - Characteristics of yield line - Determination of collapse load / plastic moment - Application of virtual work method - square, rectangular, circular slabs - Design problems. | |
| **UNIT V - SLENDER COLUMN** | **(9)** |
| Design of Slender columns - Design for Uniaxial and Biaxial bending using Column Curves. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**


1. Krishnaraju N.," Design of reinforced Concrete Structures", CBS Publishers and Distributors Pvt Ltd, 4th Edition, 2015.
2. Punmia B.C, Ashok Kumar Jain, Arun K. Jain, "R.C.C. Designs Reinforced Concrete Structures", Laxmi Publications Pvt. Ltd., New Delhi, 2006.
3. Varghese P.C., "Advanced Reinforced Concrete Design", Prentice Hall of India Pvt. Ltd., New Delhi, 2012.


**REFERENCES:**


1. Gambhir M.L., "Design of Reinforced Concrete Structures", Prentice Hall of India Private Limited, 2012
2. Subramanian. N., "Design of Reinforced Concrete Structures", Oxford University, New Delhi, 2013.
3. IS 456:2000, "Code of Practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi, 2007
4. SP 16:1980, "Design Aids for Reinforced Concrete, Bureau of Indian Standards", New Delhi.
5. IS 3370 (Part I & II):2009, "Concrete Structures for Storage of Liquids - Code of Practice", Bureau of Indian Standards, New Delhi.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | 3 | | | | | 3 | |
| 2 | 2 | 3 | | | | | | 2 | | | | 2 | 2 | 2 |
| 3 | 2 | | 2 | | | | | 3 | | | | 3 | 3 | 2 |
| 4 | 2 | 3 | | | | | | | | | | | 3 | 3 |
| 5 | | 3 | | | | | | 2 | | | | | 3 | 3 |
| **CO (W.A)** | **2.3** | **3** | **2** | | | | | **2.5** | | | | **2.5** | **2.8** | **2.5** |

| 22CEC14 - FOUNDATION ENGINEERING<br>[ IS 6403 code book is to be permitted] | | | | |
|---|---|---|---|---|
| | | **L** | **T** | **P** |
| | | **3** | **0** | **0** |
| **PREREQUISITE : 22CEC09** | | | | |
| **Course Objective:** | • To provide basic understanding of site investigation and selection of appropriate foundation.<br>• To apply design concepts of different types of foundations and earth retaining structures. | | | |

| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply soil exploration techniques according to various soil conditions. | Ap | 20% |
| **CO2** | Compute bearing capacity and settlement of shallow foundations. | Ap | 20% |
| **CO3** | Analyze and proportionate shallow and pile foundations for their capacity. | An | 40% |
| **CO4** | Analyze the failures of retaining walls and earth pressures using various theories. | An | 20% |
| **CO5** | Demonstrate familiarity with different types of foundations suited for varying ground conditions. | U | Internal Assessment |

| **UNIT I - SITE INVESTIGATION AND SELECTION OF FOUNDATION** | **(9)** |
|---|---|
| Scope and objectives - Methods of exploration - Auguring and boring - Wash boring and rotary drilling - Depth and spacing of bore holes - Soil samples - Representative and undisturbed - Sampling methods - Split spoon sampler, Thin wall sampler, Stationary piston sampler - Penetration tests (SPT and SCPT) - Selection of foundation based on soil condition - Bore log report. | |
| **UNIT II - BEARING CAPACITY OF SHALLOW FOUNDATION** | **(9)** |
| Introduction - Location and depth of foundation - Bearing capacity of shallow foundation on homogeneous deposits - Terzaghi's formula and BIS formula - Factors affecting bearing capacity - Bearing capacity from in -situ tests (SPT, SCPT and plate load) - Settlement of foundations - Total and differential settlement - Components of settlements - Codal provision. | |
| **UNIT III - FOOTINGS AND RAFTS** | **(9)** |
| Types of Isolated footing, Combined footing, Mat foundation - Contact pressure and settlement distribution - Proportioning of foundations for conventional rigid behaviour - Applications - Floating foundation - Special foundations - Seismic force consideration - Codal provision. | |
| **UNIT IV - PILE FOUNDATION** | **(9)** |
| Types of piles and their functions - Carrying capacity of single pile in granular and cohesive soil - Static formula - Dynamic formulae (Engineering news and Hileys) - Capacity from insitu tests (SPT, SCPT) - Negative skin friction - Group capacity by different methods (Feld's rule, Converse - Labarra formula) - Settlement of pile groups - Under reamed piles. | |

| UNIT V - RETAINING WALLS | (9) |
|---|---|
| Slopes - infinite and finite slopes - types of failure - Earth pressure in soils - Active and passive states - Rankine's theory - Earth pressure on retaining walls of simple configurations - Culmann Graphical method - Stabilization of soil using various methods. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**


1. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 2017.
2. Dr. K. R. Arora., "Soil Mechanics and Foundation Engineering", Standard Publisher, New Delhi, 7th ed., 2017.
3. Gopal Ranjan and Rao A.S.R. "Basic and Applied soil mechanics", New Age International (P) Ltd, New Delhi, 2006.


**REFERENCES:**


1. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers and Distributers Ltd., New Delhi, 2015.
2. Varghese, P.C.,"Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2012.
3. Das, B.M. "Principles of Foundation Engineering", Eighth edition, Thompson Asia Pvt. Ltd., Singapore, 2017.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | 3 | 3 |
| 2 | 3 | | | | | | | | | | | | 3 | 3 |
| 3 | | 3 | | | | | | | | | | | 3 | 3 |
| 4 | | 2 | | | | | | | | | | | 3 | 3 |
| 5 | | | | 3 | | | | | 3 | 2 | | | 3 | 3 |
| CO (W.A) | 3 | 2.5 | | 3 | | | | | 3 | 2 | | | 3 | 3 |

| 22CEC15 - DESIGN OF STEEL STRUCTURES<br>*[IS 800-2007 and Steel Table are to be permitted]* | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **3** | **0** | **0** | **3** |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | To impart knowledge on limit state design of structural steel members subjected to compressive, tensile and bending loads, including connection design along with the design of structural systems like roof trusses as per provisions of current code (IS 800 - 2007) of practice. |

| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply design ethos of steel structure to compute strength parameter for structural members. | Ap | 40% |
| **CO2** | Determine the design strength of joints. | Ap | 20% |
| **CO3** | Choose the appropriate size for flexural members according to the design criteria. | An | 20% |
| **CO4** | Evaluate the various loads acting and design the steel structural elements. | Ap | 20% |
| **CO5** | Propose and present effective solutions to address the practical issues, based on codal provisions. | C | Internal Assessment |

| **UNIT I - DESIGN AND CONNECTIONS** | **(9)** |
|---|---|
| Properties of steel - Structural steel sections - Limit state design Concepts - Loads on structures - Connections using welding and bolting - Design of bolted and welded joints - Eccentric connections - Efficiency of joints. | |
| **UNIT II - TENSION MEMBERS** | **(9)** |
| 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** | **(9)** |
| Types of compression members - Theory of columns - Basics of current codal provision for compression member design - Slenderness ratio - Design of simple and built up members - Design of laced and battened type columns - Design of column bases - Gusseted base - Anchor Bolts. | |
| **UNIT IV - BEAM** | **(9)** |
| Design of laterally supported and unsupported beams - Built up beams - Beams subjected to uniaxial and biaxial bending - Design of plate girders - Intermediate and bearing stiffeners - Flange and web splices. | |
| **UNIT V - ROOF TRUSS AND INDUSTRIAL BUILDING** | **(9)** |
| Roof trusses - Roof and side coverings - Introduction of Pre-Engineered Buildings - Design of purlins - Design of truss elements. | |
| **TOTAL (L:45 ) = 45 PERIODS** | |

**TEXT BOOKS:**


1. Subramanian. N, "Design of Steel Structures", Oxford University Press, New Delhi, 2018.
2. Gambhir. M. L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013.
3. Shiyekar. M. R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2nd Edition, 2013.
4. Bhavikatti. S. S, "Design of Steel Structures", IK International Publishing House Pvt. Ltd., New Delhi 2010.


**REFERENCES:**


1. Dr. L. S. Jayagopal, Dr. D. Tensing, "Design of Steel Structures", Vikas Publishing House Pvt. Ltd., 2015.
2. Narayanan. R "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002.
3. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2009.
4. Shah V.L and Veena Gore, "Limit State Design of Steel Structures", IS 800–2007 Structures Publications, 2012.
5. IS 800:2007, General Construction in Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | 2 | | | | | | | | | | | 2 | |
| 2 | 3 | | 2 | | | | | | | | | | | |
| 3 | | 3 | | 2 | | | | | | | | | 2 | |
| 4 | | | 2 | 2 | | | | | | | | | 2 | |
| 5 | | 2 | | | | | | | | | | | 3 | 2 |
| CO (W.A) | 2.5 | 2.3 | 2 | 2 | | | | | | | | | 2.3 | 2 |

| 22CEP04 - CONCRETE TECHNOLOGY LABORATORY | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 0 | 0 | 4 | 2 |
| **PREREQUISITE : 22CEC11** | | | | | |
| **Course Objective:** | • To provide fundamental knowledge of testing concrete material properties in accordance with the IS codes.<br>• To perform tests on fresh and hardened concrete, as well as explore non-destructive testing methods for assessing concrete quality and durability. | | | | |
| **Course Outcomes**<br>The students will be able to | | | | | **Cognitive Level** |
| **CO1** | Propionate the concrete mix for various field application using IS codal provision. | | | | Ap |
| **CO2** | Identify and ascertain the characteristics of the ingredients and quality of concrete based on its properties for field application. | | | | An |
| **CO3** | Interpret the results from tests on cubes, cylinders and prisms to evaluate the strength characteristics of hardened concrete. | | | | An |
| **CO4** | Assess the performance of fine and coarse aggregate test results in exposed concrete structures. | | | | An |
| **CO5** | Interpret NDT test results to detect and characterize defects such as cracks, voids, and inclusions in test specimens. | | | | E |

**LIST OF EXPERIMENTS:**

**1. TEST ON CEMENT**

a. Fineness Test
b. Consistency Test
c. Initial and Final Setting Time Test
d. Soundness Test
e. Specific gravity

**2. TEST ON FINE AGGREGATE**

a. Specific Gravity
b. Fineness Modulus

**3. TEST ON COARSE AGGREGATE**

a. Specific Gravity
b. Water Absorption Test
c. Impact Strength Test
d. Crushing Strength Test
e. Abrasion and Attrition Test

**4. TEST ON FRESH CONCRETE**

a. Slump Test
b. Vee-Bee Test
c. Compaction Factor Test
d. Flow table

**5. TEST ON HARDENED CONCRETE**

a. Test on Cubes (Compressive Strength Test)
b. Test on Cylinders (Split Tensile Strength)
c. Test on Prisms (Flexural Strength of Concrete)

**6. NON - DESTRUCTIVE TESTS**

a. Rebound Hammer Test
b. Ultrasonic Pulse Velocity Test

**TOTAL (P:60) : 60 PERIODS**

**REFERENCES:**


1. Shetty. M. S, "Concrete Technology", S. Chand & Co., Ltd, New Delhi, 2010.
2. IS: 10262 - 2019, "Indian Standard specification for Methods of Mix design".
3. IS: 383 - 1987, "Indian Standard specification for Test for Fine and Coarse aggregates from natural source for concrete".
4. IS: 403 1 (Part 4, 5, 7 and 11) - 1988 (Reaffirmed 2000), "Methods of physical tests for hydraulic cement".


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | | 3 | | | | | | 3 | | | | 2 | 2 | |
| 2 | 3 | | 3 | | | | | | | | | 3 | 3 | |
| 3 | | 3 | | 3 | | | | 3 | 3 | 3 | | 3 | | 3 |
| 4 | | 3 | | | | | | 3 | | 3 | | 3 | 3 | |
| 5 | | 3 | | 2 | 3 | | | 3 | 3 | 2 | | 3 | 3 | 3 |
| CO (W.A) | 3 | 3 | 3 | 2.5 | 3 | | | 3 | 3 | 2.7 | | 3 | 2.8 | 3 |

## 22CEP05 - DESIGN AND DRAWING LABORATORY

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**PREREQUISITE : NIL**

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

| The students will be able to **Course Outcomes** | | **Cognitive Level** |
|---|---|---|
| **CO1** | Apply design principles and standards to detailed drawings of multi-storey framed structures, slab and retaining walls. | Ap |
| **CO2** | Assess the compliance of design drawings with relevant codes and standards. | An |
| **CO3** | Design and draw reinforcement details for RCC structures. | Ap |
| **CO4** | Assess the structural integrity and stability of designed components under different loading conditions. | Ap |
| **CO5** | Design the structural members with ethical responsibility. | C |

**LIST OF EXPERIMENTS:**

1. Design and drawing of multi storey framed structure (Beam, Column and Slab)
2. Design and drawing of RCC cantilever retaining walls
3. Design and drawing of one way and two way slab
4. Design of solid slab bridges for IRC loading and reinforcement details
5. Design and drawing of rectangular and circular RCC water tank
6. Design and drawing of elevated RCC water tank (Rectangular and Circular)
7. Design and detailing of Roof Truss
8. Design and detailing of Culvert
9. Design and detailing of Irrigation canal bridge
10. Design and detailing of Septic tank

**TOTAL (P:60) = 60 PERIODS**

**REFERENCES:**


1. Krishnaraju. N "Structural Design and Drawing, Universities Press, 2009.
2. Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, "Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., 2015.


**Note: Manual Design and CAD Drawing**

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | 3 | 2 | | | | | | | | 3 | | 3 | 3 | 3 |
| **2** | 2 | 2 | | | | | | | | | | | | 2 |
| **3** | 3 | | 3 | | 3 | | | | | | | 3 | 3 | 3 |
| **4** | 3 | 2 | | | | | | | | | | 3 | 2 | |
| **5** | | 3 | 3 | | 3 | | | 3 | | 3 | | | 3 | 3 |
| **CO (W.A)** | **2.8** | **2.2** | **3** | | **3** | | | **3** | | **3** | | **3** | **2.8** | **2.8** |

| 22MAN10R - COMMUNICATION AND QUANTITATIVE REASONING | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 1 | 0 | 2 | 0 |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To enhance the proficiency of the students in both spoken and written communication<br>• To acquire skills required to solve quantitative aptitude problems |

| Course Outcomes<br>The Student will be able to | | Cognitive Level | Weightage of COs in Continuous Assessment Test |
|---|---|---|---|
| **CO1** | Converse and draft ideas clearly and persuasively in various contexts. | U | 40% |
| **CO2** | Solve quantitative aptitude problems with confidence. | Ap | 30% |
| **CO3** | Draw valid conclusions, identify patterns, and solve problems. | An | 30% |

| **UNIT I - LANGUAGE BOOSTERS** | **(5+10)** |
|---|---|
| JAM - General Topic Presentation - Group Discussion - Mock Interview - E Mail Writing - Essay writing | |
| **UNIT II - APTITUDE** | **(5+10)** |
| Mensuration - Area, Shapes, Perimeter - Races and Games - Data Interpretation on Multiple Charts. | |
| **UNIT III - REASONING** | **(5+10)** |
| Venn diagram - Syllogism - Data Sufficiency - Cubes & Embedded Images. | |
| **TOTAL (L:15, P:30) : 45 PERIODS** | |

**REFERENCES:**


1. Rizvi, M.Ashraf. "Effective Technical Communication", Tata McGraw-Hill Education, 2017.
2. Aggarwal R S. "Quantitative Aptitude for Competitive Examinations." S.Chand Publishing Company Ltd(s), 2022.
3. Arun Sharma. "How to Prepare for Quantitative Aptitude for the CAT", Tata McGraw - Hill Publishing, 2022.
4. Praveen R V., "Quantitative Aptitude and Reasoning", PHI Learning Pvt. Ltd., 2016.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | | | | | | | | | 2 | 3 | | | | |
| 2 | | 2 | | 2 | | | | | | | | | | |
| 3 | | 2 | | 2 | | | | | | | | | | |
| CO (W.A) | | 1 | | 1 | | | | | 1 | 1 | | | | |

| 22CEC16 - ESTIMATING AND COSTING | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 2 | 4 |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective :** | • To estimate costs using various methods and techniques, and effectively manage and control project budgets.<br>• To develop the skills to present and justify cost estimates professionally while understanding industry standards and ethical considerations. |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply different estimation methods to real-world scenarios | Ap | 40% |
| **CO2** | Analyze cost data to develop comprehensive budgets. | An | 20% |
| **CO3** | Evaluate the effectiveness of tendering and contracting strategies in construction projects. | An | 20% |
| **CO4** | Develop valuation reports, adhere to industry standards. | C | 20% |
| **CO5** | Apply ethical principles and collaborate with engineers in preparing reports for residential buildings, roads, water supply, and sanitary installations. | Ap & C | Internal Assessment |

| **UNIT I - ESTIMATE OF BUILDING** | **(10)** |
|---|---|
| Introduction - General items of work in building - standard units - Principles of working out quantities for detailed and abstract estimates - Methods of Estimate of buildings - Long wall and short wall method - center line method - Preparation of detailed estimate of R.C.C framed and Load bearing structure. | |
| **UNIT II - ESTIMATION OF OTHER STRUCTURES** | **(9)** |
| Estimate of Septic tank, soak pit - Estimate of road materials for flexible and rigid pavements - Estimate retaining walls - Estimate of RCC slab culvert, pipe culvert. | |
| **UNIT III - RATE ANALYSIS** | **(9)** |
| Analysis of Rates - Schedule of rates - factors affecting rates - Rate materials and labors - Analysis of rates for cement concrete, RCC, Brick masonry, stone masonry, concreting, flooring, plastering, painting and tile laying - PWD schedule of rates. | |
| **UNIT IV - TENDER AND CONTRACT** | **(9)** |
| Tender: Tender notices - Types - Prequalification of contractors - pre-bid meeting - Drafting - Model tenders - Procedure for Submission and opening tender - Acceptance and rejection of tender -Tender validity period - E-Tendering. Contracts: contract -Types of contract - Contract Laws - contract conditions - Arbitration and legal requirements. | |
| **UNIT V - VALUATION AND REPORT PREPARATION** | **(8)** |
| Valuation: Necessity - Purpose -Types and Valuation methods - Market value - Scrap value - Salvage value - Annuity - Capitalized value - Sinking fund - Depreciation - Value of building - Rent fixation - Mortgage - Lease - Principles of report preparation - Report on Residential building - Roads - Water supply and sanitary installations. | |

**LIST OF EXPERIMENTS:**

1. Rate analysis for earth work, PCC, RCC, Brick work, plastering and steel fabrication
2. Calculation of quantities and prepare the estimate for load bearing structure (Residential)
3. Calculation of quantities and prepare the estimate for framed structure (Residential)
4. Prepare the bar-bending schedule for footing, column, plinth / roof beam and slab

**TOTAL (L:45 + P:30) = 75 PERIODS**

**TEXTBOOKS:**


1. Dutta, B.N., "Estimating and Costing in Civil Engineering (Theory and Practice)", UBS Publishers & Distributors Pvt. Ltd., New Delhi, 2016.
2. Rangwala .S.C.," Estimating, Costing and Valuation", Charotar Publishing House, Anand, 2017.


**REFERENCES:**


1. Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S. Chand & Company Ltd., 2014.
2. Chakraborti M," Estimating Costing, Specification and Valuation in Civil Engineering", Chakraborti Publishers, 2010.


**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | 2 | | | | | | 2 | 3 | | | | | |
| 2 | 3 | 3 | | | | | | 2 | 2 | 3 | | | | 3 |
| 3 | | 2 | | | | | | | | | | | | |
| 4 | 2 | | | | | | | 2 | | | | | 3 | 2 |
| 5 | 2 | | | | | 2 | | 2 | 2 | 3 | | | 3 | 3 |
| **CO (W.A)** | **2.5** | **2.3** | | | | **2** | | **2** | **2.3** | **3** | | | **3** | **2.7** |

| 22CEC17 - PRE ENGINEERING BUILDINGS | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | |

| | |
|---|---|
| **Course Objective :** | • To analyze design requirements and to create effective pre-engineered building solutions. To evaluate structural and functional performance to ensure that designs meet industry standards and project specifications. |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Use industry guidelines and standards to select appropriate structural systems. | Ap | 20% |
| **CO2** | Analyze the various framing systems in pre-engineered Building (PEB) structures. | An | 40% |
| **CO3** | Apply pre-engineering knowledge to design, analyze, and solve problems in building construction and materials. | Ap | 20% |
| **CO4** | Apply techniques for estimating structural reactions and analyze methods for managing lateral forces in building systems. | Ap | 20% |
| **CO5** | Observe real-life applications and construction techniques and prepare a detailed report on the construction process and system implementation. | An | Internal Assessment |

| **UNIT I - BASICS OF METAL BUILDING SYSTEMS** | **(9)** |
|---|---|
| Introduction to metal building systems - Origin - Advantages and disadvantages - Industry groups - MBMA - MBCEA - NAIMA - MCA - NRCA - Structural loads - Loads and load combinations - Structural behavior - Structural system selection criteria. | |
| **UNIT II - PRIMARY FRAMING** | **(9)** |
| Available systems - Tapered beams - Single span rigid frame - Multi span rigid frame - Single span and continuous trusses - Framing systems - Lean to framing - Role of frame bracing. | |
| **UNIT III - SECONDARY FRAMING** | **(9)** |
| Girts and Purlins - Types of purlins for metal building systems - Design of cold-formed framing - Cold - formed steel purlins - Purlin bracings - Cold-formed steel grits - Hot rolled steel girts. | |
| **UNIT IV - METAL ROOFING AND WALL MATERIALS** | **(9)** |
| Types of metal roofs - Seam configurations - Through fastened Roofing - Structural standing-seam roof - Insulated structural panels - Architectural metal roofing - Panel finishes - Site - formed metal panels - Wind uplift ratings of metal roofs. Wall Materials - Metal panels - Hard walls - Single - Wythe Masonry - Brick veneer walls - Combination walls - Concrete Materials. | |

| UNIT V - FOUNDATION FOR METAL BUILDING SYSTEMS | (9) |
|---|---|
| Soil investigation program - Difference between conventional foundation and foundation for metal building system - Estimation of column reaction - Methods of resisting lateral reactions - Anchor bolt and base plates - Design of slabs on grade. | |
| **TOTAL (L :45) = 45 PERIODS** | |

**TEXT BOOK:**

1. Alexander Newman, "Metal Building Systems", 3rd Edition, McGraw Hill, 2014.

**REFERENCES:**


1. Subramanian N, "Design of Steel Structures Limit States Method", 2nd Edition, Oxford University Press, New Delhi, 2016.
2. Bhavikatti S.S., "Design of Steel Structures", 5th Edition, I.K. International Publishing House Pvt. Ltd., New Delhi, 2017.
3. Duggal S., "Design of Steel Structures", 3rd Edition, McGraw Hill Education, 2017.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | 2 |
| 2 | | 2 | | | | | | | | | | | | |
| 3 | 3 | | 2 | 2 | | | | | | | | | 3 | 2 |
| 4 | 3 | | 2 | | | | | 3 | | | | | | 3 |
| 5 | | 3 | | | | | | 2 | 3 | 3 | | 3 | 3 | 3 |
| **CO (W.A)** | **2.7** | **2.5** | **2** | **2** | | | | **2.5** | **3** | 3 | | **3** | **3** | **2.5** |

| 22CEP06 - COMPUTER AIDED STRUCTURAL DESIGN LABORATORY | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 0 | 0 | 4 | 2 |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To equip with fundamental principles and practical skills in structural analysis and design.<br>• To design safe and efficient structural elements, ensuring compliance with relevant codes and standards. |

| | **Course Outcomes**<br>The students will be able to | **Cognitive Level** |
|---|---|---|
| **CO1** | Apply structural analysis principles and their application to different types of loads and structures. | Ap |
| **CO2** | Perform detailed structural analysis using appropriate software and analytical methods for designing structures. | An |
| **CO3** | Apply structural design principles to develop safe, economical, and efficient designs for various structural elements and systems. | Ap |
| **CO4** | Interpret and apply relevant design codes and standards | Ap |
| **CO5** | Analyze the structures to seismic forces and apply seismic design principles to mitigate earthquake risks in RCC structures. | An |

**LIST OF EXPERIMENTS:**

1. Analysis and design of continuous beam with various loading
2. Analysis of single storey RCC building
3. Earthquake analysis of RCC structures
4. Analysis and design of shear wall
5. Analysis and design of footing
6. Analysis and design of RCC rectangular elevated water tank
7. Analysis and design of an industrial building (Steel Structure)
8. Analysis and design of transmission line tower

**TOTAL(P:60)=60PERIODS**

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | | 2 | | | | | | | | | | | | 2 |
| **2** | | 2 | | | 2 | | | | | 3 | | 3 | 3 | 3 |
| **3** | 3 | 3 | 2 | | 3 | | | | | 2 | | | 3 | 3 |
| **4** | 3 | | | | | | | | | | | 2 | 2 | 2 |
| **5** | | 2 | | | | | | | | | | 2 | | 2 |
| **CO (W.A)** | **3** | **2.3** | **2** | | **2.5** | | | | | **2.5** | | **2.3** | **2.7** | **2.4** |

| 22CEP07 - SURVEY CAMP | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 0 | 0 | 2 | 1 |
| **PREREQUISITE : 22CEC04** | | | | | |
| **Course Objective:** | • To apply various surveying methods and equipment in field settings to collect and analyze accurate survey data.<br>• To design and execute a complete surveying project, integrating theory and practice to address real-world surveying challenges effectively. | | | | |
| **Course Outcomes**<br>The students will be able to | | | | | **Cognitive Level** |
| **CO1** | Design and execute surveying projects, applying theoretical knowledge to practical scenarios effectively. | | | | Ap |
| **CO2** | Demonstrate a thorough understanding of surveying principles and techniques using field equipment and methods. | | | | Ap |
| **CO3** | Analyze and interpret survey data to produce precise and comprehensive reports. | | | | An |
| **CO4** | Compare and contrast different surveying methods and techniques. | | | | An |
| **CO5** | Prepare contour map for the given area. | | | | C |

**LIST OF EXPERIMENTS:**

Ten days survey camp using theodolite, leveling and total station. At the end of the camp, each student shall have plot the contour map and calculate the area. The camp record shall include all original field observations, calculations and plots.

1.Traverse - using Theodolite / Total station

2. Contouring

3. L.S & C.S - Road

4. Offset of Buildings and Plotting the Location

5. Using GPS to find latitude and longitude for given location

6. Determination of height of the object (Total station)

7. Foundation marking

(Ten Days Survey Camp will be conducted during 5th Semester winter vacation)

**TOTAL (P:30) = 30 PERIODS**

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | 2 | | | | | | 3 | | | 2 | | 3 |
| 2 | 2 | | | | | | | | 3 | | | 3 | 3 | 3 |
| 3 | | 2 | | | | | | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| 4 | | 2 | | | 2 | | | | 3 | | 3 | 3 | 2 | 3 |
| 5 | 3 | | 2 | | | | | | 3 | 3 | | 3 | 3 | 3 |
| **CO (W.A)** | **2.7** | **2** | **2** | | **2** | | | **3** | **3** | **2.5** | **3** | **2.8** | **2.8** | **3** |

| 22GEA01 UNIVERSAL HUMAN VALUES<br>(For Common to All Branches) | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 2 | 0 | 0 | 2 |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity.<br>• To facilitate the development of a holistic perspective among students towards life and profession.<br>• To highlight plausible implications of holistic understanding in terms of ethical human conduct.<br>• To understand the nature and existence.<br>• To understand human contact and holistic way of living |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Evaluate the significance of value inputs in formal education and start applying them in their life and profession. | E | Internal Assessment |
| **CO2** | Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual. | Ap | |
| **CO3** | Analyze the value of harmonious relationship based on trust and respect in their life and profession. | An | |
| **CO4** | Examine the role of a human being in ensuring harmony in society and nature. | Ap | |
| **CO5** | Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession. | Ap | |

| **UNIT I - INTRODUCTION - BASIC HUMAN ASPIRATION, ITS FULFILLMENT THROUGH ALL - ENCOMPASSING RESOLUTION** | **(6)** |
|---|---|
| The basic human aspirations and their fulfillment through Right understanding and Resolution, Right understanding and Resolution as the activities of the Self, Self being central to Human Existence; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution | |
| **UNIT II - RIGHT UNDERSTANDING (KNOWING)- KNOWER, KNOWN & THE PROCESS** | **(6)** |
| The domain of right understanding starting from understanding the human being (the knower, the experiencer and the doer) and extending up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct). | |
| **UNIT III - UNDERSTANDING HUMAN BEING** | **(6)** |
| Understanding the human being comprehensively as the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Basis for harmony/contradiction in the self | |
| **UNIT IV - UNDERSTANDING NATURE AND EXISTENCE** | **(6)** |
| A comprehensive understanding (knowledge) about the existence, Nature being included; the need and process of inner evolution (through self-exploration, self- awareness and self-evaluation), particularly | |

| | |
|---|---|
| awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence). | |
| **UNIT V - UNDERSTANDING HUMAN CONDUCT, ALL-ENCOMPASSING RESOLUTION AND HOLISTIC WAY OF LIVING** | **(6)** |
| Understanding Human Conduct, different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All- encompassing Resolution covering all four dimensions of human endeavor viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from Self to Nature and entire Existence | |
| **TOTAL (L:30) = 30 PERIODS** | |

**TEXT BOOKS:**

1. R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), "A Foundation Course in Human Values and Professional Ethics". ISBN 978-93-87034-47-1, Excel Books, New Delhi

**REFERENCES:**


1. Ivan Illich, 1974, "Energy & Equity", The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, "Small is Beautiful: a study of economics as if people mattered", Blond & Briggs, Britain.
3. Sussan George, 1976, "How the Other Half Dies", Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, "Limits to Growth - Club of Rome's report", Universe Books.
5. A Nagraj, 1998, Jeevan Vidya EkParichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, "Science and Humanism", Commonwealth Publishers.
7. A N Tripathy, 2003, "Human Values", New Age International Publishers
8. E G Seebauer& Robert L. Berry, 2000, "Fundamentals of Ethics for Scientists & Engineers", Oxford University Press
9. M Govindrajran, S Natrajan& V.S. Senthil Kumar, "Engineering Ethics (including Human Values)", Eastern Economy Edition, Prentice Hall of India Ltd.
10. Subhas Palekar, 2000, "How to practice Natural Farming", Pracheen (Vaidik) Krishi Tantra Shodh, Amravati
11. B P Banerjee, 2005, "Foundations of Ethics and Management", Excel Books
12. B L Bajpai, 2004, "Indian Ethos and Modern Management", New Royal Book Co., Lucknow. Reprinted 2008.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | | | | | | 2 | 2 | 3 | 2 | 2 | | 3 | | |
| 2 | | | | | | 2 | 2 | 3 | 2 | 2 | | 3 | | |
| 3 | | | | | | 2 | 2 | 3 | 2 | 2 | | 3 | | |
| 4 | | | | | | 2 | 2 | 3 | 2 | 2 | | 3 | | |
| 5 | | | | | | 2 | 2 | 3 | 2 | 2 | | 3 | | |
| **CO (W.A)** | | | | | | **2** | **2** | **3** | **2** | **2** | | **3** | | |

| 22CED01 - DESIGN PROJECT | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 0 | 0 | 4 | 2 |
| **PREREQUISITE : NIL** | | | | |

| **Course Objective:** | • To improve the skill of designing various problems related to Civil Engineering projects |
|---|---|

| **Course Outcomes** The students will be able to | | **Cognitive Level** |
|---|---|---|
| **CO1** | Prepare plan, section and elevation of a civil engineering structure as per NBC. | C |
| **CO2** | Design the structure in accordance with relevant IS codes | Ap |
| **CO3** | Analysing the structure in accordance with relevant IS codes | An |
| **CO4** | Calculate quantity and rate for the civil engineering structure as per PWD schedule of rates | Ap |
| **CO5** | Prepare and present the project report | Ap |

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.

**TOTAL (P:60) = 60 PERIODS**

**Mapping of COs with POs / PSOs**

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | | 3 | 3 | 3 | 3 | | | | 3 | 3 | 3 | 3 | 3 | 3 |
| **2** | | | 3 | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **3** | | 3 | | | 3 | | | | 3 | 3 | 3 | 3 | 3 | 3 |
| **4** | 3 | | | | | | 3 | 3 | | 3 | 3 | 3 | 3 | 3 |
| **5** | 3 | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO (W.A)** | **3** | **3** | | **2** | **3** | | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **3** |

| 22GED02 - INTERNSHIP / INDUSTRIAL TRAINING | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 0 | 0 | 0 | 2 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To apply the theoretical knowledge gained in academic courses to real-world industrial or professional settings.<br>• To obtain a broad understanding of the emerging technologies in Industry. | | | | |
| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** | | | |
| **CO1** | Engage in Industrial activity which is a community service. | U | | | |
| **CO2** | Prepare the project report, three minute video and the poster of the work. | Ap | | | |
| **CO3** | Develop new ideas into feasible projects, enhancing their problem-solving and project development skills. | C | | | |
| **CO4** | Develop problem-solving skills and innovative thinking. | Ap | | | |
| **CO5** | Assess the effectiveness of industry practices. | E | | | |

During semester breaks, students are encouraged to engage in industrial training or undergo internship in an industry related to the field of study. The duration of the activity shall be of 4 weeks (28 days). The work carried out in the semester break is assessed through an oral seminar accompanied by a written report. It is expected that this association will motivate the student to develop simple civil (or other) products to make their life comfortable and convert new ideas into projects.

Every student is required to complete 4 weeks of internship (with about 28days), during the Summer/Winter semester breaks. The Internships are evaluated through Internship Reports. The internships can be taken up in an industry, a government organization, a research organization or an academic institution, either in the country or outside the country, that include activities like:

- Successful completion of Internships/ Value Added Programs / Training
- Programs/ workshops organized by academic Institutions and Industries
- Soft skill training by the Placement Cell of the college
- Active association with incubation/ innovation /entrepreneurship cell of the institute;
- Participation in Inter-Institute innovation related competitions like Hackathons
- Working for consultancy/ research project within the institutes
- Participation in activities of Institute's Innovation Council, IPR cell, Leadership
- Talks, Idea/ Design/ Innovation contests
- Internship with industry/ NGO's/ Government organizations/ Micro/ Small/
- Medium enterprises
- Development of a new product/ business plan/ registration of a start-up

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | | | | | | | | | 2 | | 2 | | 3 | 3 |
| **2** | 3 | | | | | | | | 2 | 3 | 3 | 3 | 3 | 3 |
| **3** | 3 | | | | | | | | | 2 | | 2 | 3 | 3 |
| **4** | | | 2 | | | 3 | | | | | 2 | 3 | 3 | 3 |
| **5** | 2 | | | | | | | | | | | | 3 | 3 |
| **CO (W.A)** | **2.7** | | **2** | | | **3** | | | **2.5** | **2.5** | **2.3** | **2.7** | **3** | **3** |

| 22CED02 - PROJECT WORK | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **0** | **0** | **20** | **10** |
| **PREREQUISITE : NIL** | | | | |

| | |
|---|---|
| **Course Objective:** | • To solve a specific problem by identifying it through literature review and proceeding to successful solution by formulating proper methodology.<br>• To provide opportunity to exercise their creative and innovative qualities by working together in a team to solve problem statements involving both theoretical and experimental studies related to civil engineering. |

| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** |
|---|---|---|
| **CO1** | Identify the practical problem by conducting literature survey/patent search. | Ap |
| **CO2** | Formulate proper methodology as per standards available. | Ap |
| **CO3** | Solving the problem using suitable experimental/analytical studies | An |
| **CO4** | Analyze the problem based on the methodology and tabulate the results. | An |
| **CO5** | Conclude the results and submit the project report. | C |

**DESCRIPTION**

Project work may be allotted to a single student or to a group of students not exceeding 3 per group. The title of project work is approved by head of the department under the guidance of a faculty member and student(s) shall prepare a comprehensive project report after completing the work to the satisfaction of the guide.

The Head of the department shall constitute a review committee for project work. There shall be three reviews during the semester by the committee to review the progress. Student(s) shall make presentation on the progress made by him / her / them before the committee and evaluation is done as per Rules and Regulations.

**TOTAL (P:300) = 300 PERIODS**

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | 3 | | | 3 | | | | | 3 | | | 3 | | 2 |
| **2** | | 3 | | 3 | | | | | 3 | | | 3 | | 3 |
| **3** | | 2 | | | | | 3 | 3 | 3 | | | | | |
| **4** | 3 | 3 | 3 | 3 | | 3 | 2 | | 3 | | | | | |
| **5** | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO (W.A)** | **3** | **2.7** | **3** | **3** | | **3** | **2.5** | **3** | **3** | **3** | **3** | **3** | **3** | **2.7** |

| 22CEX01 - ADVANCED STEEL DESIGN | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| **PREREQUISITE : 22CEC15** | | | | |
| **Course Objective:** | • To apply relevant building codes and standards to ensure that their steel designs meet regulatory requirements.<br>• To determine safe as well as economical steel section for various industrial and framed structures like chimneys, silos, plate girders and gantry girders. | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply codal provision to design various components of industrial building. | Ap | 20% |
| **CO2** | Evaluate and design the forces of chimney and silo. | An | 20% |
| **CO3** | Apply relevant codes and standards for the design and analysis of cold-formed steel structures. | An | 20% |
| **CO4** | Analyze and design welded plate girders. | An | 20% |
| **CO5** | Determine the design forces over a gantry girder and design the member. | An | 20% |

| | |
|---|---|
| **UNIT I - INDUSTRIAL BUILDINGS** | **(9)** |
| Roof trusses - Roof and side coverings - Wind load calculation - Design of purlins - Design of truss under gravity load and wind load - Introduction to design of steel structures for fire loads | |
| **UNIT II - DESIGN OF CHIMNEYS AND SILOS** | **(9)** |
| Introduction - Forces acting on chimneys - Types - Load calculation - Design of Self supporting chimneys - Pressure on side walls of silos - Design of single cell circular silos. | |
| **UNIT III - LIGHT GAUGE STEEL STRUCTURES** | **(9)** |
| Introduction to cold formed steel - Advantages of cold formed steel sections - Types of cross sections - Local buckling - Design of compression members - Design of beams. | |
| **UNIT IV - PLATE GIRDER** | **(9)** |
| Introduction - Difference between beam and plate girder - Types of plate girders - Post buckling behavior of web plate - Proportioning of the web plate and flanges - Design of welded plate girder. | |
| **UNIT V - GANTRY GIRDER** | **(9)** |
| Introduction - Load consideration - Max load effects - Determination of maximum bending moment and shear force due to crane wheel load - Longitudinal effect of wheel load - Design of gantry girder. | |
| **TOTAL (L:45) = 45 PERIODS** | |

| **TEXTBOOK:** |
|---|
| 1. Duggal S.K., "Design of Steel Structures", 3rd Edition, McGraw Hill Education, 2019. |
| **REFERENCES:** |
| 1. Subramanian N., "Design of Steel Structures Limit States Method",2nd Edition, Oxford University Press, New Delhi,2015.<br>2. Bhavikatti S.S., "Design of Steel Structures", 5th Edition, I.K. International Publishing House Pvt. Ltd., New Delhi, 2017. |

| **Mapping of COs with POs / PSOs** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | 3 | | | | | | | | | | | | 3 | 3 |
| **2** | | 3 | 2 | | | | | | | 2 | 2 | 2 | | 2 |
| **3** | 3 | 2 | 2 | | | | | | | | | | | 2 |
| **4** | | 2 | 2 | | | | | | | | | 2 | 2 | |
| **5** | | 2 | 2 | | | | | | | | | | | 2 |
| **CO (W.A)** | **3** | **2.3** | **2** | | | | | | | **2** | **2** | **2** | **2.5** | **2.3** |

| 22CEX02 - PREFABRICATED STRUCTURES | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To impart knowledge on prefabricated elements and the technologies used for fabrication and erection.<br>• To acquire the knowledge about the modern trends in building construction, role of prefabricated structures and the basic functional requirements of industrial structures. |

| Course Outcomes<br>The students will be able to | | Cognitive Level | Weightage of COs in End Semester Examination |
|---|---|---|---|
| **CO1** | Apply principles of fabrication in the construction industry that necessitate the adoption of prefabrication techniques. | Ap | 20% |
| **CO2** | Analyse the various components of prefabrications. | An | 20% |
| **CO3** | Apply knowledge of fabrication techniques in the design and production of prefabricated elements. | Ap | 20% |
| **CO4** | Design the structural elements in accordance with codal provisions. | E | 40% |
| **CO5** | Conduct independent study as part of a team and deliver an effective oral presentation on real-time examples. | An | Internal Assessment |

| **UNIT I - DESIGN PRINCIPLES** | **(9)** |
|---|---|
| Introduction to prefabrication - Need for prefabrication - General principles - Comparison with monolithic construction -Types of prefabrication - Site and plant prefabrication - Economy of prefabrication - Modular coordination - Standardization - Materials - Systems - Production - Transportation - Erection. | |
| **UNIT II - PREFABRICATED COMPONENTS AND JOINTS** | **(9)** |
| Planning for components of prefabricated structures, Behaviour of structural components - Large panel constructions - Construction of roof and floor slabs - Wall panels - Columns - Shear walls, Disuniting of structures - Joints - Joints for different structural connections, Effective sealing of joints for water proofing, Provisions for non-structural fastenings, Expansion joints in precast construction. | |
| **UNIT III - PRODUCTION AND FABRICATION** | **(9)** |
| Production technology - Choice of production setup, manufacturing methods, stationary and mobile production, planning of production setup, storage of precast elements, dimensional tolerances, acceleration of concrete hardening. Hoisting technology - equipment for hoisting and erection, techniques for erection of different types of members like beams, slabs, wall panels and columns, vacuum lifting pads. | |
| **UNIT IV - DESIGN OF PREFABRICATED BEAMS** | **(9)** |
| Prefabricated load carrying members - Types of beams - Design of simple rectangular beams and I-beams, handling and erection stresses, elimination of erection stresses - beams, columns, symmetric frames. | |

| UNIT V - DESIGN OF PREFABRICATED ELEMENTS | (9) |
|---|---|
| Types of Slabs - Construction of roof and floor slabs - Design of hollow core slab - Columns - Construction and design principles of column. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**

1. Lewitt,M. " Precast Concrete- Materials, Manufacture, Properties And Usage ,CRC Press, 2019,
2. Ramachandra Murthy D.S., "Design and Construction of Precast Concrete Structures", 1st Edition, Dipti Press OPC Private Limited, Chennai; 2017.

**REFERENCES:**

1. Kim S. Elliott, "Precast Concrete Structures", 2nd Edition, CRC Press, United States, 2017.
2. PCI Design Hand Book", 6th Edition, Precast / Prestressed Concrete Institute, ACI, Chicago, 2004.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | 3 |
| 2 | | 2 | | | | 2 | | | | | | | | |
| 3 | 3 | | | | | 2 | | | | | | 2 | | 2 |
| 4 | | | 3 | | | | 2 | | | | | 3 | 3 | 3 |
| 5 | 3 | 3 | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 |
| CO (W.A) | 3 | 2.5 | 3 | | | 2 | 2 | | 3 | 3 | 3 | 2.7 | 3 | 2.8 |

| 22CEX03 - PRESTRESSED CONCRETE STRUCTURES<br>[ IS 1343 code book is to be permitted] | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **3** | **0** | **0** | **3** |

**PREREQUISITE : NIL**

| **Course Objective:** | • To impart knowledge on the prestressing principles and the methods of prestressing for real time applications. |
|---|---|

| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply the design concepts of prestressing in members. | Ap | 20% |
| **CO2** | Design the prestressed concrete structural elements and assess serviceability factors. | An | 40% |
| **CO3** | Implement the methods for achieving continuity in beams. | Ap | 20% |
| **CO4** | Evaluate the design of circular prestressing and the uses of non-prestressed reinforcement. | E | 20% |
| **CO5** | Engage in independent study as a member of a team and make an effective oral presentation on the research article. | U | Internal Assessment |

| **UNIT I - DESIGN CONCEPTS OF PRESTRESSING** | **(9)** |
|---|---|
| Basic concepts - Advantages - Materials required - Systems and methods of prestressing - Freyssinet, Magnel, Lee - McCall and Gifford Udall anchorage systems - Analysis of sections - Stress concept - Strength concept - Load balancing concept - Losses of prestress - in post -tensioned and pre-tensioned members. | |
| **UNIT II - DESIGN FOR FLEXURE AND SHEAR** | **(9)** |
| Basic assumptions of flexural design - Permissible stresses in steel and concrete as per I.S.1343 Code - Different Types of sections - Design of sections of Type I and Type II post-tensioned and pre-tensioned beams - Check for flexural capacity based on I.S. 1343 Code - Influence of Layout of cables in post-tensioned beams - Location of wires in pre-tensioned beams - Design for shear based on I.S. 1343 Code. | |
| **UNIT III - DEFLECTION AND DESIGN OF ANCHORAGE ZONE** | **(9)** |
| Factors influencing deflections - Short-term deflections of uncracked members - Prediction of long-term deflections due to creep and shrinkage - Check for serviceability limit states. Determination of anchorage zone stresses in post -tensioned beams by Magnel's method, Guyon's method and I.S. 1343 code - design of anchorage zone reinforcement. | |
| **UNIT IV - COMPOSITE BEAMS AND CONTINUOUS BEAMS** | **(9)** |
| Composite structures - Advantages - Types of composite structures - Analysis and design of composite beams - Shrinkage strain and its importance - Differential shrinkage - Methods of achieving continuity in continuous beams - Analysis for secondary moments - Concordant cable and linear transformation - Calculation of stresses - Principles of design. | |

| UNIT V - MISCELANEOUS STRUCTURES | (9) |
|---|---|
| Role of prestressing in members subjected to tensile forces and compressive forces - Design of tension members and compression members - Design of tanks, pipes and sleepers - Partial prestressing - methods of achieving partial prestressing, merits and demerits of partial prestressing. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**


1. Krishna Raju, "Prestressed Concrete", 6th Edition, Tata McGraw Hill Publishing Co, India, 2018.
2. Rajagopalan N, "Prestressed Concrete", 2nd Edition, Narosa Book Distributors, 2010.


**REFERENCES:**


1. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2017.
2. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", 3rd Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
3. IS 1343 - 2012: Code of practice for Prestressed concrete.
4. IS 784 - 2001: Code of practice for Prestressed concrete pipes.
5. IS 3370 - 1999: Code of practice for concrete structures for the storage of liquids.


**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | |
| 2 | | 3 | 3 | | | 3 | | 3 | | | | 3 | 3 | 3 |
| 3 | 2 | | | | | 2 | | | | | | 3 | | 3 |
| 4 | 3 | | 3 | 3 | | | | 3 | | | | | | 3 |
| 5 | | 3 | | 3 | | | | | 3 | 3 | | 3 | 3 | 3 |
| CO (W.A) | | 3 | 3 | 3 | | 2.5 | | 3 | 3 | 3 | | 3 | 3 | 3 |

| 22CEX04 - DISTRESS MONITORING AND REHABILITATION OF STRUCTURES | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | |
| **Course Objective:** | • To explain the causes and effects of structural distress and describe various rehabilitation methods and their applications.<br>• To apply monitoring techniques and assessment tools to identify and evaluate distress in structures. | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply the knowledge of construction materials and techniques to analyze building durability problems. | Ap | 40% |
| **CO2** | Apply various repair techniques for cracked and corroded elements. | Ap | 20% |
| **CO3** | Evaluate the common defects and distress in construction through diagnostic procedures. | An | 20% |
| **CO4** | Apply various methods of strengthening the structural components. | Ap | 20% |
| **CO5** | Analyze and develop report for simple maintenance and repair problems. | An | Internal Assessment |

| **UNIT I - INTRODUCTION** | **(9)** |
|---|---|
| Maintenance, rehabilitation, repair, retrofit and strengthening - need for rehabilitation of structures - Cracks in R.C. buildings - causes and effects - importance of maintenance, routine and preventive maintenance. | |
| **UNIT II - REPAIR MATERIALS** | **(9)** |
| Criteria for material selection -Special mortars and concrete - Polymer Concrete and Mortar - Quick setting compounds - Grouting materials - Gas forming grouts - Bonding agents -Latex emulsions - Epoxy bonding agents - Protective coatings - FRP sheets. | |
| **UNIT III - CRACK REPAIR TECHNIQUES** | **(9)** |
| Methods of crack repair - Grouting - Routing - sealing - Stitching - Dry packing - Repair of active cracks - dormant cracks - Corrosion of embedded steel in concrete - Mechanism - Stages of corrosion - Repair techniques of corroded structural elements. | |
| **UNIT IV - DAMAGE DIAGNOSIS AND ASSESSMENT** | **(9)** |
| Visual inspection - Non-Destructive Testing - Rebound hammer, Ultra sonic pulse velocity - Semi destructive testing - Probe test - Pull out test - Chloride penetration test - Carbonation - Corrosion activity measurements. | |
| **UNIT V - RETROFITTING OF STRUCTURES** | **(9)** |
| Jacketing - Column jacketing - Beam jacketing - Beam Column joint - Reinforced concrete jacketing - Steel jacketing - FRP jacketing - Strengthening - Shear strengthening - Flexural strengthening. | |
| | **TOTAL (L:45) = 45 PERIODS** |

**TEXT BOOKS:**

1. Vidivelli. B., "Rehabilitation of Concrete Structures", Standard Publishers, 2009.
2. PeterH.Emmons, "Concrete Repair and Maintenance Illustrated Problem Analysis, Repair Strategy, Techniques", Galgotia Publication, 2018.

**REFERENCES:**

1. Shetty M.S., "Concrete Technology - Theory and Practice", S.Chand and Company, 2019.
2. Ravishankar.K, Krishnamoorthy T.S, "Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
3. Santhakumar A. R., "Concrete Technology", Oxford University Press, 2006.

**Mapping of COs with POs / PSOs**

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | 3 |
| 2 | 3 | | | 3 | | | | 2 | | 2 | | 3 | 2 | 3 |
| 3 | | 3 | | | 2 | | | | | | | 3 | | 2 |
| 4 | 3 | | | 2 | | | | | | | | | | |
| 5 | | 3 | | 2 | 2 | | | | 3 | 2 | | 3 | 3 | 3 |
| **CO (W.A)** | **3** | **3** | | **2.3** | **2** | | | **2** | **3** | **2** | | **3** | **2.5** | **2.8** |

| 22CEX05 - DYNAMICS AND EARTHQUAKE RESISTANT STRUCTURES<br>[ IS 1893, IS 4326 and IS 13920 code books are to be permitted] | | | | |
|---|---|---|---|---|
| | **L** | **T** | **P** | **C** |
| | **3** | **0** | **0** | **3** |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To impart knowledge on the theory of vibration and basics of structural dynamics.<br>• To impart the design philosophy of earthquake resistant design of structures.<br>• To create awareness on the use of codal provisions for aseismic design of structures. |

| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply the basics of structural dynamics in analysis of structures subjected to earthquake | Ap | 20% |
| **CO2** | Apply knowledge of seismic characteristics to adopt suitable techniques in structural design. | An | 40% |
| **CO3** | Design the earthquake resistant RCC structures as per codal provisions. | E | 20% |
| **CO4** | Compute earthquake forces for buildings and able to understand design concepts. | E | 20% |
| **CO5** | Analyze historical case studies of significant earthquakes and their effects on structures, and write detailed reports. | An | Internal Assessment |

| **UNIT I BASICS AND CAUSES OF EARTHQUAKE** | **(9)** |
|---|---|
| Cross section of earth interior - Seismology - Plate tectonics - Faults - Seismic waves - Consequences of earthquake - Earthquake parameters - Magnitude & intensity scales - Seismic zones of India - Characteristics of ground motion and attenuation - Earthquake recording instruments - Seismograph - Seismogram - Causes of earthquakes and its effect on built structures - Damages caused during past earthquakes. | |
| **UNIT II EARTHQUAKE VIBRATIONS OF BUILDINGS** | **(9)** |
| Static load v/s Dynamic load - Force control and displacement control - Simplified single degree of freedom system - Modelling of buildings - Natural frequency and resonance - Responses of buildings to different types of vibrations like free and forced - Damped and Undamped vibration - Response of building to earthquake ground motion - Introduction to multi degree of freedom systems - Mode shapes only. | |
| **UNIT III EARTHQUAKE LOAD ANALYSIS** | **(9)** |
| Planning considerations and Architectural concepts - Evaluation of Earthquake forces - Material properties - Guidelines for Earthquake resistant design - lateral load analysis - Capacity based design and Detailing - Rigid frames - Shear walls. | |
| **UNIT IV EARTHQUAKE RESISTANT DESIGN OF STRUCTURES** | **(9)** |
| Earthquake resistant design of RCC buildings - Pinching Effect - Bouchinger Effects - Response Spectra - | |

Design spectra - Seismic coefficient method and Dynamic analysis - Ductile detailing of reinforced concrete beams, Columns and shear wall - Design procedure on ductile detailing (IS 13920:1993) - Design concepts of non-structural members.

| **UNIT V VIBRATION CONTROL TECHNIQUES** | **(9)** |
|---|---|

Vibration control - Tuned mass dampers - Principles and application, Basic concepts of seismic base isolation - Various systems. Case studies of important structures.

**TOTAL (L:45) = 45 PERIODS**

**TEXT BOOKS:**


1. Mario Paz, "Structural Dynamics – Theory and Computations", Fourth Edition, CBS publishers, 1997.
2. Agarwal.P and Shrikhande.M. Earthquake Resistant Design of Structures, Prentice Hall of India Pvt. Ltd. 2007.


**REFERENCES:**


1. Anil K Chopra, "Dynamics of structures – Theory and applications to Earthquake Engineering", Prentice Hall Inc., 2007.
2. Moorthy C.V.R., "Earthquake Tips", NICEE, IIT Kanpur,2002.
3. IS13920-1993, Ductile detailing of reinforced concrete structures subjected to seismic forces - Code of practice.
4. IS 1893 part 1 2002, Indian standard criteria for earthquake resistant design of structures.
5. IS 4326-1993, Earthquake Resistant Design and Construction of Buildings Code of Practice (Second Revision)


**Mapping of COs with POs / PSOs**

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | 3 | | | | | | | | | | | 3 | 2 | 3 |
| **2** | 2 | | | 3 | | | | | | | | | | 2 |
| **3** | | 3 | 3 | | | | | 3 | | | | 3 | 2 | 3 |
| **4** | | 3 | 3 | | | | | 3 | | | | 3 | 3 | 3 |
| **5** | | 3 | | 3 | | 3 | | | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO (W.A)** | **2.5** | **3** | **3** | **3** | | **3** | | **3** | **3** | **3** | **3** | **3** | **2.5** | **2.8** |

| 22CEX06 - INTRODUCTION TO FINITE ELEMENT METHOD | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | |

| | |
|---|---|
| **Course Objective:** | • To impact basic knowledge on the various steps involved in finite element analysis.<br>• To introduce various types of one - two - three - dimensional elements. |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply the concepts of finite element method to solve engineering problems. | Ap | 20% |
| **CO2** | Employ the direct stiffness matrix method for analysis of structural elements. | Ap | 20% |
| **CO3** | Form the shape function and stiffness matrix for one dimensional element. | An | 20% |
| **CO4** | Apply numerical methods for various isoparametric elements. | Ap | 20% |
| **CO5** | Analyze the structural elements of framed structures. | An | 20% |

| **UNIT I - INTRODUCTION** | **(9)** |
|---|---|
| Historical Background - Mathematical Modeling of field problems in Engineering - Governing Equations - Discrete and continuous models - Boundary, Initial and Eigen Value problems - Weighted Residual Methods - Variational Formulation of Boundary Value Problems - Ritz Technique - Basic concepts of the Finite Element Method. | |
| **UNIT II - STIFFNESS MATRIX FORMULATION** | **(9)** |
| Introduction to discrete and continua elements - Discrete Elements - Direct stiffness method - Special characteristics of stiffness matrix - Assemblage of elements - Boundary condition & reaction - 2D - truss element - 2D - beam element - Analysis of framed Structures - Basic steps in finite element analysis - Differential equilibrium equations - strain displacement relation - linear constitutive relation - Numerical methods in finite element analysis- Gauss elimination method. | |
| **UNIT III - ONE DIMENSIONAL PROBLEMS** | **(9)** |
| One Dimensional Second Order Equations - Discretization - Element types- Linear and Higher order Elements - Continua Elements - Displacement models - convergence requirements. Natural coordinate systems - Shape function. Interpolation function. Linear and quadratic elements - Lagrange and Serendipity elements. Strain displacement matrix - element stiffness matrix and nodal load vector. Natural frequencies of longitudinal vibration and mode shapes. | |
| **UNIT IV - TWO DIMENSIONAL PROBLEMS** | **(9)** |
| Two dimensional isoparametric elements - Four node quadrilateral elements - triangular elements. Computation of stiffness matrix for isoparametric elements - numerical integration (Gauss quadrature) Convergence criteria for isoparametric elements. | |

| UNIT V - ANALYSIS OF FRAMED STRUCTURES | (9) |
|---|---|
| Stiffness of Truss Members-Analysis of Truss-Stiffness of Beam Members-Finite Element Analysis of Continuous Beam-Plane Frame Analysis-Analysis of Grid and Space Frame. | |
| **TOTAL (L:45) : 45 PERIODS** | |

**TEXTBOOKS:**


1. Rao, S.S., "The Finite Element Method in Engineering", 6th Edition, Butterworth Heinemann 2018.
2. Reddy, J.N. "Introduction to the Finite Element Method", 4thEdition, Tata McGrawHill, 2018.


**REFERENCES:**


1. David Hutton, "Fundamentals of Finite Element Analysis", Tata McGraw Hill Publishing Company Limited, New Delhi, 2005.
3. G.R. Liu and S. S. Quek, "Finite Element Method: A Practical Course", Butterworth-Heinemann; 1st edition (21 February 2003).
4. Chennakesava R. Alavala, "Finite Element Methods: Basic Concepts and Applications", Prentice Hall Inc., 2010.
5. S. S. Bhavikatti, "Finite Element Analysis", New Age Publishers, 2007.
6. Krishnamoorthy, C. S, "Finite Element Analysis - Theory and Programming", McGraw - Hill, 1995.


**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | |
| 2 | 2 | | | | | | | | | | | | 2 | |
| 3 | | 2 | | | | | | | | | | | | 2 |
| 4 | 2 | | | 2 | | | | | | | | | | |
| 5 | | 2 | | 2 | | | | | | | | | 2 | |
| CO (W.A) | 2 | 2 | | 2 | | | | | | | | | 2 | 2 |

| 22CEX07 - ADVANCED STRUCTURAL ANALYSIS | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| **PREREQUISITE : 22CEC07** | | | | |
| **Course Objective:** | • To impart knowledge on plastic and elastic methods of analysis for structures.<br>• To impart knowledge on the analysis of space truss, cable supported structures and arch structures. | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply the concept of plastic analysis to optimize the structural performance. | Ap | 20% |
| **CO2** | Apply energy methods to analyse the structures. | Ap | 20% |
| **CO3** | Determine the forces acting in cable structures and analyse the behaviour of various types of arches. | An | 40% |
| **CO4** | Analyze the structural behavior of shell structures under various loading conditions. | An | 20% |
| **CO5** | Solve the problems to analysis the various structures. | An | Internal Assessment |

| **UNIT I - PLASTIC ANALYSIS OF STRUCTURES** | **(9)** |
|---|---|
| Plastic moment of resistance - Plastic modulus - Shape factor - Load factor - Plastic hinge and mechanism - Plastic analysis of indeterminate beams and portal frames. | |
| **UNIT II - ENERGY METHOD OF ANALYSIS** | **(9)** |
| Introduction - Applications - Statically indeterminate beams - Kani's Method - Analysis of Indeterminate Structures - Continuous Beams and Portal Frames (with and without sway). | |
| **UNIT III - ARCHES** | **(9)** |
| Arches as structural forms - Arch structures - Arch action - Types of arches - Parabolic and circular arches - Analysis of three hinged and two hinged arches. | |
| **UNIT IV - SUSPENSION CABLES** | **(9)** |
| Suspension Cables - Components - Analysis of suspension cables - Analysis of stiffening girders - Beams curved in plan. | |
| **UNIT V - SHELLS** | **(9)** |
| Introduction - Classification of shells - Structural action - Analysis of spherical domes - Analysis of cylindrical shells - Introduction to folded plates. | |
| **TOTAL ( L:45) : 45 PERIODS** | |

| **TEXT BOOKS:** |
|---|
| 1. Devdas Menon, Structural Analysis, 3rd Edition, Narosa Publishing House, New Delhi, 2023<br>2. Vaidyanathan, R and Perumal, P., "Comprehensive Structural Analysis ‖ Volume I and II", Laxmi Publications Pvt. Ltd., Chennai, 4th Edition, 2016. |
| **REFERENCES:** |
| 1. Hibbeler, R.C, "Structural Analysis", 10th Edition, Pearson India, Bengaluru, 2023<br>2. Punmia.B.C, Ashok K.Jain, Arun K Jain, "Theory of Structures", 12th Edition, Laxmi Publications, New Delhi, 2023. |

| **Mapping of COs with POs / PSOs** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | 3 | | | | | | | | | | | | | |
| **2** | 3 | | | | | | | | | | | | | 2 |
| **3** | | 3 | | 3 | | | | | | | | 2 | 2 | 3 |
| **4** | | 2 | | | | | | | | | | | | 2 |
| **5** | | 3 | | 3 | | | | | 3 | | | 3 | 2 | 3 |
| **CO (W.A)** | **3** | **2.7** | | **3** | | | | | **3** | | | **2.5** | **2** | **2.5** |

## 22CEX08 - STEEL CONCRETE COMPOSITE STRUCTURES

| | L | T | P | C |
|---|---|---|---|---|
| | 3 | 0 | 0 | 3 |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To impart knowledge on the behaviour and design procedure of steel - concrete composite elements and structures.<br>• To understand the effect of composite action and assess governing limit states for composite elements. |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Identify the different types of steel-concrete composite structure and its connections. | Ap | 20% |
| **CO2** | Design the composite beam and column. | E | 40% |
| **CO3** | Design the slab under various loading conditions. | E | 20% |
| **CO4** | Analysis the historical Steel concrete composite construction and seismic behaviour of the structures. | An | 20% |
| **CO5** | Engage in independent learning through real time case studies of composite structure with respect to seismic circumstances. | An | Internal Assessment |

| | |
|---|---|
| **UNIT I - INTRODUCTION** | **(9)** |
| Introduction to steel - concrete composite construction - codes - composite design - shear connectors - types of shear connectors - degrees of shear connections - partial and full shear connections. | |
| **UNIT II - DESIGN OF COMPOSITE BEAM** | **(9)** |
| Introduce composite beams, including shear studs - Determine the location of a beam's neutral axis/axes depending on the level of composite action. Calculate shear stud strength and understand strength modifiers - deflection of composite beams. | |
| **UNIT III - DESIGN OF COMPOSITE COLUMN** | **(9)** |
| Introduction of composite beams-shear studs - Location of beams neutral axis depending on the level of composite action-shear stud strength and strength modifiers-deflection of composite beams. Types of Composite columns - design of encased columns - design of in-filled columns - axial, uni-axial and bi-axially loaded columns. | |
| **UNIT IV - DESIGN OF COMPOSITE SLAB** | **(9)** |
| Introduction - Composite slabs - profiled sheeting - sheeting parallel to span - sheeting perpendicular to span. | |
| **UNIT V - CASE STUDY** | **(9)** |
| Case studies on steel concrete composite construction in buildings - seismic behaviour of composite structures. | |
| **TOTAL (L:45) = 45 PERIODS** | |

| **TEXTBOOKS:** |
|---|
| 1. Johnson R.P., "Composite structures steel and concrete Beams, Slabs, Columns and Frames for Buildings", Vol. 1, Fourth Edition, Blackwell Scientific Publications, 2018.<br>2. Oehlers D. J, and Bradford M. A., "Composite Steel and Concrete Structural Members, Fundamental Behaviour", Revised Edition, Pergamon press, Oxford, 2000. |
| **REFERENCES:** |
| 1. Owens G.W and Knowles.P, "Steel Designers Manual", Seventh Edition, Steel Concrete Institute (UK), Oxford Blackwell Scientific Publications, 2011.<br>2. Teaching resource for "Structural Steel Design", Vol.2 of 3, Institute for steel Development and |

**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | 3 |
| 2 | | 3 | 3 | | | | | | | | | 3 | 3 | 3 |
| 3 | | 3 | 3 | | | | | | | | | 3 | 3 | 3 |
| 4 | | 3 | | 3 | | | | | | | | | | 3 |
| 5 | | 3 | | 3 | | | | | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO (W.A)** | **3** | **3** | **3** | **3** | | | | | **3** | **3** | **3** | **3** | **3** | **3** |

| 22CEX11 - CONSTRUCTION EQUIPMENT AND MANAGEMENT | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To impart knowledge in selection strategies of various equipment based on the requirement of the project at optimum cost and time. | | | | |

| Course Outcomes<br>The students will be able to | | Cognitive Level | Weightage of COs in End Semester Examination |
|---|---|---|---|
| **CO1** | Select suitable equipment required for building construction. | U | 20% |
| **CO2** | Choose appropriate equipment for specific tasks in different scenarios. | Ap | 40% |
| **CO3** | Recommend the most effective equipment for various concreting tasks based on project-specific requirements. | Ap | 20% |
| **CO4** | Categorize the modern equipment's needed for surveying. | An | 20% |
| **CO5** | Explain type of equipment and its applications through independent learning in a team and give oral presentation. | An | Internal Assessment |

| **UNIT I - EQUIPMENT MANAGEMENT** | **(9)** |
|---|---|
| Identification - Factors in selection of equipment - Planning Equipment Utilization - Renting strategies - Capital cost - Investment alternatives - Elements of operating and owning - Bidding costs - Replacement decisions - Rent and Lease considerations - Safety management. | |
| **UNIT II - EARTHWORK EQUIPMENT** | **(9)** |
| Tractors - Motor Graders - Scrapers - Front end Loaders - Earth movers -Equipment for Dredging and Trenching- Tunnelling methods and equipments - Compaction Equipment - Diaphragm wall equipment - Pile Driving Equipment - Drilling and Blasting. | |
| **UNIT III - EQUIPMENTS FOR SCREENING AND TRANSPORTING** | **(9)** |
| Forklifts and related equipment - Portable Material Bins - Material handling cranes - Conveyors - Aggregate Crushers - Feeders - Screening Equipment - Gantry girder. | |
| **UNIT IV - CONCRETING EQUIPMENT** | **(9)** |
| Batching and Mixing Equipment - Hauling equipment - RMC- Modern Formwork Techniques - Shuttering - Types of pumps used for Construction - Boom placer- Equipment for Grouting and Dewatering - 3D Concrete Printing. | |
| **UNIT V - SURVEYING EQUIPMENT** | **(9)** |
| Modern electronic surveying equipments - Digital levels - Digital theodolite - Advanced Total station - Lasers and sensors in Surveying - Remote sensing - Geographical Information System. | |
| **TOTAL (L:45) = 45 PERIODS** | |

| **TEXTBOOK:** |
|---|
| 1. Sharma.S. C., "Construction Equipment and Management", 1st Edition, Khanna Book Publishing Co. (P) Ltd., India, 2019. |
| **REFERENCES:** |
| 1. Peurifoy R.L., "Construction Planning, Equipment and Methods", 7th Edition, McGraw Hill, Singapore, 2013.<br>2. Leonid Nadolinets, "Surveying Instruments and Technology", 1st Edition, CRC Press, 2017. |

| **Mapping of COs with POs / PSOs** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cos** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | 2 | | | | | | | | | | | | | 2 |
| **2** | 2 | | | 2 | | | | | | | | | 2 | 3 |
| **3** | 3 | | | 2 | | | | | | | | | | 2 |
| **4** | | 2 | | | | | | | | | | | 2 | |
| **5** | | 3 | | 3 | | | | | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO (W.A)** | **2.3** | **2.5** | | **2.3** | | | | | **3** | **3** | **3** | **3** | **2.3** | **2.5** |

| 22CEX12 - SUSTAINABLE AND LEAN CONSTRUCTION | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | |

| | |
|---|---|
| **Course Objective:** | • To develop student's ability to implement sustainable building practices, energy conservation strategies, and lean construction techniques, with a focus on achieving green energy buildings.<br>• To equip students with the knowledge and skills to implement sustainable construction practices, accurately assess building energy use, and apply advanced green building concepts. |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply methods to calculate the embodied energy of various construction materials and assess their impact on the overall energy efficiency of buildings. | Ap | 40 |
| **CO2** | Apply quality control and durability practices to enhance the life cycle and sustainability of construction materials and structures. | Ap | 20 |
| **CO3** | Apply building information modeling tools to support and enhance lean construction practices on project site. | Ap | 20 |
| **CO4** | Apply productivity measurement systems (PMS) to evaluate and enhance efficiency in construction projects, leading to continuous improvement and effective project management. | Ap | 20 |
| **CO5** | Demonstrate practical aspects of sustainable and lean construction to real-world scenarios. | E | Internal Assessment |

| **UNIT I - INTRODUCTION** | **(9)** |
|---|---|
| Introduction and definition of Sustainability - Carbon cycle - role of construction material: concrete and steel, etc. - CO2 contribution from cement and other construction materials - Recycled and manufactured aggregate - Role of QC and durability - Life cycle and sustainability. | |
| **UNIT II - ENERGY CALCULATIONS** | **(9)** |
| Components of embodied energy - calculation of embodied energy for construction materials - Energy concept and primary energy - Embodied energy via-a-vis operational energy in conditioned building - Life Cycle energy use. | |
| **UNIT III - GREEN BUILDINGS** | **(9)** |
| Control of energy use in building - National Building Code (NBC), ECBC code, codes in neighboring tropical countries - OTTV concepts and calculations - Features of LEED and TERI - Griha ratings - Role of insulation and thermal properties of construction materials - influence of moisture content and modeling - Performance ratings of green buildings - Zero energy building. | |
| **UNIT IV - CORE CONCEPTS IN LEAN** | **(9)** |
| Introduction to the Course; Lean Overview; Need for Productivity Measurement and improvement; Productivity Measurement System (PMS). | |

| UNIT V - LEAN CONSTRUCTION TOOLS AND TECHNIQUES | (9) |
|---|---|
| Sampling-Work Sampling; Survey - Foreman delay survey, Value Stream- Process Mapping - 5S , Collaborative Planning System (CPS) - Last Planner System (LPS) - Big Room Approach, IT-BIM and Lean, How to Start Practicing Lean Tools in Project Site. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**

1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition, Wiley Publishers 2016.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell,UK, 2016.

**REFERENCES:**

1. Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.
2. Ballard. G, Tommelein I, Koskela L. and Howell G., Lean construction tools and techniques, 2002.
3. Salem. O, Solomon J, Genaidy A and Luegring M., Site implementation and Assessment of Lean Construction Techniques, Lean Construction Journal, 2005.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | 2 |
| 2 | 2 | | | | | | 2 | | | | | | | |
| 3 | 3 | | | | 2 | 2 | 2 | | | | | | | 2 |
| 4 | | | | 2 | | | | | | | 2 | | | |
| 5 | | 3 | | | | | 2 | | 2 | 2 | | | 2 | 2 |
| CO (W.A) | 2.3 | 3 | | 2 | 2 | 2 | 2 | | 2 | 2 | 2 | | 2 | 2 |

| 22CEX13 - SAFETY IN CONSTRUCTION PRACTICES | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |

**PREREQUISITE : NIL**

| **Course Objective:** | • To understand the latest safety and health regulations and the Indian Standards applicable to the construction industry. |
|---|---|

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Illustrate the causes of construction accidents and their effects on workers and project timelines. | Ap | 20% |
| **CO2** | Apply workplace standards, safety regulations and ethical codes of conduct. | Ap | 20% |
| **CO3** | Identify the suitable safety measures in handling construction equipment. | An | 20% |
| **CO4** | Evaluate workplace hazards and incidents using various analysis and investigation techniques, then implement health management systems. | An | 40% |
| **CO5** | Engage in independent study as a member of a team and make an effective oral presentation / draft a report on the applications of safety norms and procedures in construction site. | C | Internal Assessment |

| **UNIT I - INTRODUCTION TO CONSTRUCTION SAFETY** | **(9)** |
|---|---|
| History of safety in construction - Evolution of safety thinking - Basic terminology in safety - types of injuries - Safety pyramid - Accident patterns - Theories of accident - Causation - Role of top management and workers in construction safety. | |
| **UNIT II - PLANNING FOR SAFETY** | **(9)** |
| Introduction to OSHA regulations - Causes and effects of accidents at site - Safety personnel - Safety budget - Safety culture - Planning for PPE - Role of stakeholders in safety - Workers' compensation. | |
| **UNIT III - SITE SAFETY PROGRAMS** | **(9)** |
| SOP (Safe Operating Procedures) - Construction equipment - Materials handling - Disposal - Hand tools - Safety during alteration ,Demolition works - Earth work, steel construction, temporary structures, masonry & concrete construction, cutting and welding. | |
| **UNIT IV - HAZARDS IN CONSTRUCTION PROJECTS** | **(9)** |
| Job Safety Analysis (JSA) - Job hazard analysis (JHA) - Health hazards - Types - Precautionary measures - Hazard management - Accident investigation - Accident indices - Violation - Penalty | |
| **UNIT V - SAFETY IN CONSTRUCTION** | **(9)** |
| Safety concern in construction - Role of owners in safety and health management - Responsibility of owners in safety - Fostering total safety culture - Job site safety - Responsibility of workers at site. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**


1. S.K.Bhattacharjee, "Safety Management in Construction",1st Edition, Khanna Publishers, New Delhi,2011.
2. Allan St John Holt, "Principles of Construction Safety", Wiley-Blackwell Publications, 2008.


**REFERENCES:**


1. Rita Yi Man Li& Sun WahPoon, "Construction Safety" ,1st Edition, Springer, New York,2013
2. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, "Construction Safety and Health Management", Prentice Hall Inc., 2011
3. Jimmy W. Hinze, "Construction Safety", Prentice Hall Inc., 2015.
4. Tamilnadu Factory Act, Department of Inspectorate of factories, Tamilnadu.
5. Patrick X.W. Zou, Riza Yosia Sunindijo, "Strategic Safety Management in Construction and Engineering", John Wiley & Sons, Ltd 2015.


**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | 2 | | | | | | | | 2 |
| 2 | 3 | 2 | | | | 2 | | 3 | | | | | 2 | |
| 3 | | 2 | | | 2 | | | | | | | | | |
| 4 | | 3 | | 2 | | | | | | | 2 | | | 2 |
| 5 | | 2 | | 2 | | | | | 3 | 2 | | 3 | 3 | 2 |
| **CO (W.A)** | **2.5** | **2.25** | | **2** | **2** | **2** | | **3** | **3** | **2** | **2** | **3** | **2.5** | **2** |

| 22CEX14 - ADVANCED CONSTRUCTION TECHNIQUES | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | |
| **Course Objective:** | • To understand and apply the latest construction techniques to engineering construction for sub structure, super structure, special structures, rehabilitation and strengthening techniques and demolition techniques. | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply the modern construction techniques used in the sub structure and super structure construction. | Ap | 40% |
| **CO2** | Analyse the sequences and methods used in construction of special structures. | An | 20% |
| **CO3** | Identify the repair techniques for different structures undergoing damage for various reasons. | An | 20% |
| **CO4** | Assess the safety measures and precautions used in demolition and dismantling activities. | An | 20% |
| **CO5** | Examine the implementation of advanced techniques in construction projects based on case studies or site visits, and develop a presentation or report outlining a new innovation or improvement in advanced construction techniques. | E | Internal Assessment |

| **UNIT I - SUB STRUCTURE CONSTRUCTION** | **(9)** |
|---|---|
| Construction Methodology - Box jacking - Pipe jacking - Under water construction of diaphragm walls and basement - Tunneling techniques - Piling techniques - Driving well and caisson - sinking cofferdam - cable anchoring and grouting. | |
| **UNIT II - SUPER STRUCTURE CONSTRUCTION** | **(9)** |
| Vacuum dewatering of concrete flooring - Concrete paving technology - Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections - Erection techniques of tall structures, Large span structures - launching techniques for heavy decks - in-situ prestressing in high rise structures. | |
| **UNIT III - CONSTRUCTION OF SPECIAL STRUCTURES** | **(9)** |
| Erection of lattice towers - Rigging of transmission line structures - Construction sequence in cooling towers, Silos, chimney, sky scrapers - Bow string bridges, Cable stayed bridges - Launching and pushing of box decks - Construction of jetties and break water structures - Construction sequence and methods in domes - Support structure for heavy equipment and machinery in heavy industries. | |

| UNIT IV - REHABILITATION AND STRENGTHENING TECHNIQUES | (9) |
|---|---|
| Seismic retrofitting - Strengthening of beams - Strengthening of columns - Strengthening of slab - Strengthening of masonry wall, Protection methods of structures, Mud jacking and grouting for foundation - Micro piling and underpinning for strengthening floor and shallow profile - Sub grade water proofing, Soil Stabilization techniques. | |
| **UNIT V - DEMOLITION** | **(9)** |
| Demolition Techniques, Demolition by Machines, Demolition by Explosives, Advanced techniques using Robotic Machines, Demolition Sequence, Dismantling Techniques, Safety precaution in Demolition and Dismantling. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**

1. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 2010.
2. Varghese, P.C. "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2016.
3. Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi, 2013

**REFERENCES:**

1. Peter H.Emmons, "Concrete repair and maintenance illustrated", Galgotia Publications Pvt. Ltd., 2008.
2. Sankar, S.K. and Saraswati, S., "Construction Technology", Oxford University, New Delhi, 2008.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | 3 | 2 | 3 |
| 2 | | 2 | | 2 | | | | | | | | | | |
| 3 | | 3 | | | | | | | | | | | | |
| 4 | | 2 | | | | | | | | | | | | 2 |
| 5 | 3 | 2 | 2 | | 3 | | 2 | | 3 | 2 | | 3 | 2 | 3 |
| CO (W.A) | 3 | 2.3 | 2 | 2 | 3 | 2 | 2 | | 3 | 2 | | 3 | 2 | 2.7 |

| 22CEX15 - ENERGY EFFICIENT BUILDINGS | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To acquire and apply knowledge of energy consumption, passive solar heating and cooling, day lighting, electrical lighting, and building ventilation.<br>• To design energy-efficient buildings that ensure indoor comfort and optimize energy use.. | | | | |

| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply principles of climate adaptation to design buildings that optimize thermal comfort and energy efficiency. | Ap | 40% |
| **CO2** | Evaluate, optimize, and integrate day lighting and electric lighting systems in building design. | Ap | 20% |
| **CO3** | Design energy-efficient buildings by applying advanced architectural and engineering principles. | Ap | 20% |
| **CO4** | Apply energy efficiency design concepts and architectural interventions. | Ap | 20% |
| **CO5** | Synthesize and present their knowledge of climate adaptation, passive solar heating, day lighting, heat control, and energy-efficient building design. | E | Internal Assessment |

| **UNIT I - INTRODUCTION** | **(9)** |
|---|---|
| Climate adapted and climate rejecting buildings - Heat Transfer - Thermal Storage - Measurement of Radiation - The Greenhouse Effect -Thermal Comfort - Site Planning and Development - Temperature - Humidity - Wind - Sun Path Diagrams - Sun Protection - Types of Shading Devices. | |
| **UNIT II - PASSIVE SOLAR HEATING AND COOLING** | **(9)** |
| General Principles of passive Solar Heating - Water Walls - Concepts - Ventilation - Principles - Case studies - Courtyards - Roof Ponds - Cool Pools - Predicting ventilation in buildings - Window Ventilation Calculations - Evaporation and dehumidification - Zoning - Air Filtration. | |
| **UNIT III - DAYLIGHTING AND ELECTRICAL LIGHTING** | **(9)** |
| Materials, components and details - Insulation - Glazing materials - Day lighting - concepts - Building Design Strategies - Daylight apertures - Light Shelves - Codal requirements - Day lighting design - Electric Lighting - Switching controls - Electric Task Lighting - Electric Light Zones - Power Adjustment Factors. | |
| **UNIT IV - HEAT CONTROL AND VENTILATION** | **(9)** |
| Heat insulation - Terminology - Thermal performance of Building sections - Orientation of buildings - Building characteristics for various climates - Thermal Design of buildings - Ventilation - Minimum standards for ventilation - Ventilation Design - Natural Ventilation. | |

| UNIT V - DESIGN FOR CLIMATIC ZONES | (9) |
|---|---|
| Energy efficiency - Design Concepts and Architectural Interventions - Evaporative Cooling - Design of Energy Efficient Buildings for Various Zones - Cold and sunny - Commonly used software packages in energy efficient building analysis and design | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**


1. Brown, G.Z. and DeKay, M., "Sun, Wind and Light - Architectural Design Strategies", John Wiley and Sons Inc, 3rd Edition, 2014.
2. Majumdar, M (Ed), "Energy - Efficient Buildings in India", Tata Energy Research Institute, Ministry of Non-Conventional Energy Sources, 2009.


**REFERENCES:**


1. Energy Conservation Building Code, CAU of Energy Efficiency, New Delhi, 2018.
2. Handbook on Functional Requirements of Buildings Part 1 to 4 SP : 41 ( S and T) 1995
3. John Krigger, Chris Dorsi, "Residential Energy: Cost Savings and Comfort for Existing Buildings", Published by Saturn Resource Management, 2013.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | |
| 2 | | 2 | | | | | | | | | | | | 2 |
| 3 | | | 2 | 2 | | | | | | | | | | 2 |
| 4 | 2 | | | | | | | | | | | | | |
| 5 | | 3 | | | | 3 | 2 | | 3 | 2 | 3 | 3 | 2 | 3 |
| **CO (W.A)** | **2** | **2.5** | **2** | **2** | | **3** | **2** | | **3** | 2 | **3** | **3** | **2** | **2.3** |

| 22CEX16 - CONSTRUCTION PLANNING AND SCHEDULING | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To equip students with the knowledge and skills required to effectively plan, schedule, and manage construction projects.<br>• To prepare students to manage construction projects efficiently, ensuring adherence to timelines, budgets, quality standards, and safety regulations. | | | | |

| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply financial concepts within cost accounting systems to achieve overall project success. | Ap | 40% |
| **CO2** | Estimate activity durations, resource requirements and utilize coding systems to implement effective construction plans. | Ap | 20% |
| **CO3** | Apply various scheduling techniques to manage construction schedules. | Ap | 20% |
| **CO4** | Apply principles of resource management to estimate various requirements of resources. | Ap | 20% |
| **CO5** | Analyze real construction projects and addressing in aspects of technology choice, scheduling with critical path and resource leveling, cost forecasting, quality control measures, and effective resource utilization. | E | Internal Assessment |

| **UNIT I - CONSTRUCTION PLANNING** | **(9)** |
|---|---|
| Basic concepts in the development of construction plans-choice of Technology and Construction method-Defining Work Tasks - Definition- Precedence relationships among activities - Estimating Activity Durations-Estimating Resource Requirements for work activities - coding systems. | |
| **UNIT II - SCHEDULING PROCEDURES AND TECHNIQUES** | **(9)** |
| Relevance of construction schedules - Bar charts - The critical path method-Calculations for critical path scheduling - Activity float and schedules - Presenting project schedules - Critical path scheduling for Activity - on-node and with leads, Lags and Windows - Calculations for scheduling with leads, lags and windows - Crashing and time/cost tradeoffs - Introduction to application software. | |
| **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 - RESOURCE MANAGEMENT | (9) |
|---|---|
| Types of resources - Estimating resource requirements - Material management - Effective utilization of resources - Depreciation of construction equipment - Manpower planning - Performance Appraisal - Resource levelling - Resource smoothing. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS** :

1. Seetharaman. S, "Construction Engineering and Management", 5th Edition, Umesh Publishing, 2019.

**REFERENCES:**

1. S.C. Sharma, S.V. Deodhar, "Construction Engineering and Management", 1st Edition, Khanna Publishing House, 2017.
2. Garold D. Oberlender, "Project Management for Engineering and Construction", 3rd Edition, McGraw- Hill Education, 2014.

| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | 2 | | | | | | | | | | | | | 2 |
| **2** | 3 | | | | | | | | | | | | 2 | |
| **3** | | 3 | | | | | | | | | | | 2 | 3 |
| **4** | 3 | | | | | | | | | | | | | 3 |
| **5** | | 3 | | 3 | | | | 3 | 2 | 2 | | 3 | | 2 |
| **CO (W.A)** | **2.7** | **3** | | **3** | **3** | | | **3** | **2** | **2** | | **3** | **2** | **2.5** |

| 22CEX17 - ARCHITECTURE AND TOWN PLANNING | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To apply architectural design principles to develop basic building layouts and town plans that meet specified functional, aesthetic, and sustainability criteria. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply the architectural concepts into design practice. | Ap | 20% |
| **CO2** | Practice the interior design using locally available materials. | Ap | 20% |
| **CO3** | Classify the zoning and Identify the standards required for town planning. | Ap | 40% |
| **CO4** | Prepare building plans as per standards and zoning regulations. | Ap | 20% |
| **CO5** | Engage in independent study as a member of a team and make an effective oral presentation / draft a report on the on a specific issue findings by observing real-world applications of architectural and town planning concepts. | E | Internal Assessment |

| **UNIT I - ARCHITECTURAL SPACE STANDARDS** | **(9)** |
|---|---|
| Introduction to architecture - Aesthetics - Fundamental concepts of architecture - Form, shape, size - Background - Focus - Balance - Rhythm - Harmony - Texture - Contrast - Monotony - Scale - Proportion - Colour - Circulation and inter - circulation - Solids and voids - Principles of planning. | |
| **UNIT II - INTERIORS** | **(9)** |
| Interior Planning and treatment - Use of natural and synthetic building materials - Thermal and Acoustical materials - Lighting and illumination. | |
| **UNIT III - PLANNING AND CONCEPTS OF TOWN PLANNING** | **(9)** |
| Planning Surveys - Importance of Climate topography, drainage and water supply in the selection of site for the development - Residential - Commercial - Industrial - Public - Transportation, Basic amenities and services. | |
| **UNIT IV - ZONING** | **(9)** |
| Principles of zoning - Housing - Slum - Parks and Playgrounds - Industries - Public buildings - Urban roads and Traffic Management. | |
| **UNIT V - BUILDING BYE-LAWS** | **(9)** |
| Town planning legislation and municipal acts - Planning control development schemes - Building rules and regulations - Set back - Light plane - Floor space Index - Off-street parking - Fire protection - Examples of planned cities and housing in India - Applications of Remote Sensing and GIS in town planning. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**

1. Rangwala. S., "Town Planning", 32nd Edition, Charotar Publishers, 2023.
2. Pramar. V.S. "Design fundamental in Architecture", Somiya Publications Pvt. Ltd., New Delhi, 1997.

**REFERENCES:**


1. Hiraskar. G. K., "Fundamentals of Town Planning", 17th Edition, Dhanpat Rai Publications, 2017.
2. Francis D. K. Ching., "Architecture: Form, Space & Order", 4th Edition, John Wiley & Sons, 2014.
3. Biswas Hiranmay, "Principles of Town Planning and Architecture" ,VAYU Education of India, New Delhi., 1st ed., 2012
4. National Building Code of India, SP7 (Group 1) Bureau of Indian Standards, New Delhi, 2017.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | 3 | 3 |
| 2 | 3 | | | | | | | 2 | | 3 | 3 | 3 | 3 | 3 |
| 3 | | 2 | | | | | | 2 | | | 3 | 3 | 3 | 3 |
| 4 | 3 | | | | | 2 | | 2 | | 3 | | | 3 | 3 |
| 5 | | 3 | | 3 | 2 | 2 | | | | 3 | 3 | 3 | 3 | 3 |
| **CO (W.A)** | **3** | **2.5** | | **3** | **2** | **2** | | **2** | | **3** | **3** | **3** | **3** | **3** |

| 22CEX18 - CONTRACT MANAGEMENT | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To impart knowledge on tender preparation, tendering process, arbitration procedure and laws, Intellectual property requirements and Labour Regulations. |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply the principles of the Indian Contract Act to ensure that construction agreements meet legal requirements and are enforceable. | Ap | 20% |
| **CO2** | Apply the concept of bidding and evaluate tenders based on procedure. | Ap | 20% |
| **CO3** | Ensure the follow of arbitration act and practice ethical code of conduct in IPR, copy rights and design patent. | Ap | 40% |
| **CO4** | Choose the laws applicable to labour legislation in construction industry. | Ap | 20% |
| **CO5** | Prepare a report on contract management strategies by analyzing case studies and evaluating effective approaches for contract creation, execution, and oversight. | E | Internal Assessment |

| **UNIT I - CONSTRUCTION CONTRACTS** | **(9)** |
|---|---|
| Indian contract Act - Need - Provisions - Scope for modifications / improvement - Contract specifications - Types of contract documents used in construction - Contract procurement - Selecting a contractor - Introduction to BOT and BOOT projects - EPC contracts. | |
| **UNIT II - TENDERS** | **(9)** |
| Tender request for proposals - Bids & Proposals - Bid evaluation - Contract conditions and specifications - Critical / Red flag conditions - Contract award and Notice to proceed - Variations and changes in contracts - Differing site conditions - Cost escalation - Delays, Suspensions & Terminations - Wrong practices in contracting (Bid shopping, Bid fixing, Cartels). | |
| **UNIT III – ARBITRATION** | **(9)** |
| Arbitration and litigation procedure - preparation, settlement, evidence - Comparison of actions and laws - Agreements ,subject matter violations - Appointment of arbitrators - Conditions of arbitrations - Powers and duties of arbitrator - Enforcement of award – costs - Arbitration and conciliation act 1996 - Case studies. | |

| UNIT IV - LAW RELATING TO INTELLECTUAL PROPERTY | (9) |
|---|---|
| Introduction - meaning of intellectual property - main forms of IP- Copyright - Trademarks, patents and designs, secrets - Law relating to Copyright in India - Meaning of copyright - Ownership of copyrights and assignment - Criteria of infringement - Piracy in internet - Remedies and procedures in India - Law relating to patents under Patents Act - Process of obtaining patent - Application, examination, opposition and sealing of patents. | |
| **UNIT V - LAWS APPLICABLE TO CONSTRUCTION ACTIVITY** | **(9)** |
| Industrial disputes act - Workmen's compensation act - Employer's liability act - Payment of wages act - Contract labour act - Minimum wages act - Inter-state migrant workmen act - BOCW Act - other acts introduced time to time. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**

1. Gajaria G.T., "Laws Relating to Building and Engineering Contracts in India", 4th Edition, M.M.Tripathi Pvt. Ltd., Bombay, 2000.

**REFERENCES:**

1. Joseph T. Bockrath, "Contracts and the Legal Environment for Engineers and Architects", 7th Edition, McGraw-Hill, New York 2010.
2. Jimmie Hinze, "Construction Contracts", 3rd Edition, McGraw-Hill, New York, 2010.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | 2 |
| 2 | 2 | | | | | | | | | | 2 | | | 2 |
| 3 | | 2 | | | | | | 2 | | | 2 | | 2 | 2 |
| 4 | | 2 | | | | | | | | | | | | 2 |
| 5 | | 3 | | | | | | 2 | 2 | 2 | 2 | | 2 | 2 |
| **CO (W.A)** | **2** | **2.3** | | | | | | **2** | **2** | **2** | **2** | | **2** | **2** |

| 22CEX21 - AIRPORTS AND HARBOURS | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To examine the essential components and operational procedures of airports and harbours, while exploring their regulatory frameworks and economic impacts. | | | | |

| Course Outcomes<br>The students will be able to | | Cognitive Level | Weightage of COs in End Semester Examination |
|---|---|---|---|
| **CO1** | Apply the principles of airfield components to optimize efficiency, minimize conflicts, and ensure safe aircraft movements. | Ap | 20% |
| **CO2** | Apply principles of airport planning in the context of site selection and circulation area. | Ap | 20% |
| **CO3** | Analyse the various components and construction techniques to devise a strategy for optimizing port infrastructure development. | An | 30% |
| **CO4** | Investigate the various length and elevation adopted for runway and taxiway designs and it's orientation. | Ap | 30% |
| **CO5** | Present a detailed case study of a notable airport or harbor project, highlighting its challenges and impact on the local community. | An | Internal Assessment |

| **UNIT I - AIRPORT PLANNING** | **(7)** |
|---|---|
| Air transport characteristics - airport classification - ICAO - airport planning: Site selection typical Airport Layouts, Case Studies, parking and Circulation Area. | |
| **UNIT II - AIRPORT COMPONENTS** | **(9)** |
| Planning of Airfield Components - Runway, Taxiway, Apron, Hangar - Passenger Terminals - Geometric design of runway and taxiways - Runway pavement Design - Difference between Highway and airport pavements - Introduction to various design methods - Airport drainage. | |
| **UNIT III - AIRPORT DESIGN** | **(10)** |
| Runway Design : Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design - Elements of Runway Design - Airport Zones - Passenger Facilities and Services - Runway and Taxiway Markings - Air Traffic Control Tower - Instrumental Landing. | |
| **UNIT IV - SEAPORTS COMPONENTS AND CONSTRUCTION** | **(10)** |
| Definition of Basic Terms: Harbor, Port, Satellite Port, Docks - Dry and Floating Dock, Waves and Tides - Planning and Design of Harbors: Harbour Layout and Terminal Facilities - Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins Floating Landing Stage - Navigational Aids-Inland Water Transport. | |

| UNIT V - SEAPORT REGULATIONS AND EIA | (9) |
|---|---|
| Wave action on Coastal Structures and Shore Protection and Reclamation - Coastal Regulation Zone, 2011- EIA - methods of impact analysis and its process. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS**:


1. Khanna S.K. Arora M.G and Jain S.S, Airport Planning and Design, Nemachand and Bros, Roorkee, 2012.
2. Robert Honjeff and Francis X. Mckelvey, "Planning and Design of Airports", McGraw Hill, New York,2000
3. Richard De Neufille and Amedeo Odoni, "Airport Systems Planning and Design", McGraw Hill, New York, 2014.
4. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering ,Scitech Publications (India), Chennai, 2010.


**REFERENCES:**


1. Venkatramaiah. C., "Transportation Engineering - Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels", Universities Press (India) Private Limited, Hyderabad, 2015.
2. Mundrey J S, "Railway Track Engineering", McGraw Hill Education ( India) Private Ltd, New Delhi, 2013.


| Mapping of COs with POs / PSOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | | 3 | | | | | | | | | | | 3 | |
| **2** | | 3 | | | | | | | | | | | 3 | |
| **3** | | | | | 3 | | | | | | | | | 3 |
| **4** | | | 3 | | | | | | | | | | 3 | |
| **5** | | | | | | | | | | 3 | | | 3 | |
| **CO (W.A)** | | **3** | **3** | | **3** | | | | | **3** | | | **3** | **3** |

| 22CEX22 - TRAFFIC ENGINEERING AND MANAGEMENT | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To imparts knowledge on traffic engineering, safety and management concepts on rural and urban highways. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply the fundamentals of traffic flow. | Ap | 20% |
| **CO2** | Implement the traffic planning and management systems | Ap | 20% |
| **CO3** | Analyze the various traffic surveys and to overcome the time delay so as to ensure the comfort of the journey. | An | 40% |
| **CO4** | Design the components of urban transportation system | Ap | 20% |
| **CO5** | Engage with challenges, emerging trends and Ethical considerations in transportation planning through independent learning and discussions. | An | Internal Assessment |

| **UNIT I - TRAFFIC CHARACTERISTICS** | **(9)** |
|---|---|
| Road Characteristics - Road user characteristics - PIEV theory - Vehicle - Performance characteristics - Fundamentals of Traffic Flow - Urban Traffic problems in India - Integrated planning of town country, regional and all urban infrastructure - Towards Sustainable approach - land use & transport and modal integration. | |
| **UNIT II - TRAFFIC SURVEYS** | **(9)** |
| Traffic Surveys - Speed, journey time and delay surveys - Vehicles Volume Survey including non motorized transport - Methods and interpretation - Origin Destination Survey - Methods and presentation - Level of service - Concept, applications and significance. | |
| **UNIT III - TRAFFIC DESIGN AND VISUAL AIDS** | **(10)** |
| Intersection Design - Channelization - Rotary intersection design - Signal design - Coordination of signals - Grade separation - Traffic signs including VMS and road markings. | |
| **UNIT IV - TRAFFIC SAFETY AND ENVIRONMENT** | **(10)** |
| Road accidents - Causes, effect, prevention, and cost - Traffic and environment hazards - Air and Noise Pollution, causes, abatement measures - Promotion and integration of public transportation Promotion of non-motorized transport. | |
| **UNIT V - TRAFFIC MANAGEMENT** | **(9)** |
| Area Traffic Management System - Traffic System Management (TSM) with IRC standards - Traffic Regulatory Measures - Travel Demand Management (TDM) - Intelligent Transport System for traffic management. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS**:

1. Kadiyali L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2019
2. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.

**REFERENCES:**


1. Wolfgang S.Homburger et al., "Fundamentals of Traffic Engineering" 15th Edition, Institute of Transportation Studies, University of California, 2012.
2. James L.Pline (Edr),"Traffic Engineering Hand Book, Institute of Transportation Engineers", Washington DC, USA, 2000.
3. Nicholas T.Garber, Lester A Hoel, "Traffic and Highway Engineering", Revised Second Edition, ITP, California, USA, 2010.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | |
| 2 | 3 | | | 2 | | | | | | | | | 3 | 3 |
| 3 | | 2 | | | | | | | | | | | 2 | 2 |
| 4 | 2 | | 3 | | | | | | | | | 3 | 2 | 3 |
| 5 | | 3 | | 3 | | | 3 | 3 | | | 3 | | | 3 |
| **CO (W.A)** | **2.3** | **2.5** | **3** | **2.5** | | | **3** | **3** | | | **3** | **3** | **2.3** | **2.8** |

| 22CEX23 - URBAN PLANNING AND DEVELOPMENT | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To impart knowledge on planning process and to introduce about the regulations and laws related to urban planning.<br>• To apply the knowledge of implementation of urban concepts in city area. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Identify the issues involved in urban areas and the challenges in implementing new initiatives under government sectors. | U | 20% |
| **CO2** | Apply the different concepts to plan the urban area and city development. | Ap | 20% |
| **CO3** | Evaluate the planning and development methods of urban projects. | Ap | 40% |
| **CO4** | Apply the regional planning process by identifying and summarizing the key steps according to established standards and norms. | Ap | 20% |
| **CO5** | Examine various town and country planning acts and their functions. | An | 20% |

| **UNIT I - INTRODUCTION** | **(9)** |
|---|---|
| Definition of Human settlement, Urban area, Town, City, Metropolitan City, Megalopolis, Urbanization, Urbanism, Suburbanization, Urban sprawl, Peri - urban areas, Urban Agglomeration, Classification of urban areas - Atal Mission for Rejuvenation and Urban Transformation (AMRUT) | |
| **UNIT II - PLANNING PROCESS** | **(9)** |
| Principles of Planning - Objectives, Draft Plans, Final Plan. Planning Theories - Garden City Concept, Geddesian Triad by Patrick Geddes, Modernism Concept by Le-Corbusier, Theories of Ekistics, Bid-rent Theory by William Alonso. | |
| **UNIT III - DEVELOPMENT PLANS, PLAN FORMULATION AND EVALUATION** | **(9)** |
| Types of plans - Regional Plan, Master Plan, Structure Plan, Detailed Development Plan, New Town/ Satellite town- Development Plan, Smart City Plan - Scope and Methodologies for the preparation of Regional Plan (RP), Master Plan (MP), and Detailed Development Plan (DDP). | |
| **UNIT IV - IMPLEMENTATION OF PLANS** | **(9)** |
| Planning Standards, Project Formulation and evaluation; Project Report preparation and presentation; Legal and Financial constraints - Problems due to multiple laws - Urban planning agencies and their functions in the plan formulation and implementation. | |

| UNIT V - URBAN AND REGIONAL PLANNING LEGISLATIONS, REGULATIONS AND DESIGNS | (9) |
|---|---|
| Town and Country Planning, Local Bodies and Land Acquisition Acts, Development and Building Rules, Site analyses, Layouts and Buildings Design. | |
| **TOTAL (L:45)= 45 PERIODS** | |

**TEXT BOOKS:**


1. M.Pratap Rao, "Urban Planning: Theory and practice", CBS Publishers and Distributors, 2009.
2. Peter Hall, Mark Tewdwr-Jones., "Urban and Regional Planning", Routledge; 5th Edition, 2010.


**REFERENCES:**


1. S.K.Kulshrestha, "Urban and Regional Planning in India", SAGE Publications India Pvt Ltd, 2012.
2. Goel, S.L Urban Development and Management, Deep and Deep publications, New Delhi 2002.
3. Arthur B. Gallion, "The Urban Pattern" 5th Edition, CBS Publishers & Distributors, 2003.
4. Thooyavan, K.R., Human Settlements - A Planning Guide to Beginners, M.A Publications, Chennai, 2005.
5. Urban and Regional Development Plans Formulation & Implementation Guidelines", Ministry Urban Affairs & • Employment, Govt. of India, New Delhi, 2014.
6. Town and Country Planning organization in India - http://tcpo.gov.in/.
7. Ministry of Housing and Urban Affairs Government of India http:/.moud. gov .in
8. Tamil Nadu Town and Country Planning Act 1971, and Rules made there under, Government of Tamil Nadu, Chennai.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | | 2 | | | | | | | | | | | | 2 |
| 2 | 2 | | | | | | | | | | | | | 2 |
| 3 | 3 | | | 2 | | | | | | | 2 | 2 | 2 | 2 |
| 4 | 3 | | | 2 | | | | | | | | 2 | | 2 |
| 5 | | 2 | | | | | | | | | 2 | | 2 | 2 |
| CO (W.A) | 2.7 | 2 | | 2 | | | | | | | 2 | 2 | 2 | 2 |

| 22CEX24 - SMART CITIES | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To understand the concepts of smart city and to introduce the students about application of technologies in smart cities. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply appropriate techniques for urbanization and smart cities infrastructure and its challenges. | Ap | 20% |
| **CO2** | Apply the concept of smart transport system for smart cities. | Ap | 20% |
| **CO3** | Analyze the relationship between sustainability and smart planning through project guidelines. | An | 20% |
| **CO4** | Evaluate techniques or strategies used in smart cities to address city challenges effectively. | Ap | 40% |
| **CO5** | Prepare a report that presents case studies of smart cities, highlighting their strategies, implementations and outcomes in addressing urban challenges | An, E | Internal Assessment |

| **UNIT I - INTRODUCTION** | **(9)** |
|---|---|
| Urbanization, need of focused development, role of Authorities, Smart city, Opportunity and Challenges - Smart infrastructures for city - Smart Cities Mission | |
| **UNIT II - SMART PHYSICAL INFRASTRUCTURE** | **(9)** |
| Infrastructure development in Smart Cities - Physical Infrastructure, Land Use - Compact/mixed - use development, Transit oriented development (TOD); Smart City Management - Transportation Unified governance structure (UMTA). | |
| **UNIT III - SUSTAINABILITY AND SMART PLANNING** | **(9)** |
| Relationship Between Sustainability and Smart plan - Place making project guidelines - Surveillance, Smart Street Lighting, Intelligent Emergency Services, Intelligent Disaster Forecasting and Management. | |
| **UNIT IV - APPLICATION OF TECHNOLOGIES IN SMART CITIES** | **(9)** |
| Role of Technologies in Smart Cities - Integrated Command and Control Center (ICCC), Data Analytics, Data driven strategies implementation in smart cities. | |
| **UNIT V - SMART CITIES PROJECT MANAGEMENT** | **(9)** |
| Need for project management, Philosophy and concepts; Project phasing and stages; Project organizational structuring: Planning and Scheduling: Project cost analysis; Procurement and Contracting. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**

1. Sharma P , "Sustainable Smart cities in India, Challenges and Future Perspectives", Springer Link, 2017.
2. Sameer Sharma, "Smart Cities Unbounded- Ideas and Practice of Smart Cities in India", Bloomsbury India, 2018.
3. Anilkumar P.P, "Introduction to Smart Cities", 1st Edition, Pearson India Education Service Pvt Ltd, Noida,Uttar Pradesh, India, 2019.

**REFERENCES:**

1. Binti Singh, ManojParmar, "Smart City in India Urban Laboratory, Paradigm or Trajectory", Routledge India,2019.
2. https://smartcities.gov.in/guidelines#block-habikon-content
3. https://smartnet.niua.org/learn/library

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | |
| 2 | 2 | | | | | | | | | | | | | 2 |
| 3 | | 2 | | 2 | | | 2 | | | | | 2 | | 2 |
| 4 | | 2 | | 2 | | | | | | | | 2 | | 2 |
| 5 | | 2 | | | | | 2 | | 3 | 2 | 3 | 3 | 2 | |
| CO (W.A) | 2 | 2 | | 2 | | | 2 | | 3 | 2 | 3 | 2.3 | 2 | 2 |

| 22CEX25 - INTELLIGENT TRANSPORTATION SYSTEMS | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | |
| **Course Objective:** | • To impart knowledge on ITS implementation in developing countries.<br>• To analyze the objectives of Intelligent Transportation Systems (ITS) to improve traffic management, enhance safety, and optimize transportation efficiency, technologies and real-time monitoring. | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply ITS techniques to optimize traffic flow adaptive control systems. | Ap | 20% |
| **CO2** | Interpret the concepts of data collection in ITS. | Ap | 20% |
| **CO3** | Identify the systems to optimize traffic management, improving efficiency, safety, and flow in transportation networks. | An | 20% |
| **CO4** | Evaluate the impact of intelligent transportation Systems (ITS) by analyzing traffic and incident management systems, | Ap | 20% |
| **CO5** | Assess the effectiveness of ITS applications vehicle operations. | An | 20% |

| **UNIT I - INTRODUCTION TO ITS** | **(9)** |
|---|---|
| Fundamentals of ITS: Definition of ITS, Challenges in ITS Development - Purpose of ITS Deployment- Benefits of ITS - Overview of application of ITS in Transportation Planning. | |
| **UNIT II - DATA COLLECTION THROUGH ITS** | **(9)** |
| Sensors and its application in traffic data collection - Elements of Vehicle Location and Route Navigation and Guidance concepts; ITS Data collection techniques - vehicle Detectors, Automatic Vehicle Location (AVL). | |
| **UNIT III - ITS IN TRAFFIC MANAGEMENT** | **(9)** |
| ITS User Needs and Services and Functional areas - Introduction, Advanced Traffic Management systems (ATMS), Advanced Traveler Information systems (ATIS), Advanced Vehicle Control systems (AVCS). | |
| **UNIT IV - ITS IN TRANSPORTATION PLANNING** | **(9)** |
| ITS and safety, ITS and security - Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road - pricing. | |
| **UNIT V - ITS APPLICATION IN LOGISTICS** | **(9)** |
| Commercial vehicle operations and intermodal freight - Fleet Management - IT application in freight logistics - E commerce. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOK:**

1. R. Srinivasa Kumar,"Intelligent Transportation Systems", Universities Press P Ltd, Telangana, 2022.

**REFERENCES:**


1. Intelligent Transport Systems, Intelligent Transportation Primer, Washington, US,2001.
2. Henry F.Korth, and Abraham Siberschatz, Data Base System Concepts, McGraw Hill,1992.
3. TurbanE. "Decision Support and Export Systems Management Support Systems", Maxwell Macmillan,1998.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | 2 |
| 2 | 2 | | | | | | | | | | 2 | | | |
| 3 | | 2 | | | | | | | | | 2 | | | |
| 4 | 3 | | | 2 | | | | | | | | 2 | | |
| 5 | | 2 | | | | | | | | | 2 | | | 2 |
| CO (W.A) | 2.3 | 2 | | 2 | | | | | | | 2 | 2 | | 2 |

| 22CEX26 - PAVEMENT ENGINEERING | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To gain knowledge on various IRC guidelines for designing rigid and flexible pavements.<br>• To assess quality and serviceability conditions of roads. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Classify the pavements and evaluate the performance of pavements | Ap | 40% |
| **CO2** | Design the flexible pavements. | An | 20% |
| **CO3** | Design the rigid pavements as per IRC guidelines. | An | 20% |
| **CO4** | Evaluate the effectiveness of stabilization techniques for highway pavements. | An | 20% |
| **CO5** | Analyze case studies and prepare a report on pavement types and stabilization methods, evaluating their performance and effectiveness in various environments. | An | Internal assessment |

| **UNIT I - 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 - Mechanistic empirical and theoretical methods - Design procedure as per IRC guidelines. | |
| **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. | |
| **UNIT V - STABILIZATION OF PAVEMENTS** | **(9)** |
| Stabilisation with special reference to highway pavements - Choice of stabilizers - Testing and field control - Stabilisation for rural roads in India - Use of Geosynthetics in roads. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**

1. Khanna, S.K. and Justo C.E.G.and Veeraragavan, A, "Highway Engineering", Revised 10th edition, New Chand and Brothers, Roorkee 2014.
2. Kadiyali, L.R., "Principles and Practice of Highway Engineering", Khanna tech. Publications, New Delhi, 2005.

**REFERENCES:**

1. Yoder, R.J. and Witchak M.W. "Principles of Pavement Design", John Wiley 2000.
2. Guidelines for the Design of Flexible Pavements, IRC-37-2001,"The Indian Roads Congress", New Delhi.
3. Guideline for the Design of Rigid Pavements for Highways, IRC 58-1998, The Indian Road Congress, New Delhi.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | |
| 2 | 3 | 3 | 3 | | | | | 3 | | | | 3 | 3 | 3 |
| 3 | 3 | 3 | 3 | | | | | 3 | | | | 3 | 3 | 3 |
| 4 | | 2 | | 2 | | | | | | | | 2 | 2 | 2 |
| 5 | | 3 | | 3 | | 3 | | 3 | 3 | 3 | 3 | | 3 | 3 |
| **CO (W.A)** | **2.7** | **2.8** | **3** | **2.5** | | **3** | | **3** | **3** | **3** | **3** | **2.7** | **2.8** | **2.8** |

| 22CEX27 - TRANSPORTATION PLANNING PROCESS | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To understand and apply the transportation planning process to develop effective strategies for addressing urban mobility challenges, optimizing transportation networks, and ensuring sustainable development. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply the principles of the transportation planning process and methods of data collection. | Ap | 20% |
| **CO2** | Apply the survey, trip attraction, generation and distribution in transportation. | An | 40% |
| **CO3** | Analyse the modal choice and the transportation network. | Ap | 20% |
| **CO4** | Evaluate the objectives of transportation network assignments by applying general principles and techniques. | An | 20% |
| **CO5** | Prepare a report that presents case studies on travel patterns to understand trip generation rates and patterns. | An | Internal assessment |

| **UNIT I - TRANSPORTATION PLANNING PROCESS** | **(9)** |
|---|---|
| Importance of transportation planning, Integration of Land Use and Transport - Systems Approach to Transport Planning - Four Steps in the Transport Planning Process; Travel Demand Modelling Approach; Traffic Analyses Zones - internal and external; Various Transportation Surveys for the collection of data - methodology, analyses of data and presentation of results. | |
| **UNIT II - TRIP GENERATION STAGE** | **(9)** |
| Definition and importance - Trip Production and Attraction, Types of trips; Factors governing trip generation: population related data, land and building use, socio-economic - Trip generation models: Types, Assumptions made, Multiple Linear Regression, category analysis- merits and de-merits of the model, verification, calibration and validation of the model. | |
| **UNIT III - TRIP DISTRIBUTION STAGE** | **(9)** |
| Definition and objective - Data collection, analyses and presentation of trip matrix table, Desire Line Diagram, Development of Gravity, growth factor methods for Trip Distribution, Calibration of gravity model and its validation. | |
| **UNIT IV - MODAL SPLIT STAGE** | **(9)** |
| Factors influencing mode choice - Household characteristics - Zonal Characteristics; Network characteristics - Modal split: pre distribution or post distribution - Mode wise trip matrix and modal split analyses- Overview of Probit and Logit model. | |

| UNIT V - TRAFFIC ASSIGNMENT STAGE | (9) |
|---|---|
| Meaning and objective - General principles; Assignment Techniques - all - or - nothing assignments, multiple route assignment, capacity restraint, diversion curves, Trip assignment route selection; Mode-wise trip matrices; element of transportation network, nodes and links, speed flow curves, minimum path trees. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**

1. Kadiyali. L.R., Traffic Engineering and Transport Planning, Khanna Publishers, Delhi, 2019.
2. C.S. Papacostas and P.D. Prevedouros, Transportation Engineering and Planning, Prentice Hall of India Pvt. Ltd., 2009.

**REFERENCES:**

1. J D Ortuzar and L G Willumnsen. Modeling Transport. John Wiley and Sons, New York, 2011.
2. C. JotinKhisty, Kent Lall, Transportation Engineering: An Introduction, Prentice Hall, 1998
3. Juan de Dios Ort zar and Luis G. Willumsen, Modelling Transport, John Wiley & Sons 2001
4. Chennai Comprehensive Traffic Study, Chennai Metropolitan Development Authority, 2007.
5. James H.Banks, Introduction to Transportation Engineering, Tata McGraw Hill Education Pvt Ltd, 2010.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | |
| 2 | 2 | | | | | | | | | | | | 3 | 3 |
| 3 | | 2 | | | | | | | | | | 2 | | 3 |
| 4 | | 2 | | | | | | | | | | | | |
| 5 | | 3 | | | | 3 | 3 | | | 3 | 3 | | 3 | 3 |
| CO (W.A) | 2 | 2.3 | | | | 3 | 3 | | | 3 | 3 | 2 | 3 | 3 |

| 22CEX28 - TRANSPORTATION ECONOMICS | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To understand the concept and evaluation of economics in various transportation projects. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Identify and apply the different methods for economic evaluation. | Ap | 20% |
| **CO2** | Evaluate the components, and factors to assess the impact of route switching mechanisms when developing new infrastructure. | An | 20% |
| **CO3** | Analyse the demand supply concept in metropolitan cities. | Ap | 20% |
| **CO4** | Analyze various costs of public and private transportation schemes. | An | 20% |
| **CO5** | Apply financial decision making in transportation projects. | An | 20% |

| **UNIT I - ECONOMIC EVALUATION** | **(9)** |
|---|---|
| Need for economic evaluation of urban transport projects - Principles of economic analysis - Methods of economic evaluation - Comparison of various methods - Application of simulation modelling in evolving suitable evaluation techniques. | |
| **UNIT II - MODELING OF ROAD USER COSTS** | **(9)** |
| Components of vehicle operating cost - Factors affecting vehicle operating cost - Value of travel time saving - Accident cost - Concept of route switching mechanism - Ripple effects in developing new infrastructure. | |
| **UNIT III - TRANSPORT DEMAND SUPPLY CONCEPT** | **(9)** |
| Transport demand and supply concepts - Status of transport demand supply in metropolitan cities - Demand and Supply equilibrium - Subsidy in Transport demand - Supply augmentation and saturation consideration. | |
| **UNIT IV - TRANSPORT PRICING** | **(9)** |
| Transport costs - Elasticity of demand - Average cost and marginal cost pricing - Market pricing and market segmentation - Second best pricing - Pricing policy - Congestion pricing - Public and private transport pricing. | |
| **UNIT V - FINANCING TRANSPORT SYSTEM** | **(9)** |
| Characteristics of transportation infrastructure - Trends in transportation infrastructure - Investment needs, options and budgetary support in transport sector - Existing financing practices - Principles of build, operate and transfer (BOT) - BOT variants and its applicability. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOK:**

1. Khanna, S.K., Justo C.E.G. and Veeraragavan A. "Highway Engineering", New Chand and Brothers, Roorkee, Revised 10th Edition, 2018.

**REFERENCES:**

1. Kadiyali, L.R. and Lai, N.B. "Highway Engineering (Including Expressways and Airport Engineering)", Khanna Publishers, New Delhi, 5th Edition, 2013.
2. Kadiyali L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 10th Edition, 2016.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | |
| 2 | | 2 | | | | 2 | | | | | 2 | | | 2 |
| 3 | 2 | | | | | | | | | | 3 | 2 | | 2 |
| 4 | | 2 | | | | | | | | | | | | 2 |
| 5 | 2 | | | | | 2 | | | | | 2 | | 2 | |
| CO (W.A) | 2 | 2 | | | | 2 | | | | | 2.3 | 2 | 2 | 2 |

| 22CEX31 - CLIMATE CHANGE ADAPTATION AND MITIGATION | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To impart knowledge on the global warming, the impact of climate change on society and the adaptation and mitigation measures. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Examine key climate parameters to identify their impact on weather patterns. | Ap | 40% |
| **CO2** | Analyze the elements related to climate change to understand their causes, impacts, and mitigation strategies. | An | 20% |
| **CO3** | Mitigate the factors influencing climate change and suggest suitable remedial measures. | Ap | 20% |
| **CO4** | Evaluate various energy sources and audit practices to promote a sustainable energy environment. | An | 20% |
| **CO5** | Analyze real-world examples of adaptation and mitigation efforts in different regions and prepare a report. | An | Internal Assessment |

| **UNIT I - INTRODUCTION** | **(9)** |
|---|---|
| Atmosphere - weather and Climate - climate parameters - Temperature, Rainfall, Humidity, Wind - Global ocean circulation - El Nino and its effect - Carbon cycle. | |
| **UNIT II - ELEMENTS RELATED TO CLIMATE CHANGE** | **(9)** |
| Greenhouse gases - Total carbon dioxide emissions by energy sector - industrial, commercial, transportation, residential - Impacts - air quality, hydrology, green space - Causes of global and regional climate change - Changes in patterns of temperature, precipitation and sea level rise - Greenhouse effect. | |
| **UNIT III - IMPACTS OF CLIMATE CHANGE** | **(9)** |
| Effects of Climate Changes on living things - health effects, malnutrition, human migration, socioeconomic impacts - tourism, industry and business, vulnerability assessment- infrastructure, population and sector - Agriculture, forestry, human health, coastal areas. | |
| **UNIT IV - MITIGATING CLIMATE CHANGE** | **(9)** |
| IPCC Technical Guidelines for Assessing Climate Change Impact and Adaptation - Identifying adaption options - designing and implementing adaption measures - surface albedo environment - reflective roofing and reflective paving - enhancement of evapo transpiration - tree planting programme - green roofing strategies - energy conservation in buildings - energy efficiencies - carbon sequestration. | |

| UNIT V - ALTERNATE FUELS AND RENEWABLE ENERGY | (9) |
|---|---|
| Energy source - coal, natural gas - wind energy, hydropower, solar energy, nuclear energy, geothermal energy - biofuels - Energy policies for a cool future - Energy Audit. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**

1. Ruddiman W.F, freeman W.H. and Company, "Earth"s Climate Past and Future", 2001
2. Velma. I. Grover,"Global Warming and Climate Change Vol I an II", Science Publishers, 2005.
3. Dash Sushil Kumar, "Climate Change - An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007.

**REFERENCES:**

1. Maximilian Lackner, BaharakSajjadi and Wei-Yin Chen, "Handbook of Climate Change Mitigation and Adaptation", Third Edition, Springer Nature, 2022.
2. IPCC Sixth Assessment Report, 2021.
3. Kendal McGuffie, Ann Henderson, "A Climate Modelling" Primer 4th Edition, John Wiley & Sons, Ltd, Chichester, UK 2014.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | 2 | | | 2 |
| 2 | | 3 | | | | | | | | | | 2 | | 3 |
| 3 | | 3 | | | | | | | | | | 2 | | |
| 4 | | 2 | | | | | | | | | | | 2 | |
| 5 | | 3 | | | | 3 | 3 | | 3 | 3 | | 3 | | 3 |
| CO (W.A) | 2 | 2.8 | | | | 3 | 3 | | 3 | 3 | | 2.3 | 2 | 2.3 |

| 22CEX32 - AIR AND NOISE POLLUTION CONTROL ENGINEERING | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | |
| **Course Objective:** | • To acquire fundamental knowledge of the sources, effects, dispersion of air pollutants, its mitigation and quality management, and basics of noise pollution. | | | |

| Course Outcomes<br>The students will be able to | | Cognitive Level | Weightage of COs in End Semester Examination |
|---|---|---|---|
| **CO1** | Explain the air quality standards and its management. | Ap | 20% |
| **CO2** | Classify the various air and noise pollutants and identify their sources. | Ap | 40% |
| **CO3** | Apply air sampling techniques and interpret the results using meteorological data. | Ap | 20% |
| **CO4** | Evaluate the appropriate air pollution control methods. | An | 20% |
| **CO5** | Analyze real-life air or noise pollution incidents and discuss the causes and consequences. | An | Internal Assessment |

| **UNIT I - GENERAL** | **(9)** |
|---|---|
| Atmosphere as a place of disposal of pollutants - Air Pollution - Definition - Global Climate - Units of measurements of pollutants - Air emission and quality standards - Air pollution indices - Air quality management in India. | |
| **UNIT II - SOURCES, CLASSIFICATION AND EFFECTS** | **(9)** |
| Sources and classification of air pollutants - Man made - Natural sources - Type of air pollutants - Pollution due to automobiles - Analysis of air pollutants - Chemical, Instrumental and biological methods. Air pollution and its effects on human beings, plants and animals. | |
| **UNIT III - SAMPLING, METEOROLOGY AND AIR QUALITY MODELLING** | **(9)** |
| Sampling and measurement of particulate and gaseous pollutants - Ambient air sampling - Meteorology - temperature lapse rate and stability - Adiabatic lapse rate - Wind Rose - Wind velocity and turbulence - Dispersion of air pollutants. | |
| **UNIT IV - AIR POLLUTION CONTROL MEASURES** | **(9)** |
| Control - Control equipment's - Particulate control methods - Bag house filter - Settling chamber - cyclone separators - inertial devices - Electrostatic precipitator - Absorption - Absorption equipment's. | |
| **UNIT V - NOISE POLLUTION AND ITS CONTROL** | **(9)** |
| Sources of noise - Units and Measurements of Noise - Characterization of Noise from Construction, Mining, Transportation and Industrial Activities, Airport Noise - auditory effects, non-auditory effects. Prevention and Control of Noise Pollution. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**

1. C. S. Rao, "Environmental Pollution Control Engineering", Wiley Eastern Limited, 2006.
2. M. N. Rao, H. V. N. Rao, Air pollution, Tata McGraw Hill Pvt Ltd, New Delhi, 2017
3. Dr. Y. Anjaneyulu, "Air Pollution and Control Technologies", Allied publishers Pvt. Ltd., 2019.

**REFERENCES:**


1. Lawrence K.Wang, Norman C.Pereira, Yung-Tse Hung, "Advanced Air and Noise Pollution Control", 2nd Edition 2010, Humana Press, United States.
2. W.L. Heumann, "Industrial Air Pollution Control Systems", McGraw-Hill, New York, 2015.
3. Peavy S.W., Rowe D.R. and Tchobanoglous G, "Environmental Engineering", McGraw-Hill, New Delhi, 2015.
4. Mahajan S.P, "Pollution Control in Process Industries", Tata McGraw-Hill Publishing Company, New Delhi, 2015.
5. Garg, S.K, "Environmental Engineering Vol. II", Khanna Publishers, New Delhi, 1979.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | 2 | | | | | | | | 2 |
| 2 | 2 | | | | | | | | | | | | 2 | |
| 3 | 2 | 2 | | | | | | | | | | | | |
| 4 | | 3 | | | | 2 | | | | | | | 2 | 2 |
| 5 | | 3 | | | 2 | 3 | 3 | | 3 | 3 | 3 | | | 3 |
| **CO (W.A)** | **2** | **2.7** | | | **2** | **2.3** | **3** | | **3** | 3 | **3** | | **3** | **2.3** |

| 22CEX33 - ENVIRONMENTAL IMPACT ASSESSMENT | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : 22CEC12** | | | | | |
| **Course Objective:** | • To imparts knowledge on EIA and to identify the impact of environmental attributes for sustainable development. | | | | |

| Course Outcomes<br>The students will be able to | | Cognitive Level | Weightage of COs in End Semester Examination |
|---|---|---|---|
| **CO1** | Apply the process and the effectiveness of EIA in identifying significant environmental impacts. | Ap | 20% |
| **CO2** | Illustrate the process of issues concerning societal, ethical and legislative needs. | Ap | 20% |
| **CO3** | Analyse the cost benefits and its alternatives in EIA. | An | 20% |
| **CO4** | Interpret the importance of public participation in EIA studies. | Ap | 20% |
| **CO5** | Analyze case studies to identify the methods used for impact prediction, assessment, and mitigation. | An | 20% |

| **UNIT I - INTRODUCTION** | **(9)** |
|---|---|
| Definition - Concept of environment - Hierarchy in EIA - Initial environmental examination (IEE) - Environmental impact statement (EIS) - Significant environmental impacts - EIA process screening - Stages of development - Need for EIA studies - Advantages and limitation of EIA. | |
| **UNIT II - EIA METHODOLOGIES AND MEASUREMENT** | **(9)** |
| Methods of EIA - Check lists - Matrices - Networks - Cost benefit Analysis - Analysis of alternatives - Prediction tools - Terms of Reference (ToR) - RIA Matrix | |
| **UNIT III - ASSESSMENT AND MITIGATION MEASURES** | **(9)** |
| Definition - Water quality indicators and standards - Water impact factors - Water quality impact analysis - Mitigation measures - Aesthetic environmental impacts - Framework for visual impact assessment - Mitigation Measures and monitoring - Public participation in EIA. | |
| **UNIT IV - EIA DOCUMENTATION AND LEGISLATIONS** | **(9)** |
| Environmental management plan - preparation, implementation and review - policy and guidelines for planning and monitoring programmes - The environmental protection Act - The water act - The Air (Prevention and Control of pollution Act) - EIA notification 1994 and 2006 - Wild life Act. | |
| **UNIT V - CASE STUDIES** | **(9)** |
| Mining, power plants, cement plants, highways, Water resource projects, storage and handling of hazardous chemicals, common hazardous waste facilities, CETPs, CMSWMF, building and construction projects. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**


1. Barthwal R.R., "Environmental Impact Assessment", 2nd Edition, New Age International Publishers, New Delhi, 2019.
2. K. V. Raghavan and A A. Khan, "Methodologies in Hazard Identification and Risk Assessment", Manual by CLRI, 1990.
3. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff "Risk Assessment and Management Handbook", McGraw Hill Inc., New York, 1996.


**REFERENCES:**


1. Lawrence, D.P., "Environmental Impact Assessment – Practical solutions to recurrent problems", Wiley-Interscience, New Jersey. 2003.
2. Y.Anjaneyulu and Valli Manikam, "Environmental Impact Assessment Methodologies", 2nd Edition, B.S Publications, Hyderabad 2020.
3. Charles H. Eccleston., "Environmental Impact Assessment: A Guide to Best professional practices", 1st Edition, CRC Press. United States, 2017.


**Mapping of COs with POs / PSOs**

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | 2 | | | | | | 2 | | | | | | | 2 |
| **2** | 2 | 2 | | 2 | | 3 | 2 | 2 | | | 3 | 2 | 2 | 2 |
| **3** | | 3 | | 2 | | 2 | | | | | | | 2 | 3 |
| **4** | | 2 | | | | 2 | | | | | 3 | | | |
| **5** | | 3 | | | | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO (W.A)** | **2** | **2.5** | | **2** | | **2.5** | **2** | **2** | **3** | 3 | **3** | **2.5** | **2** | **2.5** |

| 22CEX34 - INDUSTRIAL WASTEWATER MANAGEMENT | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To analyze the physical, chemical, and biological characteristics of wastewater from different industrial sources.<br>. To imparts knowledge on the significance of industrial waste water and solid waste treatment techniques for ensuring environmental sustainability. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply the hierarchy principles to minimizing waste generation and promoting sustainable waste management practices. | Ap | 20% |
| **CO2** | Analyze the characteristics of industrial wastewater. | An | 20% |
| **CO3** | *Apply* techniques to stabilize industrial wastewater flow and pollutant load. | Ap | 20% |
| **CO4** | *Evaluate* the management and disposal strategies for residuals generated from industrial wastewater treatment processes. | Ap | 20% |
| **CO5** | *Analyze* industrial wastewater management practices in real-world case studies to identify challenges and solutions. | An | 20% |

| **UNIT I - INTRODUCTION** | **(9)** |
|---|---|
| Industrial scenario in India - Uses of water by industry - Sources, characteristics and types of industrial waste water - Nature and Origin of Pollutants - Industrial wastewater monitoring and sampling - Industrial Wastewater generation rates - Toxicity of Industrial effluents and Bioassay tests. | |
| **UNIT II - INDUSTRIAL POLLUTION PREVENTION AND WASTE MINIMISATION** | **(9)** |
| Prevention Control of Industrial Pollution - Benefits and Barriers - Waste management Hierarchy - Source reduction techniques - Evaluation of Pollution Prevention Options - Cost benefit analysis - Pay-back period - Recycle, reuse and byproduct recovery. | |
| **UNIT III - INDUSTRIAL WASTEWATER TREATMENT** | **(9)** |
| Flow and Load Equalisation - Solids Separation - Removal of Fats, Oil and Grease - Neutralisation - Removal of Inorganic Constituents - Precipitation, Heavy metal removal, Nitrogen & Phosphorous removal, Ion exchange, Adsorption, Membrane Filtration, Electro dialysis & Evaporation. | |
| **UNIT IV - WASTEWATER REUSE AND RESIDUAL MANAGEMENT** | **(9)** |
| Individual and Common Effluent Treatment Plants - Zero effluent discharge systems - Quality requirements for Wastewater reuse , Industrial reuse , Present status and issues - Disposal on water and land - Residuals of industrial wastewater treatment. | |

| UNIT V - CASE STUDIES | (9) |
|---|---|
| Industrial manufacturing process - source reduction options and waste treatment flow sheet for Textiles - Tanneries - Pulp and paper - metal finishing - Sugar and Distilleries. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**


1. Rao M.N. and Datta A.K., "Wastewater Treatment", 3rd Edition, Oxford - IBH Publication, New Delhi, 2017.
2. Soli. J. Arceivala, Shyam. R. Asolekar, "Waste water Treatment for pollution control and reuse" Tata McGraw Hill, 2007.


**REFERENCES:**


1. Stanley N Barton "Industrial Waste: Management, Assessment and Environmental Issues (Waste and Waste Management)", 1st Edition, Nova science publishers Inc, New Delhi, 2016.
2. Nelson Leonard Nemerow, "Industrial waste treatment - contemporary practice and vision for the future", Elsevier, Singapore, 2007.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | 2 | | | | | | | | 2 |
| 2 | | 2 | | | | | 2 | | | | | | 2 | |
| 3 | 3 | | | | | 2 | | | | | 3 | | | |
| 4 | 3 | | | 3 | | | | | | | | | 2 | |
| 5 | | 3 | | 3 | | 2 | 2 | | | 2 | 2 | 3 | | 3 |
| CO (W.A) | **2.7** | **2.5** | | **3** | | **2** | **2** | | | 2 | **2.5** | **3** | **2** | **2.5** |

| 22CEX35 - SOLID AND HAZARDOUS WASTE MANAGEMENT | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | |
| **Course Objective:** | • To identify environmental concerns for hazardous waste on water, land and air.<br>• To impart knowledge on the principles involved in the management of hazardous wastes from source identification up to disposal.<br>• To identify containment technologies and land treatment techniques for hazardous waste | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | *Apply* effective methods for source reduction, segregation, and onsite storage of industrial wastes. | Ap | 20% |
| **CO2** | Analyze the composition and characteristics of different types of solid and hazardous waste. | An | 20% |
| **CO3** | Elucidate the collection and conveyance approaches available in solid waste sector. | Ap | 20% |
| **CO4** | Interpret the causes and effects of hazardous wastes with treatment techniques. | An | 20% |
| **CO5** | Recommend appropriate disposal method for solid and hazardous wastes. | Ap | 20% |

| **UNIT I - HAZARDOUS SOLID WASTE AND ITS CLASSIFICATION** | **(9)** |
|---|---|
| Sources - Types - Composition - Characteristics - need for solid and hazardous waste management - Generation rates - Elements of Integrated waste management - legislations on management and handling of solid wastes. | |
| **UNIT II - WASTE CHARACTERIZATION SOURCE REDUCTION AND RECYCLING** | **(9)** |
| Waste sampling and characterization plan - hazardous characteristics - ignitability, corrosivity and TCLP tests - source reduction, segregation and onsite storage of wastes - waste exchange - extended producer responsibility - recycling of plastics, C&D wastes and E wastes. | |
| **UNIT III - WASTE COLLECTION, TRANSPORT AND RECOVERY OF MATERIALS** | **(9)** |
| Door to door collection of segregated solid wastes - analysis of hauled container and stationery container collection systems - storage, labeling and handling of hazardous wastes - mechanical processing and material separation technologies - Size reduction - size separation - density separation - magenetic separation - compaction - physico chemical treatment of hazardous wastes - solidification and stabilization. | |
| **UNIT IV - THERMAL PROCESSING OF WASTES** | **(9)** |
| Biological and thermos - chemical conversion technologies - composting - bio methanation - incineration - pyrolysis - plasma arc gasification - By-products - operation of facilities and environmental controls - treatment of biomedical wastes - case studies and emerging waste processing technologies. | |

| UNIT V - WASTE DISPOSAL | (9) |
|---|---|
| Sanitary and secure landfills - site selection - liner and cover systems - geo synthetic clay liners and geo membranes - design of sanitary landfills and secure landfills - leachate collection, treatment and landfill gas management - landfill construction and operational controls - landfill closure and environmental monitoring - landfill bioreactors - rehabilitation of open dumps and bio mining of dumpsites - remediation of contaminated sites - Case studies | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**


1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, "Integrated Solid Waste Management", Mc- Graw Hill India, First edition, 2015.
2. Rao M.N, Razia Sultana, Sri Harsha Kota, "Solid and Hazardous Waste Management - Science and Engineering" , Butterworth-Heinemann, 2016
3. Cherry P M, "Solid and Hazardous Waste Management", CBS publishers and distributors Pvt Ltd, 2018.


**REFERENCES:**


1. William A. Worrell, P. Aarne Vesilind, Christian Ludwig, Solid Waste Engineering - A Global respective, 3rd Edition, Cengage Learning, 2017.
2. CPHEEO, "Manual on Municipal Solid waste management, Vol I, II and III", Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi, 2016.
3. Freeman, H. M., "Standard Handbook of Hazardous Waste Treatment and Disposal", 2nd Edition, McGraw-Hill, Inc., 1997.
4. William C.Blackman.Jr, "Basic Hazardous waste management", Third Edition, Lewis Publishers, 2016.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | 2 | | | | | | | | 3 |
| 2 | | 2 | | | | | 2 | | | | | | | 2 |
| 3 | | 2 | | | 2 | 2 | | | | | | | 2 | |
| 4 | | 3 | | | | | 2 | | | | | 3 | | 2 |
| 5 | | 2 | | | | 2 | | | | 2 | | 3 | 2 | 3 |
| CO (W.A) | 2 | 2.3 | | | 2 | 2 | 2 | | | 2 | | 3 | 2 | 2.5 |

| 22CEX36 - PLUMBING (WATER & SANITATION) | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To identify different types of pipes used in water supply and sanitary and drainage work. | | | | |

| Course Outcomes<br>The students will be able to | | Cognitive Level | Weightage of COs in End Semester Examination |
|---|---|---|---|
| **CO1** | Apply national and international codes, including the NBC and other relevant codes, to building design and construction. | Ap | 20% |
| **CO2** | Select proper plumbing materials and systems. | An | 20% |
| **CO3** | Apply appropriate pipe materials and jointing methods based on system requirements | Ap | 20% |
| **CO4** | Identify water supply and Sanitary fitting used in installation | An | 20% |
| **CO5** | Apply strategies for reducing and reusing water in building systems and projects | Ap | 20% |

| **UNIT I - IMPORTANCE OF CODES AND STRUCTURAL COORDINATION** | **(9)** |
|---|---|
| Scope and purpose - codes and standards in the building industry - NBC and other codes, Local Municipal Laws, approvals, general regulations, standards - water supply, sewerage system, drainage system, workmanship, water conservation - protection of pipes and structures - waterproofing. | |
| **UNIT II - PLUMBING TERMINOLOGY** | **(9)** |
| Plumbing Fixtures - accessible, readily accessible, aerated fittings, AHJ, bathroom group, carrier, flood level rim, floor sink, flushometer valve, flush tanks, lavatories, macerating toilet, plumbing appliances, and plumber. Traps - indirect waste, vent, blow off, developed length, dirty arm, FOG, receptors, slip joints, trap, and vent. Drainage: adapter fitting, adjusted roof area, AAV, air break, air gap, area drain, base, bell and spigot joint, building drain, branch, DFU, grease interceptor, joints, roof drain, smoke test, stack. | |
| **UNIT III - SANITARY DRAINAGE AND STORM DRAIN** | **(9)** |
| One pipe and two pipe systems, different pipe materials and jointing methods, special joints, hangers and supports, protection of pipes and structures, alternative materials, workmanship, prohibited fittings and practices, hydraulic jump, change in direction of flow, T and Y fittings, cleanouts, pipe grading, fixtures below invert level, suds relief, testing, building sewers, trenching, testing, sumps and pumps, introduction to Drainage Fixture Units (DFU) and sizing of horizontal and vertical pipes. Rain Water Harvesting (RWH) definition, need, catchment, NBC requirements and advantages of RWH. | |
| **UNIT IV - WATER SUPPLY, GRAY AND RECLAIMED WATER** | **(9)** |
| Sources of water, potable and non-potable water, reclaimed water, calculating daily water requirement and storage, hot and cold water distribution system, backflow prevention, air gap, cross connection control, pressure and velocity, pipe materials and jointing methods, alternative materials, hangers and | |

| | |
|---|---|
| supports, workmanship, prohibited fittings and practices - protection of pipes and structures - Water Supply Fixture Units (WSFU) and sizing. Gray water - approvals, specifications and drawings, safety. | |
| **UNIT V - INTRODUCTION TO WTP AND STP** | **(9)** |
| Introduction to Net Zero concept, need to reduce and reuse, rating of Water Efficient Plumbing fixtures and fittings, 24x7 water supply, metering and sub-metering, typical daily water and wastewater calculations for a project. Sources - utility and treatment of water - parameters of water quality, parts of water treatment plant (WTP), disinfection methods, storage conditions, RO water systems, rainwater harvesting treatment, desalinatio - characteristics of domestic sewage, sewage treatment methods, aerobic and anaerobic treatment, level of treatment, reclaimed water, comparison of various methods. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**

1. O.P. Gupta, "Elements of Water Pollution Control Engineering", Khanna Book Publishing, New Delhi.
2. Uniform Illustrated Plumbing Code-India (UIPC-I) published by IPA and IAPMO (India).

**REFERENCES:**

1. Water Efficient Products-India (WEP-I) published by IPA and IAPMO (India).
2. "A Guide to Good Plumbing Practices", published by IPA.
3. IS 17650 Part 1 and Part 2 for "Water Efficient Plumbing Products".

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | 3 | 2 |
| 2 | | 2 | | 2 | | 3 | | | | | | | 2 | 3 |
| 3 | 3 | | | | | 2 | | | | | | | | 2 |
| 4 | | 2 | | 2 | | | | | | | | | | 3 |
| 5 | 3 | 2 | | 2 | | 3 | | | | | | | 3 | 2 |
| **CO (W.A)** | **3** | **2** | | **2** | | **2.7** | | | | | | | **2.7** | **2.4** |

| 22CEX37 - TRANSPORT AND ENVIRONMENT | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To create an awareness / overview of the impact of transportation projects on the environment and society. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply EIA guidelines to assess the environmental impacts of transportation projects. | Ap | 20% |
| **CO2** | Analyze various methods used for environmental impact analysis in project assessments. | An | 20% |
| **CO3** | Implement Indian Roads Congress (IRC) guidelines to ensure compliance in transportation project planning and execution. | Ap | 20% |
| **CO4** | Evaluate methods for reducing global warming through project design and execution. | An | 20% |
| **CO5** | Analyze Environmental Impact Assessments (EIA) of highway and railway projects to understand their environmental and social implications. | An | 20% |

| **UNIT I - NTRODUCTION** | **(9)** |
|---|---|
| Environmental Inventory, Environmental Assessment, Environmental Impact Assessment (EIA), Environmental Impact of Transportation Projects, Need for EIA, EIA Guidelines for Transportation Project, Historical Development. | |
| **UNIT II - METHODOLOGIES** | **(9)** |
| Elements of EIA - Screening and Scoping - Methods of Impact Analysis - Applications - Appropriate methodology. | |
| **UNIT III - ENVIRONMENTAL IMPACT, PREDICTION AND ASSESSMENT** | **(9)** |
| Prediction and Assessment of Impact of Transportation Project at various stages on water, air, noise, land acquisition and resettlement, Socio economic impact, indigenous people, aesthetics, health and safety, energy studies, traffic impact studies, IRC guidelines. | |
| **UNIT IV - ENVIRONMENTAL MITIGATION AND MANAGEMENT PLAN** | **(9)** |
| Mitigation of the impact on Natural and Man-made Environment, Health, Water, Land, Noise, Air, Public participation, Environmental Management Plan, Energy Conservation, Methods to reduce Global Warming. | |
| **UNIT V - CASE STUDIES** | **(9)** |
| EIA Case Studies on Highway, Railway - EIA Case Studies on Transit Oriented Development (TOD), Compact Cities, Non-Motorised Transport (NMT). | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**

1. P. Meenakshi, Elements of Environmental Science and Engineering, Prentice Hall of India, New Delhi, 2006
2. Thirumurthy A.M., Introduction to Environmental Science and Management, Shroff Publishers, Bombay, 2005.

**REFERENCES:**


1. Indian Road Congress (IRC), Environmental Impact of Highway Projects, IRC, Delhi, 1998.
2. EIA Guidance Manual- Highway- MOEF & Govt of India, 2010
3. Indian Road Congress (IRC), Environmental Impact of Highway Projects, IRC, Delhi, 1998.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | 2 |
| 2 | | 2 | | | | | 2 | | | | | | | 2 |
| 3 | 3 | | | 2 | | | | | | | | | 2 | 2 |
| 4 | | 2 | | | | | 2 | | | | | | 2 | 2 |
| 5 | | 3 | | 3 | | | | | 2 | | | 3 | | 3 |
| **CO (W.A)** | **3** | **2.3** | | **2.5** | | | **2** | | **2** | | | **3** | **2** | **2.2** |

| 22CEX38 - GROUNDWATER ENGINEERING | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To understand the principles of groundwater governing equations, characteristics of different aquifers and techniques of groundwater model development and management. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply methods and norms for estimating aquifer properties and groundwater resources. | Ap | 20% |
| **CO2** | Apply methods to analyze groundwater flow using various analytical techniques. | Ap | 20% |
| **CO3** | Assess the inflows and outflows in an aquifer system. | An | 20% |
| **CO4** | Evaluate water quality standards for drinking, industrial, and irrigation purposes to ensure compliance and safety. | An | 20% |
| **CO5** | Identify the methods to improve groundwater quality and sustainability. | An | 20% |

| **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 - GEC norms - Steady state flow - Darcy's Law - Groundwater Velocity - Dupuit Forchheimer assumption - Steady Radial Flow into a Well. | |
| **UNIT II - WELL HYDRAULICS** | **(9)** |
| Unsteady state flow - Theis method - Jacob method - Chow's method - Law of Times - Theis Recovery - Bailer method - Slug method - tests - Image well theory - Partial penetrations of wells - Well losses - Specific Capacity and Safe yield - Collector well and Infiltration gallery. | |
| **UNIT III - GROUNDWATER MANAGEMENT** | **(9)** |
| Need for Management Model - Database for Groundwater Management - Groundwater balance study - Introduction to Mathematical model - Model Conceptualization - Initial and Boundary Condition - Calibration - Validation - Future Prediction - Sensitivity Analysis - Uncertainty - Development of a model. | |
| **UNIT IV - GROUNDWATER QUALITY** | **(9)** |
| Ground water chemistry - Origin, movement and quality - Water quality standards - Drinking water Industrial water - Irrigation water - Groundwater Pollution and legislation - Environmental Regulatory requirements. | |

| UNIT V - GROUNDWATER CONSERVATION | (9) |
|---|---|
| Artificial recharge techniques - Reclaimed wastewater recharge - Soil aquifer treatment (SAT) - Aquifer Storage and Recovery (ASR) Seawater Intrusion and Remediation - Ground water Basin management and Conjunctive use - Protection zone delineation, Contamination source inventory and remediation schemes. | |
| **TOTAL : 45 PERIODS** | |

**TEXT BOOKS:**


1. Raghunath, H.M., "Ground Water", New Age International, 2007.
2. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000.
3. Karanth, K. "Groundwater Assessment, Development and Management", Tata McGraw Hill, 2003.


**REFERENCES:**


1. Fitts R Charles, "Groundwater Science". *Elsevier, Academic Press, 2002.*
2. Ramakrishnan, S, "Ground *Water", K.J. Graph arts, Chennai, 1998.*
3. Chahar BR, *"Groundwater hydrology", McGraw Hill Education (India) Pvt Ltd, New Delhi, 2015.*
4. Raghunath H. M., "Hydrology : Principles, Analysis and Design", New Age International Publishers, 2006.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | | 2 |
| 2 | 3 | | | | | | | | | | | | 2 | 2 |
| 3 | 3 | 2 | 3 | | | | | | | | | | 3 | 2 |
| 4 | | 2 | 3 | | | | | | | | | 2 | 2 | 2 |
| 5 | | 3 | 2 | | | | | | | | | 2 | 3 | 2 |
| CO (W.A) | 3 | 2.3 | 2.7 | | | | | | | | | 2 | 2.5 | 2 |

| 22CEX41 - GROUND IMPROVEMENT TECHNIQUES | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To Apply various ground improvement techniques, such as compaction, grouting, and soil stabilization, to address specific soil issues. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Identify the geotechnical problems in various soil deposits. | Ap | 20% |
| **CO2** | Design and select suitable technique of dewatering. | Ap | 20% |
| **CO3** | Suggest suitable in-situ treatment for cohesive and cohesionless soils. | Ap | 20% |
| **CO4** | Recommend different soil reinforcement materials based on their application. | Ap | 20% |
| **CO5** | Select different types of grouting methods and stabilization techniques. | Ap | 20% |

| **UNIT I - PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES** | **(9)** |
|---|---|
| Role of ground improvement in foundation engineering - Methods of ground improvement - Geotechnical problems in alluvial, lateritic and black cotton soils - Selection of suitable ground improvement techniques based on soil conditions. | |
| **UNIT II - DEWATERING** | **(9)** |
| Dewatering Techniques - Well points - Seepage analysis for two-dimensional flow for fully and partially penetrated slots in homogeneous deposits - Design for simple cases. | |
| **UNIT III - IN-SITU TREATMENT OF COHESIONLESS AND COHESIVE** | **(9)** |
| In-situ densification of cohesionless soils - Dynamic compaction - Vibro-flotation, Sand compaction piles and deep compaction - Consolidation of cohesionless soils - Preloading with sand drains and fabric drains - Stabilization of soft clay ground using stone columns - Installation techniques. | |
| **UNIT IV - EARTH REINFORCEMENT** | **(9)** |
| Concept of reinforcement - Types of reinforcement material - Soil nailing - Reinforced earth wall - Mechanism - Applications of reinforced earth - Functions of geo textiles in filtration, drainage, separation, road works and containment applications. | |
| **UNIT V - GROUTING TECHNIQUES** | **(9)** |
| Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring - Stabilization with cement, lime and chemicals - Stabilization of expansive soil. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**

1. Purushothama Raj. P, "Ground Improvement Techniques", 3rd Edition, Laxmi Publications (P) Ltd, 2023.

**REFERENCES:**

1. Koerner, R.M. "Construction and Geotechnical Methods in Foundation Engineering", 2nd Edition McGraw Hill, 1994.
2. Das, B.M., "Principles of Foundation Engineering" 8th edition, Cengage learning, 2016.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | | | 2 | |
| 2 | 3 | | | | | 2 | | | | | | | | 2 |
| 3 | 3 | | 2 | | | 2 | | | | | | | | 2 |
| 4 | 3 | | | | | 2 | | | | | | | 2 | |
| 5 | 3 | | 2 | | | | | | | | | | | 2 |
| CO (W.A) | 3 | | 2 | | | 2 | | | | | | | 2 | 2 |

| 22CEX42 - ENGINEERING GEOLOGY | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To imparts knowledge on geological process, classification, morphology of rocks and the importance of the study of geology for civil engineering practices with regard to the selection of appropriate site for their projects like dams, tunnels, buildings etc., | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Identify and classify rocks using basic geologic features and to apply those concepts on rock engineering projects. | Ap | 20% |
| **CO2** | Analyze the physical and chemical properties of minerals. | Ap | 20% |
| **CO3** | Apply geological mapping techniques to accurately represent geological formations and structures. | Ap | 20% |
| **CO4** | Identify the geological structures of rocks and suggest suitable site investigation methods. | An | 20% |
| **CO5** | Describe the key characteristics and formation processes of important rocks. | Ap | 20% |

| **UNIT I - PHYSICAL GEOLOGY AND GEOMORPHOLOGY** | **(9)** |
|---|---|
| Significance of Geology in Civil Engineering; Internal structure of the Earth; Weathering: types, engineering classification of weathered rocks; Plate tectonics and its relevance to earthquakes; Groundwater: types of aquifers, origin. | |
| **UNIT II - MINERALOGY AND PETROLOGY** | **(9)** |
| Physical and Chemical properties of common rock forming minerals: Quartz family, Feldspar family, Mica (Biotite), Pyroxene (Augite), Amphibole (Hornblende), Calcite, Gypsum and Clay minerals. Formation of Igneous, Metamorphic and Sedimentary rocks; Description of important rocks: Granite, Dolerite, Basalt. | |
| **UNIT III - STRUCTURAL GEOLOGY AND ROCK MECHANICS** | **(9)** |
| Attitudes of beds: Strike and Dip measurements in civil engineering; Different types of folds, faults, joints and fractures in rocks; Rock Quality Designation (RQD) and Geological Strength Index (GSI). | |
| **UNIT IV - GEOPROSPECTING** | **(9)** |
| Geological mapping techniques; Remote Sensing: Fundamentals and its role in geological mapping; Geophysical methods for subsurface investigations: Electrical, Seismic and Ground Penetrating Radar (GPR); Subsurface logging. | |

| UNIT V - GEOLOGICAL CONSIDERATIONS AND GEOHAZARDS | (9) |
|---|---|
| Geological conditions necessary for designing and construction of important structures: Dams, Reservoirs, Tunnels, Road cuttings and Coastal protection; Landslides - Causes and mitigation; Earthquakes and Tsunamis: Causes and mitigation; Case studies. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**

1. Parbin Singh, "A Textbook of Engineering and General Geology", S. K. Kataria and Sons, 2021.
2. Chenna Kesavulu, N. "Textbook of Engineering Geology", Macmillan India Ltd., 2018.
3. Varghese, P.C., "Engineering Geology for Civil Engineering", Prentice Hall of India Learning Private Limited, New Delhi, 2012.

**REFERENCES:**

1. Krynine and Judd, "Principals of Engineering Geology and Geotechnics" Tata McGraw Hill, New Delhi, 2018.
2. Venkat Reddy, D. "Engineering Geology", Vikas Publishing House Pvt. Lt, 2021.
3. Bell, F.G. "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | 2 | |
| 2 | 2 | | | | | | | | | | | 2 | | |
| 3 | 3 | | | | | | | | | | | | | 2 |
| 4 | | 2 | | | | | | | | | | | 2 | |
| 5 | 3 | | | | | | 2 | | | | | 3 | 2 | 3 |
| CO (W.A) | 2.5 | 3 | | | | | 2 | | | | | 2.5 | 2 | 2.5 |

| 22CEX43 - SITE INVESTIGATION AND SOIL EXPLORATION | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • *To* understand the principles and importance of site investigation and soil exploration for engineering and construction projects. | | | | |

| Course Outcomes<br>The students will be able to | | Cognitive Level | Weightage of COs in End Semester Examination |
|---|---|---|---|
| **CO1** | Apply geophysical investigation methods to assess subsurface conditions. | Ap | 20% |
| **CO2** | Utilize sampling and exploration techniques and interpret results to assess subsurface conditions. | An | 40% |
| **CO3** | Analyze results from various field tests to determine soil properties and behavior for engineering purposes. | Ap | 20% |
| **CO4** | Apply the principles and applications of various instrumentation techniques used in soil engineering. | An | 20% |
| **CO5** | *Prepare* comprehensive reports detailing the soil sampling and field testing methods. | C | Internal Assessment |

| **UNIT I - PLANNING OF EXPLORATION AND GEOPHYSICAL METHODS** | **(9)** |
|---|---|
| Site investigation - Scope and objectives - activities involved in site investigation - Preliminary desk studies - Subsurface exploration - General considerations - Objectives - Planning an exploration programme - Location - Spacing and depth of borings - Soil Profile - Bore logs - Data Presentation - Soil investigation and exploration reports - Geophysical investigation. | |
| **UNIT II - EXPLORATION TECHNIQUES** | **(9)** |
| Open pits and trenches - Different methods of boring and drilling - Stabilization of bore holes - Cleaning of bore hole - Geophysical exploration and interpretation - non-displacement and displacement methods - Drilling in difficult subsoil conditions. | |
| **UNIT III - SOIL SAMPLING** | **(9)** |
| Sampling Techniques - Quality of samples - Factors influencing sample quality - disturbed and undisturbed soil sampling - advanced sampling techniques, shallow penetration samplers, preservation and handling of samples. | |
| **UNIT IV - FIELD TESTING IN SOIL EXPLORATION** | **(9)** |
| Field tests - Importance of field tests in soil exploration - Penetration testing - Standard Penetration Test - Static Cone Penetration Test - Dynamic cone penetration test - Plate load test - Field Vane shear test - Cyclic plate load test - Block vibration test - Field Permeability test. | |
| **UNIT V - INSTRUMENTATION** | **(9)** |
| Instrumentation in soil engineering, Strain gauges, Resistance and inductance type, Load cells, Earth pressure cells, Pore pressure measurements - Slope indicators, Sensing units - case studies. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**


1. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt.Ltd., New Delhi, 2017.
2. Dr. K. R. Arora., "Soil Mechanics and Foundation Engineering", Standard Publisher, New Delhi, 7th ed., 2017.
3. Gopal Ranjan and Rao A.S.R. "Basic and Applied soil mechanics", New Age International (P) Ltd, New Delhi,2006.
4. Clayton C.R, Matthews M.C, Simons N.E, "Site Investigation", 2nd edition, Trans Tech Publications Ltd, 1995.


**REFERENCES:**


1. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers and Distributers Ltd., New Delhi, 2015.
2. Varghese, P.C.,"Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2012.
3. Das, B.M. "Principles of Foundation Engineering" (Eigth edition), Thompson Asia Pvt. Ltd., Singapore, 2017.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | 2 | | | | | | | | 3 | 2 | 3 |
| 2 | | 3 | | | | 2 | | | | | | | | 3 |
| 3 | | 3 | | | | | | | | | | | 2 | 2 |
| 4 | 3 | | | 2 | | | | | | | 3 | | | 3 |
| 5 | | 3 | | | | | 2 | | 3 | 3 | | 3 | 2 | 2 |
| **CO (W.A)** | **3** | **3** | | **2** | | **2** | **2** | | **3** | **3** | **3** | **3** | **2** | **2.6** |

| 22CEX44 - SLOPE STABILTY AND LANDSLIDES | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To analyze stability of finite and irregular slopes and to impart knowledge on mechanism of landslides and understand the importance of field instrumentation and remedial measures. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Identify and *describe* the general characteristics and types of failures in structures and soils. | U | 20% |
| **CO2** | Analyse stability of slopes in cohesive and cohesionless soils. | An | 20% |
| **CO3** | Analysis of irregular slopes with different approaches. | Ap | 20% |
| **CO4** | identify and report the causes of landslides in different soil conditions. | An | 20% |
| **CO5** | Apply compaction techniques to new embankments to achieve desired density and stability. | Ap | 20% |

| **UNIT I - STABILITY OF SLOPES** | **(9)** |
|---|---|
| Introduction - Importance - General characteristics - Types of failures - Causes of failures - Purpose of Stability computation - Investigation of failures - Procedure - Case studies. | |
| **UNIT II - STABILITY ANALYSIS** | **(9)** |
| Stability analysis - Method of slices - Friction circle method - Soils with cohesion Soils with cohesion and angle of internal friction. Critical states for design for embankments - Stability computations - Evaluation of pore water pressure | |
| **UNIT III - IRREGULAR SLOPES** | **(9)** |
| Non – uniform soils - Janbu's analysis - Taylor's analysis - Bishop's analysis - Total stress and effective stress approaches - Composite surfaces of sliding - Block sliding. | |
| **UNIT IV - LANDSLIDES** | **(9)** |
| General Characteristics - Sources - Stability of Hill side slopes - Open cuts - Engineering problems involving the stability of slopes - Cuts in sand - Cuts in loess - Homogeneous and soft clay slopes - Sudden spreading of clay slopes - Clay flows - Clays containing pockets and sand masses - Slides in stiff clay slopes on shale - Slopes on weathered rock; talus slopes, slopes on over consolidated clays - Slides along coastal areas and tropically weathered residual soils - Long term stability of clay slopes. | |
| **UNIT V - FIELD OBSERVATIONS AND SLOPE STABILIZATION** | **(9)** |
| Field instrumentation - Observation studies during construction - Post construction, piezometers - Settlement plates - Inclinometer - Case histories. Compaction of new embankments - Compaction of natural masses of soil and existing fills - Compaction of deep deposits of sand - Vibroflotation - Compaction of compressible soils - Drainage as a means of stabilization - Use of Geotextiles - Soil nailing. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**

1. Duncan J. M., Wright S. G., and Brandon. T. L, "Soil Strength and Slope Stability" 2nd Edition, Wiley, 2014.
2. Chowdhury R, Flentje P and Bhattacharya G, "Geotechnical Slope Analysis", CRC Press, 2019.

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**REFERENCES:**

1. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations: Basic Geotechnics", Sixth Edition, Prentice Hall, 2002.
2. Anderson, M.G., and Richards, K.S., "Slope Stability", JohnWiley, 1987.
3. Cheng and Lau, "Slope Stability Analysis and Stabilization" , CRC press.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | 2 |
| 2 | | 2 | | | | | | | | | | | 2 | 2 |
| 3 | | 2 | | | | | | | | | 2 | | | 2 |
| 4 | | 2 | | 2 | | | | | | | | | 2 | 2 |
| 5 | 3 | | | | | | | | | | | | 2 | 3 |
| CO (W.A) | 2.5 | 2 | | 2 | | | | | | | 2 | | 2 | 2 |

| 22CEX45 - ROCK MECHANICS | | | | | |
|---|---|---|---|---|---|
| | | **L** | **T** | **P** | **C** |
| | | **3** | **0** | **0** | **3** |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To impart knowledge on fundamentals of rock mechanics and its application in solving simple problems associated with rock slopes and underground openings.<br>• To understand the mechanics of rock and its applications in underground structures and rock slope stability analysis. | | | | |

| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Identify and classify rocks based on geological characteristics and their engineering significance. | Ap | 20% |
| **CO2** | Apply rock mechanics principles to the design and stability analysis of underground openings. | Ap | 20% |
| **CO3** | Determine the strength and behavior of rock materials under different loading conditions. | An | 20% |
| **CO4** | Estimate initial stresses in rock formations using theoretical and empirical methods. | Ap | 20% |
| **CO5** | Compare *and* select appropriate methods for the excavation of tunnels based on geological conditions and project requirements. | An | 20% |

| **UNIT I - CLASSIFICATION AND INDEX PROPERTIES OF ROCKS** | **(9)** |
|---|---|
| Introduction - Scope of rock mechanics- Geological classification - Index properties of rock systems - Classification of rock masses for engineering purpose - Rock mass rating and Q System - Strength and modulus from classifications, Classification based on strength and modulus and strength and fracture strain, Geo engineering classification. | |
| **UNIT II - ROCK STRENGTH AND FAILURE CRITERIA** | **(9)** |
| Modes of rock failures - Strength of rock - Laboratory measurement of shear, tensile and compressive strength - Stress-strain behaviour of rock under hydrostatic compression and deviator loading - Mohr-Coulomb failure criteria. | |
| **UNIT III - INITIAL STRESSES AND THEIR MEASUREMENTS** | **(9)** |
| Estimation of initial stresses in rocks - Influence of joints and their orientation in distribution of stresses - Measurement of in-situ stresses - Hydraulic fracturing - Flat jack method - Over coring method. | |
| **UNIT IV - APPLICATION OF ROCK MECHANICS IN ENGINEERING** | **(9)** |
| Simple engineering application - Underground openings - Rock slopes - Bolting - Anchoring - Foundations and mining subsidence - Improvement of slope stability and protection. | |
| **UNIT V - ROCK STABILIZATION** | **(9)** |
| Rock support and rock reinforcement - Methods of excavation of tunnels - Control and maintenance- Tunnel ventilation - Grouting in rocks - Rock bolting - Rock anchor. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**

1. Ramamurthy T. "Engineering in Rocks for Slopes Foundations and Tunnels", 3rd Edition, PHI Learning Pvt. Ltd, 2014.

**REFERENCES:**

1. Debasis & Verma Abhiram Kumar, "Fundamentals and Applications of Rock Mechanics" 1st Edition, PHI Learning Pvt. Ltd, 2016.
2. Nagaratnam Sivakugan, Sanjay Kumar Shukla and Braja M. Das, "Rock Mechanics - An Introduction", 1st edition CRC press, India, 2012.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | 2 |
| 2 | 3 | | | | | | | | | | | 3 | | 3 |
| 3 | | 2 | | | | | | | | | | | 2 | |
| 4 | | 2 | | | | | | | | | | | 2 | |
| 5 | | 2 | | 2 | | | | | | | | | | 2 |
| CO (W.A) | 2.5 | 2 | | 2 | | | | | | | | 3 | 2 | 2.3 |

| 22CEX46 – GEO ENVIRONMENTAL ENGINEERING | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To impart knowledge on the Geotechnical engineering problems associated with soil contamination, safe disposal of waste and remediate the contaminated soils by different techniques thereby protecting environment. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Identify the soil-pollutant interaction and assess the modification of soil properties. | Ap | 20% |
| **CO2** | Categorize the process of contaminant transport and characterize the contaminated sites. | Ap | 20% |
| **CO3** | Classify different techniques for the remediation of contaminated Sites. | Ap | 20% |
| **CO4** | Design the cover system by identifying the suitable components of landfill. | An | 20% |
| **CO5** | Analyze the possible utilization of waste based on their characteristics. | An | 20% |

| **UNIT I - INTRODUCTION** | **(9)** |
|---|---|
| Role of Geo-environmental Engineering - sources, generation and classification of wastes- causes and consequences of soil pollution -factors influencing soil-pollutant interaction-modification of index-physical, chemical and engineering properties. | |
| **UNIT II - CONTAMINANT TRANSPORT AND SITE CHARACTERISATION** | **(9)** |
| Transport of contaminant in subsurface - advection, diffusion, dispersion - chemical process in subsurface - sorption, desorption, precipitation, dissolution, oxidation, complexation, ion exchange, volatization - biological process in subsurface - characterization of contaminated sites. | |
| **UNIT III - WASTE CONTAINMENT AND REMEDIATION OF CONTAMINATED** | **(9)** |
| In situ containment - vertical and horizontal barrier - soil remediation - soil vapour extraction, electro kinetic remediation, soil heating, vitrification, bioremediation, phyto remediation - ground water remediation -pump and treat, In situ flushing, permeable reacting barrier. | |
| **UNIT IV - LAND FILLS AND SURFACE IMPOUNDMENTS** | **(9)** |
| Site selection for landfills - Components of landfills - liner system - soil, geomembrane, geosynthetic clay, geocomposite liner system - leachate collection-construction and operation of landfill-landfill cover - disposal of slurry waste in ponds and impoundments. | |
| **UNIT V - UTILIZATION OF WASTE** | **(9)** |
| Evaluation of waste materials - flyash, municipal sludge, plastics, scrap tire, blast furnace slag - physical, chemical and biological characteristics-geotechnical reuse of waste materials. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**

1. Hari D. Sharma and Krishna R.Reddy, "Geo-Environmental Engineering", John Wiley and Sons, INC, USA, 2004.
2. Sharma H D and Reddy K R, "Geoenvironmental Engineering: Site remediation, Waste containment and Emerging Waste Management Technologies", John Wiley & Sons, Inc. Hoboken, New Jersey, 2004.

**REFERENCES:**

1. Westlake, K., "Landfill Waste pollution and Control", Albion Publishing Ltd., England, 2014.
2. Bagchi A, "Design of landfills and integrated solid waste management", John Wiley & Sons, Inc., USA 2004.

**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | 2 | | | | | | | | | | | 2 | |
| 2 | | 2 | | | | | | | | | 2 | | 2 | 2 |
| 3 | 2 | | | | | | | | | | | | | 2 |
| 4 | | 2 | | | | | | | | | 2 | 2 | 2 | 2 |
| 5 | | 2 | | 3 | | 3 | 3 | | | | 3 | 2 | | 2 |
| CO (W.A) | 2 | 2 | | 3 | | 3 | 3 | | | | 2.3 | 2 | 2 | 2 |

| 22CEX47 - OFFSHORE ENGINEERING | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To impart knowledge on the offshore environment, types, suitability, and design concepts of offshore structures as per the appropriate requirements. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Identify *and* calculate key wave parameters such as height, period, and wavelength. | Ap | 20% |
| **CO2** | Explain the types and choose suitable offshore structures according to environmental conditions. | An | 20% |
| **CO3** | Investigate various types of forces acting on the offshore structures. | An | 20% |
| **CO4** | Adapt appropriate codes to design the submarine pipelines. | Ap | 20% |
| **CO5** | Analyse the accidental loads and corrosion on offshore structures. | An | 20% |

| **UNIT I - INTRODUCTION TO OFFSHORE ENVIRONMENT** | **(9)** |
|---|---|
| Ocean winds-characterization of wind regime-wind velocity profile, Ocean waves-wave parameters - Introduction to Airy's wave theory and its applications-brief about time and frequency domain analysis, brief introduction about ocean currents-tides, seaquakes, Ice environment, Ice-sea interactions. | |
| **UNIT II - TYPES OF OFFSHORE STRUCTURES** | **(9)** |
| Offshore Structures-need for offshore structures. Types of Offshore Structures - components - materials used-design parameters-suitable environment conditions - construction practices - drawbacks - EIA for Offshore structures. | |
| **UNIT III - FORCES ON OFFSHORE STRUCTURES** | **(9)** |
| Introduction - Permanent loads-operating loads. Environmental forces - wind force - wave force - current force - seaquake force-Ice force. Force due to tides - Marine growth - Use of API RP 2A guidelines. | |
| **UNIT IV - SUBMARINE PIPELINES AND RISERS** | **(9)** |
| Pipeline elements - types of pipelines - laying method-materials. Pipe wall thickness verification. Pipeline stability. Design using DNV 81 code | |
| **UNIT V - ACCIDENTAL LOADS AND CORROSION** | **(9)** |
| Fire, Blast and Collision - Behaviour of steel at elevated temperature - Fire rating for Hydrocarbon fire, Blast Mitigation-Blast walls - Collision of boats and energy absorption - Corrosion - Corrosion mechanism - Types of corrosion - Offshore structure corrosion zones - Biological corrosion - Preventive measures of corrosion - Online corrosion monitoring- Corrosion fatigue. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**

1. B.C Gerwick, Jr. Construction of Marine and Offshore Structures, CRC Press, Florida, 2000.

**REFERENCES:**


1. McClelland, B and Reifel, M. D., Planning and Design of fixed Offshore Platforms, Van Nostrand, 1986.
2. DNV-RP-B101-Corrosion Protection of Floating Protection and Storage Units, 2007.
3. API RP 2A. Planning, Designing and Constructing Fixed Offshore Platforms, API. 2000.


**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | 2 | | | | | | | | | | | | |
| 2 | | 2 | | | | | | | | | | 2 | | 2 |
| 3 | | 2 | | 2 | | | | | | | | | 2 | |
| 4 | 2 | | | | | 2 | | | | | | | | 2 |
| 5 | | 2 | | | | | | | | | | | 2 | |
| CO (W.A) | 2 | 2 | | 2 | | 2 | | | | | | 2 | 2 | 2 |

| 22CEX48 - ADVANCED FOUNDATION ENGINEERING | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | |
| **Course Objective:** | • To learn different soil exploration techniques and to estimate load carrying capacity of different types of foundations.<br>• To understand the mechanism of load transfer mechanism in deep foundations.<br>• To have basic idea of machine foundations. | | | |

| Course Outcomes<br>The students will be able to | | Cognitive Level | Weightage of COs in End Semester Examination |
|---|---|---|---|
| **CO1** | Propose the safe bearing capacity (SBC) for any soil in any situations. | Ap | 20% |
| **CO2** | Design and analyse SBC of Shallow foundation. | An | 20% |
| **CO3** | Design and analyse SBC of deep foundation. | An | 20% |
| **CO4** | Analyse retaining wall, sheet pile and brace cut. | An | 20% |
| **CO5** | Design and analyse machine foundations. | An | 20% |

| | |
|---|---|
| **UNIT I - SUBSURFACE EXPLORATION** | **(9)** |
| Boring, Sampling, SPT, CPT, Geophysical methods, Bore log and soil report. | |
| **UNIT II - DESIGN OF SHALLOW FOUNDATIONS** | **(9)** |
| Bearing capacity theories - Terzaghi, Meyerhoff, Hansen, SBC based on SPT, layered soils, eccentric and inclined loads. Bearing capacity on slopes, Foundation settlements, Design of combined and Raft Foundations, Design of combined footings by conventional and elastic line methods. | |
| **UNIT III - PILE FOUNDATIONS** | **(9)** |
| Load transfer mechanism, Pile capacity in various soil types, negative skin friction, group action, settlements, laterally loaded vertical piles. Drilled Piers and Caissons - Design considerations, bearing capacity equations, Settlements. | |
| **UNIT IV - MACHINE FOUNDATIONS** | **(9)** |
| Free and forced vibration with and without damping, Elastic half space for rigid footings. Vibration analysis of foundations subjected to vertical, sliding and rocking modes, Design criteria for machine foundations. | |
| **UNIT V - DESIGN OF RETAINING WALLS** | **(9)** |
| Lateral earth pressure, Retaining wall stability, Sheet Pile Walls - Cantilever and Anchored sheet pile walls. Braced Cuts: Pressure envelopes and design of various components | |
| **TOTAL (L:45) = 45 PERIODS** | |

| **TEXTBOOKS:** |
|---|
| 1. Varghese P.C., "Foundation Engineering", Prentice-Hall of India Private Ltd, 2009.<br>2. Swami saran, "Soil dynamics and Machine Foundations", Galgotias, 2012. |
| **REFERENCES:** |
| 1. Srinivasalu and Vaidyanathan, "Handbook of Machine Foundations", Tata McGraw Hill, 2004.<br>2. Swami Saran, "Analysis and Design of Substructures", Oxford & IBH, 2008.<br>3. Tomlinson M.J., "Foundation Design & Construction", Prentice-Hall, 2003. |

| **Mapping of COs with POs / PSOs** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cos** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | 2 | | | | | | | | | | | 2 | 2 | 2 |
| **2** | | 2 | 3 | | | | | | | | | | 3 | 2 |
| **3** | | 2 | 3 | | | | | | | | | | 3 | 3 |
| **4** | 2 | 2 | | | | | | | | | | | 3 | 3 |
| **5** | 2 | 2 | 3 | | | | | | | | | | 3 | 3 |
| **CO (W.A)** | **2** | **2** | **3** | | | | | | | | | **2** | **2.8** | **2.6** |

| 22CEX51 - GREEN BUILDINGS | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | |
| **Course Objective:** | •To impart knowledge on eco-friendly building concepts and building certification systems as per Indian and International Standards.<br>•To expose the concept of green building techniques for the construction project. | | | |

| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Identify the suitable cost effective construction materials. | Ap | 20% |
| **CO2** | Summarize the contribution of buildings in global warming and issues in society and environment. | An | 20% |
| **CO3** | Apply green project management concepts in building construction | Ap | 20% |
| **CO4** | Apply the process of green energy in buildings and know the rating systems. | Ap | 20% |
| **CO5** | Mitigate energy usage with the help of solar energy in buildings. | An | 20% |

| **UNIT I - GREN BUILDING CONCEPT** | **(9)** |
|---|---|
| Historical perspective buildings - Global warming - conventional versus green buildings - concept and necessity - Merits and Demerits - Classification - Renewable energy in buildings - Basic concepts and efficiency. | |
| **UNIT II - PRINCIPLES AND ELEMENTS OF GREEN BUILDINGS** | **(9)** |
| Climate responsive process of design - climatic zones, design sequence, shelter or form, land form, vegetation, water bodies, street widths, open spaces, ground character, plan form, orientation, roof form - Shading devices and their effect. | |
| **UNIT III - SUSTAINABLE MATERIALS** | **(9)** |
| Sustainability - Material conservation: concept of embodied energy, low energy materials, sustainable materials, alternative materials - handling non - process waste reduction during construction - Materials with recycled waste - Concept of carbon emission and its reduction. | |
| **UNIT IV - UTILITY OF ENERGYIN BUILDINGS** | **(9)** |
| Concept - Solar passive cooling techniques - Solar passive heating techniques - Low energy cooling techniques - Case studies - Thermal comfort - Day lighting - Ventilation. | |
| **UNIT V - GREEN BUILDING CERTIFICATION** | **(9)** |
| Bureau of energy efficiency - Functions, policies, guidelines - Green building rating systems - IGBC - LEED - GRIHA - BREEAM - Process for obtaining green certification. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**


1. Jagadish K, Venkatarama Reddy B.V and Nanjundarao K.S, "Alternative Building Materials and Technology", New age international (P) limited, 2007.
2. Aravind Krishnana , Simos Yannas, Nick Baker, Szokolay S.V, "Climate responsive architecture (A design hand book for energy efficient buildings)", Mcgraw hill education, 7th reprint, 2013.


**REFERENCES:**


1. Bureau of energy efficiency, "Energy Conservation Building Code 2007", Ministry of Power, Government of India 2007.
2. Abe Kruger," Green building Principles and practices in residential construction", Cengage learning India Pvt Ltd, 1st Edition, 2012.
3. Charles J Kibert, "Sustainable Construction Green Building Design and Delivery", John Wiley and Sons, New Jersey, 2008.
4. Jerry Yudelson, "Marketing Green Buildings: Guide for Engineering, Construction and Architecture", the Fairmont press Inc, 2006.


**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | 2 | 2 |
| 2 | | 2 | | 2 | | | 2 | | | | | 2 | | 2 |
| 3 | 2 | | | | | | | | | | 2 | | | 2 |
| 4 | 2 | 3 | | 2 | 2 | | 2 | | | | | 3 | | 3 |
| 5 | | 2 | | | | | | | | | | | | 2 |
| CO (W.A) | 2 | 2.3 | | 2 | 2 | | 2 | | | | 2 | 2.5 | 2 | 2.2 |

| 22CEX52 - BUILDING INFORMATION MODELING | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To highlight the use of BIM models based on real-world construction projects.<br>• To explain the modelling and analysis using BIM software.<br>• To give an overview of clash detection and avoidance using BIM.<br>• To give an exposure on BIM 4D and 5 D models. | | | | |

| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply BIM tools to create and manage models for different types of buildings. | Ap | 20% |
| **CO2** | Identify clash and avoid its occurrence. | An | 20% |
| **CO3** | Apply specific modeling techniques in BIM to create detailed and integrated models. | Ap | 20% |
| **CO4** | Apply 2D drawing techniques in BIM to create precise technical drawings for architectural and structural elements. | Ap | 20% |
| **CO5** | Apply the concept of BIM 4D for project scheduling. | Ap | 20% |

| **UNIT I - INTRODUCTION TO BIM** | **(9)** |
|---|---|
| Building information Modeling - Introduction and Process- Evolution of BIM - BIM model of various buildings like commercial and residential, WTP, Transportation, Airports - Isometric view - Introduction - Examples and Problems - 3D Modeling. | |
| **UNIT II - DESIGN AUTHORING AND VISUALIZATION** | **(9)** |
| Design authoring - Work flow, Discipline based modeling, Architectural, Plumbing, Energy Analysis, Design review- Views in model, Visualization models, Walkthrough and fly through the model, Layers and Properties, AR,VR and MR. | |
| **UNIT III - INTERFERENCE / CLASH CHECK** | **(9)** |
| Clash check - types of clashes - Federated model - Clash avoidance process –Clash detection process – Introduction. Clash detection - Priority Marix, Clash detection - Rules, Clash detection - Report, Clash detection - Grouping. Clash detection - Roles and Responsibilities, Clash detection Process - Demo. | |
| **UNIT IV - DOCUMENTATION, CDE AND LOE** | **(9)** |
| 2D drawings operation, cloud computing, COE - Level of detail and level of information, LOD-Structural elements - Chart and matrix. | |
| **UNIT V - 4D AND 5D IN BUILDINGINFORMATION MODELLING** | **(9)** |
| Project schedule - 4D MIM modeling - Construction analysis - 3D control and planning - BIM for safety - Disaster and risk analysis - digital fabrication- phase planning - As built / Record models - 5D in BIM - 5D BIM and quantity take off with UOM, Exercise and Demo, quantity take off, 5D - Estimation and analysis - Asset attributes and asset requirement - Infrastructure system - Information Exchange with faculty management. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**


1. Karen kensek, Doughlas Noble, "Building Information Modeling: BIM in Current and future practice", 2014.
2. Autodesk Revit 2023 - BIM Management template and family creation by ASCENT, ISBN 978-1-63057-528-1, 2023


**REFERENCES:**


1. Eastman C, Teichotz P, Sacks Rand Liston C, "BIM handbook: A guide to building information modeling for owners, managers, designers, engineers and contractors" John Wiley and Sons, 2011.
2. Hardin B and McCool D,"BIM and construction management proven tools, methods, and workflows", John Wiley and Sons, 2015.
3. Issa R R and Olbina S, "Building Information modeling Application and Practices", American Society of Civil Engineers, 2015.
4. Pittard S & Sell P, "BIM and Quantity Surveying" Routledge, 2016.


**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | 2 | | | | 3 |
| 2 | | 2 | | | | | | | | | | | | 2 |
| 3 | 3 | | | | 2 | | | | | | | 2 | 2 | |
| 4 | 2 | | 2 | | 2 | | | | | | | | | 2 |
| 5 | 3 | | | 2 | 3 | 3 | | | | 3 | | | 2 | 3 |
| **CO (W.A)** | **2.5** | **2** | **2** | **2** | **2.3** | **3** | | | | **2.5** | | **2** | **2** | **2.5** |

| 22CEX53 - ADVANCED SURVEYING | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To impart knowledge on advanced surveying methodologies, including geodetic and satellite-based surveying systems.. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Identify the principles of topographical map preparation and electronic surveying | Ap | 20% |
| **CO2** | Apply the basic principles for accurate measurement and data collection in land surveying. | Ap | 20% |
| **CO3** | Apply the working principles of electro-optical systems to perform precise surveying tasks | Ap | 20% |
| **CO4** | Analyze parameter estimation techniques used in GPS data processing to minimize errors and improve position accuracy | An | 20% |
| **CO5** | Analyze the methods for adjusting measurements in traversing and trilateration to reduce errors and improve accuracy | Ap | 20% |

| **UNIT I - FUNDAMENTALS OF TOTAL STATION AND ELECTROMAGNETIC WAVES** | **(9)** |
|---|---|
| Methods of Measuring Distance, Basic Principles of Total Station, Historical Development, Classifications, applications and comparison with conventional surveying - Applications of Electromagnetic waves. | |
| **UNIT II - ELECTRO-OPTICAL AND MICROWAVE** | **(9)** |
| Electro - optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. | |
| **UNIT III - SATELLITE SYSTEM** | **(9)** |
| Basic concepts of GPS - Historical perspective and development - applications -Geoid and Ellipsoid - satellite orbital motion - Keplerian motion - Kepler's Law - Perturbing forces -Geodetic satellite - Doppler effect. | |
| **UNIT IV - GPS DATA PROCESSING** | **(9)** |
| GPS observables - code and carrier phase observation - linear combination and derived observables - concept of parameter estimation - downloading the data - RINEX Format - Differential data processing - software modules - solutions of cycle slips. | |
| **UNIT V - SURVEYING METHODS AND APPLICATIONS** | **(9)** |
| Total Station -Traversing and Trilateration measurement and adjustment - Planimetric map and Contour map and Topography Mapping. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**


1. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 4th Edition,1996.
2. SatheeshGopi, rasathishkumar, N.madhu, "Advanced Surveying, Total Station GPS and Remote Sensing", Pearson education , 2nd Edition,2017.
3. Gunter Seeber , Satellite Geodesy, Walter De Gruyter, Berlin, 2nd Edition, 2003


**REFERENCES:**


1. R.Subramanian, "Surveying and Levelling", Oxford University Press, Second Edition, 2012.
2. Laurila, S.H. "Electronic Surveying in Practice", John Wiley and Sons Inc, 1983
3. Guocheng Xu, "GPS Theory, Algorithms and Applications", Springer - Verlag, Berlin, 3rdEdition, 2016.
4. Alfred Leick, "GPS satellite surveying", John Wiley & Sons Inc., 4th Edition, 2015.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | 2 | 2 | 2 |
| 2 | 2 | | | | | | | | | | | | | 2 |
| 3 | 2 | | | | | | | | | | | | | 2 |
| 4 | | 3 | | | 3 | | | | 3 | 3 | | | | |
| 5 | | 2 | | 2 | | 2 | | | | 2 | | | 2 | 2 |
| CO (W.A) | 2 | 2 | | 2 | 3 | 2 | | | 3 | 2.5 | | 2 | 2 | 2 |

| 22CEX54 - REMOTE SENSING AND GIS | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To imparts the knowledge on the remote sensing and its working principles.<br>• To deliver describes the image processing techniques using GIS for real time applications. | | | | |

| **Course Outcomes**<br>The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Identify the fundamental concepts in remote sensing. | Ap | 20% |
| **CO2** | Interpret the data from images through acquisition, storage, manipulation, analysis and display of satellite data. | An | 20% |
| **CO3** | Integrate remote sensing and GIS to perform raster and vector data analysis. | An | 20% |
| **CO4** | Extrapolate the database concepts of GIS for developing and improving the imagery by selecting suitable data models. | An | 20% |
| **CO5** | Compute the field applications of remote sensing and GIS with the recent advancement techniques. | Ap | 20% |

| **UNIT I - FUNDAMENTALS OF REMOTE SENSING** | **(9)** |
|---|---|
| Definition - Components of remote sensing - History of Remote sensing - Merits and demerits of data collation between conventional and remote sensing methods - Electromagnetic spectrum - Wavelength regions important to remote sensing - Particle and Wave - theory - Stefan-Boltzman and Wein's Laws - Atmospheric scattering and absorption - Atmospheric windows - Concept of Spectral Response and Spectral Signature - Spectral reflectance of EMR with earth surface - water, vegetation and soil - Platforms and Sensors. | |
| **UNIT II - IMAGE INTERPRETATION AND ANALYSIS** | **(9)** |
| Concept and types of image interpretation - Basic elements of image interpretation - Visual interpretation keys - Types of Data Products - Digital Image Processing - Pre-processing – Image compression and enhancement techniques - Multispectral Image classification - Supervised and unsupervised. | |
| **UNIT III - GEOGRAPHICAL INFORMATION SYSTEM** | **(9)** |
| GIS definition - Basic components of GIS - Data types - Spatial and non-spatial data - Raster and Vector Data - Analysis and structure of Raster and Vector data - Maps - Map projections - Types of map projections - standard GIS software - Concept of GPS and its advantages. | |
| **UNIT IV - DATA INPUT, EDITING AND ANALYSIS** | **(9)** |
| Input methods - Data stream - Data Retrieval - Query Building - Simple Spatial Analysis - Overlay Technique - Topological analysis - Modeling surfaces - TIN - DEM - DTM - Slope Model - Integration of Remote Sensing and GIS. | |

| UNIT V - MAJOR APPLICATIONS OF REMOTE SENSING AND GIS | (9) |
|---|---|
| Natural Resources Management - Land Cover and Land Use - Water Resources and Watershed management - Irrigation and Agriculture - Environmental studies - Ground Water exploration - Wasteland Management - Forest Resources - Natural Disaster Management- Land Slides, Flood Routing, Forest Fires, Earth Quakes. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**

1. Anji Reddy M, "Remote sensing and Geographical Information Systems" , Third Edition, BS Publications, India, 2006.
2. Burrough P.A. and Rachel A. McDonell, "Principles of Geographical Information Systems", Oxford Publication, 3rd Edition 2016.

**REFERENCES:**

1. Basudeb Bhatta, "Remote Sensing and GIS", Second Edition, Oxford University Press, New Delhi, 2017.
2. Thomas M.Lillesand, Ralph W. Kiefer and Jonathan W. Chipman, "Remote Sensing and Image Interpretation", John Wiley and Sons, Inc, New York, 2015.
3. Basudeb Bhatta, "Remote sensing and GIS" Oxford Publication, 2nd Edition, 2011.

**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | 2 | | | | | | | | | | |
| 2 | | 2 | | 2 | | | | | | | | | | 2 |
| 3 | | 2 | | | | | | | | | | | 2 | 2 |
| 4 | | 2 | | | | | | | | | | | | 2 |
| 5 | 2 | | | 2 | | | | | | | | 2 | 2 | 3 |
| CO (W.A) | 2 | 2 | | 2 | | | | | | | | 2 | 2 | 2.3 |

| 22CEX55 - AI IN CIVIL ENGINEERING | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To impart knowledge on application of AI tools and techniques to optimize design, construction, and maintenance processes in civil engineering projects. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Explain the concept of AIN network and general algorithm. | U | 20% |
| **CO2** | Identify the techniques to assess the performance of geotechnical characteristics against safety and cost criteria. | An | 20% |
| **CO3** | Examine the structural elements by using AI. | An | 20% |
| **CO4** | Analyze the AI based construction activities and scheduling. | An | 20% |
| **CO5** | Apply the AI in traffic management system. | Ap | 20% |

| **UNIT I - INTRODUCTION TO ARTIFICIAL INTELLIGENCE** | **(9)** |
|---|---|
| Introduction to AI - Applications of AI in Engineering - Implementation of AI in Civil Engineering - Fundamentals of AIN Networks in AI - Genetic algorithm - Machine Learning - Regression model - Dimension Analysis - Simulation Theory - Game theory and its applications. | |
| **UNIT II - APPLICATION OF AI IN GEOTECHNICAL ENGINEERING** | **(9)** |
| Expert system for landslide hazard and risk management - Advisor on the selection of Earth retaining structures - Development of a prolonged based expert system for ground water control - Real time expert system for excavation - Knowledge based assistant for earthquake resistant design in AI - Case studies. | |
| **UNIT III - APPLICATION OF AI IN STRUCTURAL ENGINEERING** | **(9)** |
| Prolog standards for structural design - Expert system for conceptual design of bridges - structural design using intelligent objects - Expert system for design of offshore structures - knowledge based system for design of reinforced concrete walls - damage assessment based on fuzzy reasoning using AI - ANN - Expert system for base plates - Expert system for structural inspection and maintenance - case studies. | |
| **UNIT IV - APPLICATION OF AI IN CONSTRUCTION MANAGEMENT** | **(9)** |
| Knowledge based regulation processing for site development - Key approach to site layout problems - Duration of each activity forecasting techniques - Expert system for construction industry - A fuzzy expert system for priority ranking in network resource allocation - Expert system in network resource allocation - generation and scheduling of construction activities - case studies. | |
| **UNIT V - APPLICATION OF AI IN TRANSPORTATION ENGINEERING** | **(9)** |
| Traffic control system of non - autonomous vehicles at signalized road intersection - traffic lights - traffic patterns - improved safety services - application in traffic management system - application in health monitoring - case studies. | |
| | **TOTAL (L:45) = 45 PERIODS** |

**TEXTBOOKS:**


1. Prateek J," Artificial Intelligence with Python", Packt Publishing, Birmingham, 1st Edition, 2017.
2. Daugherty Paul R, and James Wilson H, "Human Machine Reimaging Working the Age of AI" Harvand Business Press, 2nd Edition, 2018.


**REFERENCES:**


1. Husai, Amir, "The sentient machine: The coming age of artificial Intelligence", Scribner publishing, 1st Edition, 2017.
2. Kaplan Jerry, "Artificial Intelligence: what everyone needs to Know", Oxford University Press, 1st Edition, 2018.
3. B.H Topping, "Artificial Intelligence Techniques and Application for Civil and Structural Engineers", Civil Compress press, Edinburgh, 1st Edition, 1989.
4. https://nptel.ac.in/courses/106102220.


**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | 2 |
| 2 | 2 | | | 2 | | | | | | | | 2 | | 2 |
| 3 | | | | 2 | | | | | | | | | 2 | 2 |
| 4 | | 2 | | | | | | | | | | 2 | | 2 |
| 5 | 2 | | | | | | | | | | | | 2 | |
| CO (W.A) | 2 | 2 | | 2 | | | | | | | | 2 | 2 | 2 |

| 22CEX56 - RAINWATER HARVESTING | | | | | |
|---|---|---|---|---|---|
| | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | | |
| **Course Objective:** | • To impart knowledge and skills relevant to water conservation and management towards achieving the sustainability in water resources. | | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Analyse the need and importance of water conservation through global and Indian practices of rainwater harvesting. | Ap | 20% |
| **CO2** | Apply the concepts of hydrology and groundwater in the estimation of runoff and recharge potentials. | An | 20% |
| **CO3** | Interpret the various types of rainwater harvesting methods and apply it on the field. | An | 20% |
| **CO4** | Design the various RWH structures to harvest the rainwater in surface and subsurface. | An | 20% |
| **CO5** | Explain the difficulties of RWH, evaluation methods and maintenance through various case studies. | Ap | 20% |

| **UNIT I - BASICS OF RWH** | **(9)** |
|---|---|
| Water and its sources - Need for water conservation - Types of water demand - Conservation Methods - Global and Indian perspectives - National mission and goals towards rainwater harvesting - National water policy - Legislation on rainwater harvesting in India and Tamil Nadu. | |
| **UNIT II - HYDROLOGY AND GROUND WATER** | **(9)** |
| Hydrological cycle - Precipitation - Rainfall measurement - Rain-gauges - Hyetograph - Infiltration - Runoff estimation - Rooftop runoff estimation. Ground water - Aquifer Properties - Darcy law and well hydraulics - Steady flow. | |
| **UNIT III - METHODS OF RAINWATER HARVESTING** | **(9)** |
| Rainwater harvesting potential of an area - Traditional harvesting practices - Rooftop harvesting - Methods of RWH structures - Site selection for rainwater harvesting - Surface runoff Harvesting - Ground water recharge - Artificial recharge. | |
| **UNIT IV - DESIGN OF RAINWATER HARVESTING STRUCTURES** | **(9)** |
| Design Considerations - Components of Rainwater harvesting system - Simple roof water collection system - Design of Storage structure - Design of Recharge structures - Recharge pit - Recharge trench - Recharge well - Gully plug - Contour bund - Percolation tank - Check dam - Recharge shaft - Efficiency of RWH system | |
| **UNIT V - MANAGEMENT OF RWH AND CASE STUDIES** | **(9)** |
| Difficulties in RWH - At catchment level - At household level - Evaluation of RWH systems - Maintenance of RWH structures - Modernisation of RWH system - Case studies on best practice of RWH in urban - Success stories of Contemporary practices of RWH in India. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXTBOOKS:**


1. Ramakrishnan S, "Ground Water", Scitech Publications (India) Pvt Ltd, 2010.
2. Jayarami Reddy P, "A Text book of Hydrology" Firewall media Publication, 2005.
3. Raghunath H M, "Ground Water" 3rd Edition, New Age International, 2007.


**REFERENCES:**


1. Rain water Harvesting Techniques to Augment Ground Water: Ministry of Water Resources Central Ground Water Board Faridabad, 2003.
2. Rainwater Harvesting: Indian Railway Institute of Civil Engineering Pune, October 2015.
3. A Manual on "Rainwater Harvesting and Conservation": Government of India, Consultancy Service Organization Central Public Works Department, New Delhi.
4. "A Water Harvesting Manual for Urban Areas" issued by Centre for Science and Environment.
5. "Traditional Water Harvesting Systems of India" C.P.R. Environmental Education Centre, Chennai, India (2004).
6. "Handbook on rainwater harvesting storage options", Ministry of Water and Environment, Uganda.


**Mapping of COs with POs / PSOs**

| Cos | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | 2 | | | 2 |
| 2 | 2 | | | 2 | | 2 | 2 | | | | | 2 | | 2 |
| 3 | | 3 | | 2 | | | 2 | | | | 3 | 2 | 3 | 3 |
| 4 | | 2 | | | | | 3 | | | | 3 | 2 | | 2 |
| 5 | 2 | | | 2 | | 2 | | | 3 | 3 | | 3 | 2 | |
| **CO (W.A)** | **2** | **2** | | **2** | | **2** | **2.3** | | **3** | **3** | **2.7** | **2.3** | **2.5** | **2.3** |

| 22CEX57 - DISASTER PREPAREDNESS AND PLANNING | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | |
| **Course Objective:** | • To imparts knowledge about various natural hazards like earthquakes, slope stability, floods, droughts, and Tsunami and the mitigation measures | | | |

| Course Outcomes<br>The students will be able to | | Cognitive Level | Weightage of COs in End Semester Examination |
|---|---|---|---|
| **CO1** | Identify the principles and components of disaster management. | Ap | 20% |
| **CO2** | Apply disaster management principles to mitigate the risks associated with man-made disasters. | Ap | 20% |
| **CO3** | Assess the effectiveness of disaster response and recovery efforts in addressing impacts across all dimensions. | An | 20% |
| **CO4** | Analyze the factors contributing to higher risk and vulnerability in specific populations or locations. | An | 20% |
| **CO5** | Analyse the risk and vulnerability in disaster management. | An | 20% |

| **UNIT I - INTRODUCTION** | **(9)** |
|---|---|
| Concepts and definitions: disaster, hazard, vulnerability, risks - severity, frequency and details, capacity, impact, prevention, mitigation. | |
| **UNIT II - DISASTERS** | **(9)** |
| Disasters classification - natural disasters - floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires - manmade disasters - industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes - hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility. | |
| **UNIT III - DISASTER IMPACTS** | **(9)** |
| Disaster impacts - environmental, physical, social, ecological, economic, political - health, psycho-social issues; demographic aspects - gender, age, special needs - hazard locations - global and national disaster trends - climate change and urban disasters. | |
| **UNIT IV - DISASTER RISK REDUCTION (DRR)** | **(9)** |
| Hazards, Risks and Vulnerabilities - Disasters in India, Assessment of Disaster Vulnerability of a location and vulnerable groups - Preparedness and Mitigation measures for various Disasters - Mitigation through capacity building - Preparation of Disaster Management Plans. | |

| UNIT V - DISASTERS, ENVIRONMENT AND DEVELOPMENT | (9) |
|---|---|
| Legislative responsibilities of disaster management - Disaster management act 2005 - post disaster recovery and rehabilitation, Relief and Logistics Management - disaster related infrastructure development - Post Disaster, Emergency Support Functions and their coordination mechanism. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**

1. Ramana Murthy, - Disaster Management, Dominant, New Delhi, 2004.
2. RajdeepDasgupta, Disaster Management and Rehabilitation, Mittal Publishers, New Delhi, 2007.

**REFERENCES:**


1. Murthy D B N, "Disaster Management: Text and Case Studies", Deep and Deep Publications (P) Ltd., New Delhi, 2007.
2. Sundar I and Sezhiyan T, "Disaster Management", Sarup and Sons, New Delhi, 2007.
3. Khanna B K, "All You Wanted To Know About Disasters", New India Publishing Agency, New Delhi, 2005.
4. "Disaster Management in India - A Status Report", Published by the National Disaster Management Institute, Ministry of Home Affairs, Govt. of India, 2004.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | | | | | | | | | | | | | 2 |
| 2 | 2 | | | 2 | | | | | | | | | 2 | 2 |
| 3 | | 3 | | 2 | | | | | | | | 2 | | 2 |
| 4 | | 2 | | | | | | | | | 2 | | | |
| 5 | | 2 | | 2 | | | | | | | | 2 | 2 | 2 |
| CO (W.A) | 2 | 2.3 | | 2 | | | | | | | 2 | 2 | 2 | 2 |

| 22CEX58 - CONSTRUCTION ECONOMICS AND FINANCE | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| **PREREQUISITE : NIL** | | | | |
| **Course Objective:** | • To expose the students to the concepts of construction finance such as comparing alternatives proposals, evaluating alternative investments, cost estimating and management of accounting. | | | |

| **Course Outcomes** The students will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply time-value of money concept to compare alternatives. | Ap | 20% |
| **CO2** | Apply these methods to compare different investment alternatives and determine the most financially viable option. | Ap | 20% |
| **CO3** | Analyse equipment cost and replacement alternatives. | An | 20% |
| **CO4** | Prepare different types of cost estimates. | An | 20% |
| **CO5** | Apply the financial management procedures and estimate the financial ratios. | Ap | 20% |

| **UNIT I - ENGINEERING ECONOMICS** | **(9)** |
|---|---|
| Basic principles - Time value of money, Quantifying alternatives for decision making, Cash flow diagrams, Equivalence - Single payment in the future (P/F, F/P), Present payment compared to uniform series payments (P/A, A/P), Future payment compared to uniform series payments (F/A, A/F), Arithmetic gradient, Geometric gradient. Funds - cash flow, sources of funds - Histograms and S - Curves - Earned Value. | |
| **UNIT II - COMPARISON OF ALTERNATIVES** | **(9)** |
| Present, future and annual worth method of comparing alternatives, Rate of return, Incremental rate of return, Break - even comparisons, Capitalized cost analysis, Benefit - cost analysis. Depreciation, Inflation and Taxes. | |
| **UNIT III - EQUIPMENT ECONOMICS** | **(9)** |
| Equipment costs, Ownership and operating costs, Buy/Rent/Lease options, Replacement analysis. | |
| **UNIT IV - COST ESTIMATING** | **(9)** |
| Types of Estimates, Approximate estimates - Unit estimate, Factor estimate, Cost indexes, Parametric estimate, Life cycle cost. | |
| **UNIT V - FINANCIAL MANAGEMENT** | **(9)** |
| Construction accounting, Chart of Accounts, Financial statements - Profit and loss, Balance sheets, Financial ratios, Working capital management. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**

1. Bose, D. C., "Fundamentals of Financial management", 2nd ed., PHI, New Delhi, 2011.
2. Prasanna Chandra, "Projects: Planning, Analysis, Selection, Financing, Implementation and Review", McGraw- Hill Education, 2019.

**REFERENCES:**


1. Gould, F. E., "Managing the Construction Process", 4th ed., Pearson Education, 2012.
2. Harris, F. , McCaffer, R. and Edum-Fotwe, F., "Modern Construction Management", 6th ed., Wiley India, New Delhi, 2012.
3. Jha, K. N., "Construction Project Management, Theory and Practice", Pearson, New Delhi, 2015.
4. Peurifoy, R. L. and Oberlender, G. D., "Estimating Construction Costs", 6th ed., McGraw-Hill, 2015.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | 3 | | | | | | | | | 2 | | | 2 |
| 2 | 2 | | | | | | | | | | 2 | | | 2 |
| 3 | 3 | 3 | | | | | | | | | 2 | | | 3 |
| 4 | 2 | 3 | | | | | | | | | 2 | | | 2 |
| 5 | 3 | 3 | | | | | | | | | 2 | | | 2 |
| **CO (W.A)** | **2.4** | **3** | | | | | | | | | **2** | | | **2.2** |

| 22GEA02 - PRINCIPLES OF MANAGEMENT | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| **PRE-REQUISITE: NIL** | | | | |

| | |
|---|---|
| **Course Objective:** | • To provide with a foundational understanding of management concepts and practices.<br>• To equip students with the knowledge and skills necessary to manage and lead organizations effectively, understanding both theoretical frameworks and practical applications in management.<br>• To learn about various planning tools and decision-making processes crucial for organizational success.<br>• To gain insights into human resource management functions.<br>• To study effective communication strategies and the impact of information technology on communication and how effective control can lead to improved productivity and organizational performance. |

| **Course Outcomes**<br>The Student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply key management theories and practices to real-world business scenarios, demonstrating the ability to implement management functions. | Ap | 20% |
| **CO2** | Analyze human resource management practices, evaluating how recruitment, training, performance appraisal, and employee relations contribute to organizational success. | An | 30% |
| **CO3** | Evaluate strategic decisions and their impacts on organizational performance,the effectiveness of communication strategies and the use of information technology in facilitating efficient and effective communication within organizations. | E | 30% |
| **CO4** | Create comprehensive strategic plans and organizational policies and design control systemsto ensure continuous improvement in productivity and organizational performance. | C | 20% |
| **CO5** | Engage in independent study as a member of a team and develop higher-order thinking skills that are crucial for effective management and leadership in complex organizational settings with assignments or case studies. | Ap | Internal Assessment |

| **UNIT I -INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS** | **(9)** |
|---|---|
| Definition of Management - Science or Art - Manager Vs Entrepreneur - types of managers -managerial roles and skills - Evolution of Management - Scientific, human relations, system and contingency approaches - Types of Business organization-Organization culture and Environment - Current trends and issues in Management. | |
| **UNIT II -PLANNING** | **(9)** |
| Nature and purpose of planning - planning process - types of planning - objectives - setting objectives - policies - Planning premises - Strategic Management - Planning Tools and Techniques - Decision making steps and process. | |
| **UNIT III -ORGANISING** | **(9)** |
| Nature and purpose - Formal and informal organization - organization chart - organization structure - types - Line and staff authority - departmentalization -delegation of authority - centralization and decentralization -Job Design - Human Resource Management - HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management | |

| UNIT IV - DIRECTING | (9) |
|---|---|
| Foundations of individual and group behaviour - motivation -motivation theories - motivational techniques - job satisfaction - job enrichment - leadership - types and theories of leadership -communication - process of communication - barrier in communication - effective communication -communication and IT. | |
| **UNIT V - CONTROLLING** | **(9)** |
| System and process of controlling - budgetary and non-budgetary control techniques - use of computers and IT in Management control - Productivity problems and management - control and performance -direct and preventive control -reporting. | |
| **TOTAL (L:45) : 45 PERIODS** | |

**TEXT BOOKS:**

1. Harold Koontz, Heinz Weihrichand Mark V. Cannice"Essentials of Management: An International, Innovation, and Leadership Perspective", 11th Edition, Tata McGraw-Hill Education, 2021.
2. J.A.F. Stoner, R.E. Freeman, and Daniel R. Gilbert "Management", 6th Edition, Pearson Education, 2018.

**REFERENCES:**


1. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", 6th Edition, Pearson Education, 2004.
2. Robert Kreitner & Mamata Mohapatra, "Management", Biztantra, 2008.
3. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management", 7th Edition, Pearson Education, 2011.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata Mcgraw Hill, 1999.


**Mapping of COs with POs / PSOs**

| COs | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | | | | | | | | | | 3 | | | |
| 2 | | 3 | | | | | | | | | 3 | | | |
| 3 | | | | | | | | | | 3 | | | | |
| 4 | | | 3 | | | | | | | 3 | | | | |
| 5 | | | | | | | | | | | 3 | 3 | | |
| CO (W.A) | 3 | 3 | 3 | | | | | | | 3 | 3 | 3 | | |

| 22GEA03 - TOTAL QUALITY MANAGEMENT | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To Recognize the importance of quality councils and strategic planning in TQM.<br>• To Explore the elements and historical development of TQM.<br>• To Foster employee involvement through motivation, empowerment, teamwork, and recognition.<br>• To Implement continuous process improvement methods like Juran's Trilogy, PDSA Cycle, 5S, and Kaizen.<br>• To Conduct quality audits and understand the introduction to other ISO standards like ISO 14000, IATF 16949, TL 9000, IEC 17025, ISO 18000, ISO 20000, ISO 22000, and ISO 21001. |

| Course Outcomes<br>The Student will be able to | | Cognitive Level | Weightage of COs in End Semester Examination |
|---|---|---|---|
| **CO1** | Describe the elements and principles of Total Quality Management (TQM). | Ap | 30% |
| **CO2** | Apply continuous process improvement methodologies such as Juran's Trilogy, PDSA Cycle, 5S, and Kaizen. | Ap | 20% |
| **CO3** | Apply various quality tools and techniques in both manufacturing and service industry. | Ap | 20% |
| **CO4** | Develop strong supplier partnerships and understand supplier selection, rating, and relationship development. | An | 20% |
| **CO5** | Choose appropriate quality standards and implement them in the respective industry App. | E | 10% |

| **UNIT I - QUALITY CONCEPTS AND PRINCIPLES** | **(9)** |
|---|---|
| Definition of Quality - Dimensions of Quality - Quality Planning - Quality Assurance and Control - Quality Costs with Case Studies - Elements / Principles of TQM - Historical Review - Leadership - Qualities / Habits - Quality Council - Quality Statements, Strategic Planning - Importance - Case Studies - Deming Philosophy - Barriers to TQM Implementation - Cases with TQM Success and Failures. | |
| **UNIT II - TQM PRINCIPLES AND STRATEGIES** | **(9)** |
| Customer Satisfaction - Customer Perception of Quality - Customer Complaints - Customer Retention, Employee Involvement - Motivation - Empowerment - Teams - Recognition and Reward - Performance Appraisal, Continuous Process Improvement - Juran's Trilogy - PDSA Cycle - 5S - Kaizen, Supplier Partnership - Partnering - Sourcing - Supplier Selection - Supplier Rating - Relationship Development, Performance Measures - Purpose - Methods - Cases. | |
| **UNIT III - CONTROL CHARTS FOR PROCESS CONTROL** | **(9)** |
| Basic Seven Tools of Quality and its Role in Quality Control, Statistical Fundamentals - Measures of Central Tendency and Dispersion, Population and Sample - Normal Curve - Control Charts for Variables and Attributes - Process Capability - Case Study- Introduction to Six Sigma. | |
| **UNIT IV - TQM-MODERN TOOLS** | **(9)** |
| New Seven Tools of Quality, Benchmarking - Need - Types and Process, Quality Function Deployment - House of Quality (HOQ) Construction - Case Studies, Introduction to Taguchi's Robust Design - Quality Loss Function - Design of Experiments (DOE), Total Productive Maintenance (TPM) - Uptime | |

| | |
|---|---|
| Enhancement, Failure Mode and Effect Analysis (FMEA) - Risk Priority Number (RPN) – Process - Case Studies. | |
| **UNIT V - QUALITY SYSTEMS** | **(9)** |
| Need for ISO 9000 and Other Quality Systems - ISO 9000: 2015 Quality System – Elements - Implementation of Quality System - Documentation - Quality Auditing, Introduction to ISO 14000 - IATF 16949 - TL 9000-IEC 17025 - ISO 18000 - ISO20000 - ISO 22000 - ISO21001. Process of Implementing ISO - Barriers in ISO Implementation. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOK:**

1. Besterfield Dale H., Besterfield Carol, Besterfield Glen H., Besterfield Mary, UrdhwareshеHemant, UrdhwareshеRashmi "Total Quality Management", 5th Edition, Pearson Education, Noida, 2018.

**REFERENCES:**

1. SubburajRamasamy, "Total Quality Management", McGraw Hill Education, New Delhi, 2017.
2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, Cengage Learning, 2012.
3. David Goetsch& Stanley Davis, "Quality Management for Organizational Excellence: Introduction to Total Quality", 8thEdition,Pearson, 2017.

**Mapping of COs with POs / PSOs**

| | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | 3 | | | | | | | | | | | | | |
| **2** | 3 | | | | | | | | | | | | | |
| **3** | 3 | | | | | | | | | | | | | |
| **4** | | 3 | | | | | | | | | | | | |
| **5** | 3 | | | | 2 | | | | | | | | | |
| **CO (W.A)** | **3** | **3** | | | **2** | | | | | | | | | |

| 22GEA04 - PROFESSIONAL ETHICS | | | | |
|---|---|---|---|---|
| | L | T | P | C |
| | 3 | 0 | 0 | 3 |

**PREREQUISITE : NIL**

| | |
|---|---|
| **Course Objective:** | • To develop students' ability to identify, analyse, and resolve ethical dilemmas in engineering contexts, fostering a commitment to professional responsibility, integrity, and ethical decision-making.<br>• To provide engineering students with a comprehensive understanding of ethical principles and practices in the engineering profession.<br>• To Familiarize students with key ethical theories, principles, and frameworks that guide ethical decision-making in professional practice.<br>• To Foster the ability to communicate ethical concerns and collaborate effectively with diverse stakeholders, including colleagues, clients, and the public.<br>• To Encourage students to uphold integrity, honesty, and accountability in their professional activities, fostering a culture of trust and reliability. |

| **Course Outcomes** The Student will be able to | | **Cognitive Level** | **Weightage of COs in End Semester Examination** |
|---|---|---|---|
| **CO1** | Apply ethical reasoning to evaluate and resolve these issues. | Ap | 30% |
| **CO2** | Apply ethical principles and reasoning to analyze real-world case studies in engineering. | Ap | 30% |
| **CO3** | Analyze the importance of ethics in professional practice. | An | 20% |
| **CO4** | Develop the ability to make informed and ethical decisions in engineering practice. | An | 10% |
| **CO5** | Recognize the importance of continuous learning and professional development in maintaining ethical standards. | E | 10% |

| **UNIT I - INTRODUCTION TO PROFESSIONAL ETHICS** | **(9)** |
|---|---|
| Definition and Importance of Ethics, Ethical Theories and Principles, Ethics vs. Morals vs. Values, Role of Ethics in Engineering. | |
| **UNIT II - PROFESSIONAL RESPONSIBILITY AND CODES OF CONDUCT** | **(9)** |
| Professional Responsibility and Accountability, Codes of Conduct in Engineering (e.g., IEEE, NSPE), Conflicts of Interest and Whistle blowing, Case Studies. | |
| **UNIT III - ETHICAL DECISION-MAKING AND PROBLEM-SOLVING** | **(9)** |
| Ethical Decision-Making Models, Tools and Frameworks for Ethical Analysis, Resolving Ethical Dilemmas, Case Studies. | |
| **UNIT IV - LEGAL AND REGULATORY ASPECTS** | **(9)** |
| Legal Frameworks Governing Engineering Practice, Intellectual Property Rights, Health, Safety, and Environmental Regulations, Case Studies. | |
| **UNIT V - SOCIAL AND ENVIRONMENTAL RESPONSIBILITY** | **(9)** |
| Social Responsibility of Engineers, Sustainable Engineering Practices, Impact of Engineering on Society and Environment, Case Studies. | |
| **TOTAL (L:45) = 45 PERIODS** | |

**TEXT BOOKS:**

1. Charles E. Harris Jr., Michael S. Pritchard, and Michael J. Rabins, "Engineering Ethics: Concepts and Cases" 6th Edition, 2018.
2. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", 5th Edition 2010.
3. by M. Govindarajan, S. Natarajan, and V. S. Senthil Kumar,"Professional Ethics and Human Values",Ist Edition 2006.

**REFERENCES:**

1. Stephen H. Unger, "Engineering Ethics: Real-World Case Studies"
2. Online Ethics Center for Engineering and Science - www.onlineethics.org
3. National Society of Professional Engineers (NSPE) - www.nspe.org

**Mapping of COs with POs / PSOs**

| | POs | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **1** | 3 | | | | | | | | | | | | | |
| **2** | 3 | | | | | | | | | | | | | |
| **3** | | 3 | | | | | | | | | | | | |
| **4** | | 3 | | | | | | | | | | | | |
| **5** | | | | | | | | 3 | | | | | | |
| **CO (W.A)** | **3** | **3** | | | | | | **3** | | | | | | |