# REGULATION 2017

# COURSE STRUCTURE

# SYLLABUS

# DEPARTMENT OF CIVIL ENGINEERING

**GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022**

**(Affiliated to Biju Patnaik University of Technology, Rourkela)**

**Accredited by NAAC with 'A' Grade with a CGPA of 3.28/4.00**
**Accredited by NBA**

**4 Year B.Tech Degree Programme**

**Regulation 2017**

## *Vision of the Department:*

To impart knowledge and excellence in Civil Engineering and Technology with global perspective and to make them ethically strong engineers to build the nation and to achieve standards of quality education with keeping in pace with rapidly changing in technology.

## *Mission of the Department:*

- To impart latest technical knowledge of Civil Engineering with the state of art infrastructure and training methods.
- To provide global competency in the field of structural engineering with interface computer applications like Staad-Pro, AutoCAD etc.
- To make the students industry ready/suitable and to supplement the growth of the nation.

## Programme Educational Objectives:

**PEO-1:**
To achieve a high level of technical expertise to shine in higher education / profession by obtaining knowledge in basic sciences, design and drawing and engineering principles
**PEO-2:**
To explore and apply the modern engineering tools for planning, design, execution and maintenance of works that is technically viable, economically and socially acceptable
**PEO-3:**
To develop good communication skills, team work in their responsibilities with excellence and to be ready to take up challenges in the current scenario

## Programme Specific Outcomes:

1. ***PSO1:*** Analyze, Design, Construct, Maintain and Operate infrastructural projects
2. ***PSO 2:*** Assess the environmental impact of various projects and take required measures to curb environmental deterioration
3. ***PSO 3:*** Able to use latest software pertaining to various streams of Civil Engineering.

## PROGRAM OUTCOMES

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

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

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

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

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

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

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

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

11. **Project management and finance**: 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.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage e in independent and life-long learning in the broadest context of technological change.

## FIRST YEAR

| 1ST SEMESTER | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sl. No. | Course Category | Course Code | Course Title | Hours per week | | | Credits |
| | | | | L | T | P | |
| | | | **THEORY** | | | | |
| 1 | BS | BBSBS1010 | Engineering Mathematics-I | 3 | 1 | 0 | 4 |
| 2 | BS | BBSBS1021<br>BBSBS1022 | Engineering Physics<br>Engineering Chemistry | 3 | 0 | 0 | 3 |
| 3 | ES | BBSES1031<br>BBSES1032 | Basics of Mechanics<br>Basics of Thermodynamics | 3 | 0 | 0 | 3 |
| 4 | ES | BBSES1041<br>BBSES1042 | Basics of Electronics<br>Basics of Electrical Engineering | 3 | 0 | 0 | 3 |
| 5 | ES | BBSES1050 | Programming in 'C' | 3 | 0 | 0 | 3 |
| 6 | HS | BBSHS1060 | Communicative English-I | 2 | 0 | 0 | 2 |
| | | | **PRACTICAL / SESSIONAL** | | | | |
| 7 | BS | BBSBS1121<br>BBSBS1122 | Engineering Physics Laboratory<br>Engineering Chemistry Laboratory | 0 | 0 | 2 | 1 |
| 8 | ES | BBSES1141<br>BBSES1142 | Basics of Electronics Laboratory<br>Basics of Electrical Engineering Laboratory | 0 | 0 | 2 | 1 |
| 9 | ES | BBSES1150 | 'C' Programming Laboratory | 0 | 0 | 2 | 1 |
| 10 | HS | BBSHS1160 | Communicative English-I Laboratory | 0 | 0 | 2 | 1 |
| 11 | ES | BBSES1171<br>BBSES1172 | Engineering Drawing<br>Engineering Workshop | 0 | 0 | 2 | 1 |
| 12 | MC | BBSHS1180 | NSS / NCC | 0 | 0 | 2 | 1 |
| | | **TOTAL:** | | **17** | **1** | **12** | **24** |

| 2ND SEMESTER | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sl. No. | Course Category | Course Code | Course Title | Hours per week | | | Credits |
| | | | | L | T | P | |
| | | | **THEORY** | | | | |
| 1 | BS | BBSBS2010 | Engineering Mathematics-II | 3 | 1 | 0 | 4 |
| 2 | BS | BBSBS1021<br>BBSBS1022 | Engineering Physics<br>Engineering Chemistry | 3 | 0 | 0 | 3 |
| 3 | ES | BBSES1031<br>BBSES1032 | Basics of Mechanics<br>Basics of Thermodynamics | 3 | 0 | 0 | 3 |
| 4 | ES | BBSES1041<br>BBSES1042 | Basics of Electronics<br>Basics of Electrical Engineering | 3 | 0 | 0 | 3 |
| 5 | ES | BBSES2050 | Data Structure using 'C++' | 3 | 0 | 0 | 3 |
| 6 | HS | BBSHS2060 | Communicative English-II | 2 | 0 | 0 | 2 |
| | | | **PRACTICAL / SESSIONAL** | | | | |
| 7 | BS | BBSBS1121<br>BBSBS1122 | Engineering Physics Laboratory<br>Engineering Chemistry Laboratory | 0 | 0 | 2 | 1 |
| 8 | ES | BBSES1141<br>BBSES1142 | Basics of Electronics Laboratory<br>Basics of Electrical Engineering Laboratory | 0 | 0 | 2 | 1 |
| 9 | ES | BBSES2150 | Data Structures using 'C++' Laboratory | 0 | 0 | 2 | 1 |
| 10 | HS | BBSHS2160 | Communicative English-II Laboratory | 0 | 0 | 2 | 1 |
| 11 | ES | BBSES1171<br>BBSES1172 | Engineering Drawing<br>Engineering Workshop | 0 | 0 | 2 | 1 |
| 12 | MC | BBSHS2180 | YOGA / Project Work | 0 | 0 | 2 | 1 |
| | | **TOTAL:** | | **17** | **1** | **12** | **24** |

## SECOND YEAR

| 3RD SEMESTER | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | |
| | | | **THEORY** | | | | |
| 1 | PC | BCEPC3010 | Mechanics of Solids | 3 | 1 | 0 | 4 |
| 2 | PC | BCEPC3020 | Building Materials & Building Construction | 3 | 0 | 0 | 3 |
| 3 | PC | BCEPC3030 | Surveying –I | 3 | 0 | 0 | 3 |
| 4 | BS | BBSBS3040 | Engineering Mathematics-III | 3 | 1 | 0 | 4 |
| 5 | ES | BCSES3051 / BCSES3052 | Object Oriented Programming through JAVA / Database Management Systems | 3 | 0 | 0 | 3 |
| 6 | BS/ HS | BBSBS3061 / BMSHS3062 | Environmental Engineering and Safety / Engineering Economics and Costing | 3 | 0 | 0 | 3 |
| | | | **PRACTICAL / SESSIONAL** | | | | |
| 7 | PC | BCEPC3110 | Mechanics of Solids Laboratory | 0 | 0 | 2 | 1 |
| 8 | PC | BCEPC3120 | Building Drawing Laboratory | 0 | 0 | 2 | 1 |
| 9 | PC | BCEPC3130 | Survey Field Work | 0 | 0 | 2 | 1 |
| 10 | ES | BCSES3151 / BCSES3152 | JAVA Programming Laboratory / Database Management Systems Laboratory | 0 | 0 | 2 | 1 |
| | | **TOTAL:** | | **18** | **2** | **8** | **24** |

| 4TH SEMESTER | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | |
| | | | **THEORY** | | | | |
| 1 | PC | BCEPC4010 | Geotechnical Engineering-I | 3 | 1 | 0 | 4 |
| 2 | PC | BCEPC4020 | Surveying –II | 3 | 0 | 0 | 3 |
| 3 | PC | BCEPC4030 | Fluid Mechanics & Hydraulic Machines | 3 | 1 | 0 | 4 |
| 4 | PC | BCEPC4040 | Structural Analysis –I | 3 | 0 | 0 | 3 |
| 5 | ES | BCEES3051 / BCSES3052 | Object Oriented Programming through JAVA / Database Management Systems | 3 | 0 | 0 | 3 |
| 6 | BS/ HS | BBSBS3061 / BMSHS3062 | Environmental Engineering and Safety / Engineering Economics and Costing | 3 | 0 | 0 | 3 |
| | | | **PRACTICAL / SESSIONAL** | | | | |
| 7 | PC | BCEPC4110 | Geotechnical Engineering Laboratory | 0 | 0 | 2 | 1 |
| 8 | PC | BCEPC4120 | Surveying –II Laboratory | 0 | 0 | 2 | 1 |
| 9 | PC | BCEPC4130 | Fluid Mechanics & Hydraulic Machines Laboratory | 0 | 0 | 2 | 1 |
| 10 | ES | BCSES3151 / BCSES3152 | JAVA Programming Laboratory / Database Management Systems Laboratory | 0 | 0 | 2 | 1 |
| | | **TOTAL:** | | **18** | **2** | **8** | **24** |

## THIRD YEAR

| 5TH SEMESTER | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | |
| | | | **THEORY** | | | | |
| 1 | PC | BCEPC5010 | Design of Concrete Structure | 3 | 1 | 0 | 4 |
| 2 | PC | BCEPC5020 | Transportation Engineering-I | 3 | 0 | 0 | 3 |
| 3 | PC | BCEPC5030 | Irrigation Engineering | 3 | 0 | 0 | 3 |
| 4 | PE | BCEPE5041 | Concrete Technology | 3 | 0 | 0 | 3 |
| | | BCEPE5042 | Remote Sensing Techniques and GIS | | | | |
| | | BCEPE5043 | Traffic Engineering and Transportation Planning | | | | |
| 5 | OE | B**OE50** | Open elective ***(Any One)*** | 3 | 0 | 0 | 3 |
| | | B**OE50** | | | | | |
| | | B**OE50** | | | | | |
| 6 | BS/ HS | BBSBS5061 | Optimization in Engineering | 3 | 0 | 0 | 3 |
| | | BMSHS5062 | Organizational Behaviour | | | | |
| | | | **PRACTICAL / SESSIONAL** | | | | |
| 7 | PC | BCEPC5110 | Transportation Engineering-I Lab | 0 | 0 | 2 | 1 |
| 8 | PC | BCEPC5120 | Design of Concrete Structure Lab | 0 | 0 | 2 | 1 |
| 9 | PC | BCEPC5130 | Irrigation Engineering Lab | 0 | 0 | 2 | 1 |
| 10 | PC | BCEPC5150 | *Skill Development Project and Hands on Training | 0 | 0 | 2 | 1 |
| 11 | PC | BCEPC5170 | ^Summer Internship-I | 0 | 0 | 2 | 1 |
| | | **TOTAL:** | | **18** | **1** | **10** | **24** |

*College should conduct at least one NSDC program under this category.

^ Four (4) weeks duration summer internship either in industry or in an R&D organization, including educational institutes with excellent research culture. The student is expected to submit a formal report at the end of the programme.

| 6TH SEMESTER | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | |
| | | | **THEORY** | | | | |
| 1 | PC | BCEPC6010 | Design of Steel Structure | 3 | 1 | 0 | 4 |
| 2 | PC | BCEPC6020 | Structural Analysis II | 3 | 0 | 0 | 3 |
| 3 | PC | BCEPC6030 | Transportation Engineering-II | 3 | 0 | 0 | 3 |
| 4 | PE | BCEPE6041 | Water Supply & Sanitary Engineering | 3 | 0 | 0 | 3 |
| | | BCEPE6042 | Prefabricated Structures | | | | |
| | | BCEPE6043 | Pavement Engineering | | | | |
| 5 | OE | B**OE60** | Open Elective ***(Any One)*** | 3 | 0 | 0 | 3 |
| | | B**OE60** | | | | | |
| | | B**OE60** | | | | | |
| 6 | BS / HS | BBSBS5061 | Optimization in Engineering | 3 | 0 | 0 | 3 |
| | | BMSHS5062 | Organizational Behaviour | | | | |
| | | | **PRACTICAL / SESSIONAL** | | | | |
| 7 | PC | BCEPC6110 | Design of Steel Structure Lab | 0 | 0 | 2 | 1 |
| 8 | PC | BCEPC6120 | Structural Analysis II Lab | 0 | 0 | 2 | 1 |
| 9 | PC | BCEPC6130 | Transportation Engineering-II Lab | 0 | 0 | 2 | 1 |
| 10 | PC | BCEPC6140 | Advanced Laboratory-I | 0 | 0 | 2 | 1 |
| 11 | HS | BTPHS6160 | #Soft Skill and Employability Skill | 0 | 0 | 2 | 1 |
| | | **TOTAL:** | | **18** | **1** | **10** | **24** |

# to be conducted by the Training & Placement Department of the College.

## FOURTH YEAR

| 7TH SEMESTER | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sl. No | Course Category | Course Code | Course Title | Hours per week | | | Credits |
| | | | | L | T | P | |
| | | | **THEORY** | | | | |
| 1 | PC | BCEPC7010 | Geotechnical Engineering-II | 3 | 0 | 0 | 3 |
| 2 | PC | BCEPC7020 | Water Resource Engineering | 3 | 0 | 0 | 3 |
| 3 | PE | BCEPE7031 | Advanced Design of Concrete Structures | 3 | 0 | 0 | 3 |
| | | BCEPE7032 | Prestressed Engineering | | | | |
| | | BCEPE7033 | Earthquake Geotechnical Engineering | | | | |
| 4 | PE | BCEPE7041 | Estimation Costing and Professional Practice | 3 | 0 | 0 | 3 |
| | | BCEPE7042 | Tall Buildings | | | | |
| | | BCEPE7043 | Bridge Structures | | | | |
| 5 | OE | B**OE70** | Open Elective ***(Any One)*** | 3 | 0 | 0 | 3 |
| | | B**OE70** | | | | | |
| | | B**OE70** | | | | | |
| | | | **PRACTICAL / SESSIONAL** | | | | |
| 6 | PC | BCEPC7110 | Geotechnical Engineering-II Laboratory | 0 | 0 | 2 | 1 |
| 7 | PC | BCEPC7140 | Advanced Laboratory-II | 0 | 0 | 2 | 1 |
| 8 | PC | BCEPC7150 | Mini Project / Projects on Internet of Things | 0 | 0 | 6 | 3 |
| 9 | PE | BCEPE7160 | ## Massive Open Online Course (MOOC) | 0 | 0 | 4 | 2 |
| 10 | PC | BCEPC7170 | ^Summer Internship-II | 0 | 0 | 2 | 1 |
| | | **TOTAL:** | | **15** | **0** | **16** | **23** |

##Meeting with the global requirements, to inculcate the habit of self-learning and in compliance with UGC guidelines, Massive Open Online Course (MOOC) have been introduced as electives and it can be selected with the latest industrial requirement.

| 8TH SEMESTER | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sl. No. | Course Category | Course Code | Course Title | Hours per week | | | Credits |
| | | | | L | T | P | |
| | | | **THEORY** | | | | |
| 1 | PE | BCEPE8011 | Town planning | 3 | 0 | 0 | 3 |
| | | BCEPE8012 | Computer Aided Design of Structures | | | | |
| | | BCEPE8013 | Repair and Rehabilitation of Structures | | | | |
| 2 | PE | BCEPE8021 | Ground Improvement Techniques | 3 | 0 | 0 | 3 |
| | | BCEPE8022 | Finite Element Techniques | | | | |
| | | BCEPE8023 | Construction Planning and Scheduling | | | | |
| 3 | OE | B**OE80** | Open Elective ***(Any One)*** | 3 | 0 | 0 | 3 |
| | | B**OE80** | | | | | |
| | | B**OE80** | | | | | |
| | | | **PRACTICAL / SESSIONAL** | | | | |
| 4 | PC | BCEPC8150 | Major Project / Industrial Project / Startup Training cum Project | 0 | 0 | 12 | 6 |
| 5 | PC | BCEPC8180 | Seminar and Technical Writing | 0 | 0 | 4 | 2 |
| 6 | PC | BCEPC8190 | Comprehensive Viva-Voce | 0 | 0 | 4 | 2 |
| | | **TOTAL:** | | **9** | **0** | **20** | **19** |

## CREDIT REPRESENTATION

| Lectures (hrs/wk/Sem.) | Tutorials (hrs/wk/Sem.) | Practical Work (hrs/wk/Sem.) | Credits (L: T: P) | Total Credits |
|---|---|---|---|---|
| 3 | 0 | 0 | 3:0:0 | 3 |
| 3 | 1 | 0 | 3:1:0 | 4 |
| 0 | 0 | 2 | 0:0:2 | 1 |
| 0 | 0 | 4 | 0:0:4 | 2 |
| 0 | 0 | 6 | 0:0:6 | 3 |
| 0 | 0 | 12 | 0:0:12 | 6 |

## SCHEME OF INSTRUCTION SUMMARY

| COURSE WORK - SUBJECTS AREA | CREDITS / SEMESTER | | | | | | | | TOTAL CREDITS | % |
|---|---|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | VII | VIII | | |
| Humanities, Social & Management Study (HS) | 3 | 3 | - | 3 | - | 4 | - | - | 13 | 7 |
| Basic Sciences (BS) | 8 | 8 | 7 | - | 3 | - | - | - | 26 | 14 |
| Engineering Sciences (ES) / Basic Engineering (BE) | 12 | 12 | 4 | 4 | - | - | - | - | 32 | 17 |
| Professional Core (PC) | - | - | 13 | 17 | 15 | 14 | 12 | 10 | 81 | 43 |
| Professional Electives (PE) | - | - | - | - | 3 | 3 | 8 | 6 | 20 | 11 |
| Open Electives (OE) | - | - | - | - | 3 | 3 | 3 | 3 | 12 | 7 |
| Mandatory Courses (MC) | 1 | 1 | - | - | - | - | - | - | 2 | 1 |
| **TOTAL** | **24** | **24** | **24** | **24** | **24** | **24** | **23** | **19** | **186** | **100** |

## Category of Courses:

### I Basic Science Courses:

| S. N. | Course Code | Course Title | L | T | P | C | Preferred Semester |
|---|---|---|---|---|---|---|---|
| 1 | BBSBS1010 | Engineering Mathematics-I | 3 | 1 | 0 | 4 | I |
| 2 | BBSBS1021 | Engineering Physics | 3 | 0 | 0 | 3 | I |
| | BBSBS1022 | Engineering Chemistry | | | | | I/II |
| 3 | BBSBS2010 | Engineering Mathematics-II | 3 | 1 | 0 | 4 | II |
| 4 | BBSBS3040 | Engineering Mathematics-III | 3 | 1 | 0 | 4 | III |
| 5 | BBSBS3061 | Environmental Engineering and Safety | 3 | 0 | 0 | 3 | III/IV |
| 6 | BBSBS5061 | Optimization in Engineering | 3 | 0 | 0 | 3 | III/IV |

### II. Engineering Science:

| S. N. | Course Code | Course Title | L | T | P | C | Preferred Semester |
|---|---|---|---|---|---|---|---|
| 1 | BBSES1031 | Basics of Mechanics | 3 | 0 | 0 | 3 | I/II |
| | BBSES1032 | Basics of Thermodynamics | | | | | I/II |
| 2 | BBSES1041 | Basics of Electronics | 3 | 0 | 0 | 3 | I/II |
| | BBSES1042 | Basics of Electrical Engineering | | | | | I/II |
| 3 | BBSES1050 | Programming in 'C' | 3 | 0 | 0 | 3 | I |
| 4 | BBSES1171 | Engineering Drawing | 0 | 0 | 2 | 1 | I/II |
| | BBSES1172 | Engineering Workshop | | | | | I/II |
| 5 | BBSES2050 | Data Structure using 'C++' | 3 | 0 | 0 | 3 | II |
| 6 | BCSES3051 | Object Oriented Programming through JAVA | 3 | 0 | 0 | 3 | III |
| 7 | BCSES3052 | Database Management Systems | 3 | 0 | 0 | 3 | IV |

### III. Humanities & Social Science including Management:

| S. N. | Course Code | Course Title | L | T | P | C | Preferred Semester |
|---|---|---|---|---|---|---|---|
| 1 | BBSHS1060 | Communicative English-I | 2 | 0 | 0 | 2 | I |
| 2 | BBSHS2060 | Communicative English-II | 2 | 0 | 0 | 2 | II |
| 3 | BMSHS3062 | Engineering Economics and Costing | 3 | - | - | 3 | III/IV |
| 4 | BMSHS5062 | Organizational Behaviour | | | | | V/VI |

### IV. Professional Core Courses:

| S. N. | Course Code | Course Title | L | T | P | C | Preferred Semester |
|---|---|---|---|---|---|---|---|
| 1 | BCEPC3010 | Mechanics of Solids | 3 | 1 | - | 4 | III |
| 2 | BCEPC3020 | Building Materials & Building Construction | 3 | - | - | 3 | III |
| 3 | BCEPC3030 | Surveying -I | 3 | - | - | 3 | III |
| 4 | BCEPC4010 | Geotechnical Engineering-I | 3 | 1 | - | 4 | IV |
| 5 | BCEPC4020 | Surveying -II | 3 | - | - | 3 | IV |
| 6 | BCEPC4030 | Structural Analysis –I | 3 | - | - | 3 | IV |
| 7 | BCEPC4040 | Fluid Mechanics & Hydraulic Machines | 3 | 1 | - | 4 | IV |
| 8 | BCEPC5010 | Design of Concrete Structure | 3 | 1 | 0 | 4 | V |
| 9 | BCEPC5020 | Transportation Engineering-I | 3 | 0 | 0 | 3 | V |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9 | BCEPC5030 | Irrigation Engineering | 3 | 0 | 0 | 3 | V |
| 10 | BCEPC6010 | Design of Steel Structure | 3 | 1 | 0 | 4 | VI |
| 11 | BCEPC6020 | Structural Analysis II | 3 | 0 | 0 | 3 | VI |
| 12 | BCEPC6030 | Transportation Engineering-II | 3 | 0 | 0 | 3 | VI |
| 13 | BCEPC7010 | Geotechnical Engineering-II | 3 | 0 | 0 | 3 | VII |
| 14 | BCEPC7020 | Water Resource Engineering | 3 | 0 | 0 | 3 | VII |

## V. Professional Elective Courses relevant to chooses Branch/Specialization:

| S. N. | Course Code | Course Title | L | T | P | C | Preferred Semester |
|---|---|---|---|---|---|---|---|
| 1 | BCEPE5041 | Concrete Technology | 3 | 0 | 0 | 3 | V |
| 2 | BCEPE5042 | Remote Sensing Techniques and GIS | 3 | 0 | 0 | 3 | V |
| 3 | BCEPE5043 | Traffic Engineering and Transportation Planning | 3 | 0 | 0 | 3 | V |
| 4 | BCEPE6041 | Water Supply & Sanitary Engineering | 3 | 0 | 0 | 3 | VI |
| 5 | BCEPE6042 | Prefabricated Structures | 3 | 0 | 0 | 3 | VI |
| 6 | BCEPE6043 | Pavement Engineering | 3 | 0 | 0 | 3 | VI |
| 7 | BCEPE7031 | Advanced Design of Concrete Structures | 3 | 0 | 0 | 3 | VII |
| 8 | BCEPE7032 | Prestressed Engineering | 3 | 0 | 0 | 3 | VII |
| 9 | BCEPE7033 | Earthquake Geotechnical Engineering | 3 | 0 | 0 | 3 | VII |
| 10 | BCEPE7041 | Estimation Costing and Professional Practice | 3 | 0 | 0 | 3 | VII |
| 11 | BCEPE7042 | Tall Buildings | 3 | 0 | 0 | 3 | VII |
| 12 | BCEPE7043 | Bridge Structures | 3 | 0 | 0 | 3 | VII |
| 13 | BCEPE8011 | Town planning | 3 | 0 | 0 | 3 | VIII |
| 14 | BCEPE8012 | Computer Aided Design of Structures | 3 | 0 | 0 | 3 | VIII |
| 15 | BCEPE8013 | Repair and Rehabilitation of Structures | 3 | 0 | 0 | 3 | VIII |
| 16 | BCEPE8021 | Ground Improvement Techniques | 3 | 0 | 0 | 3 | VIII |
| 17 | BCEPE8022 | Finite Element Techniques | 3 | 0 | 0 | 3 | VIII |
| 18 | BCEPE8023 | Construction Planning and Scheduling | 3 | 0 | 0 | 3 | VIII |

## VI. Open Electives/Other Electives/Emerging Subjects:

| S. N. | Course Code | Course Title | L | T | P | C | Preferred Semester |
|---|---|---|---|---|---|---|---|
| 1 | BCEOE5051 | Bridge Structures | 3 | 0 | 0 | 3 | V |
| 2 | BCEOE5052 | Town Planning | 3 | 0 | 0 | 3 | V |
| 3 | BCEOE5053 | System Approach in Civil Engineering | 3 | 0 | 0 | 3 | V |
| 4 | BCEOE6051 | Housing Planning & Management | 3 | 0 | 0 | 3 | VI |
| 5 | BCEOE6052 | Green Building technique | 3 | 0 | 0 | 3 | VI |
| 6 | BCEOE6053 | Air & Noise Pollution | 3 | 0 | 0 | 3 | VI |
| 7 | BCEOE7051 | Municipal Solid waste Management | 3 | 0 | 0 | 3 | VII |
| 8 | BCEOE7052 | Disaster management | 3 | 0 | 0 | 3 | VII |
| 9 | BCEOE7053 | Construction Planning & Scheduling | 3 | 0 | 0 | 3 | VII |
| 10 | BCEOE8031 | Repair and rehabilitation of Structures | 3 | 0 | 0 | 3 | VIII |
| 11 | BCEOE8032 | Remote Sensing Techniques & GIS | 3 | 0 | 0 | 3 | VIII |
| 12 | BCEOE8033 | Modern Construction Materials | 3 | 0 | 0 | 3 | VIII |

**VII Mandatory Subjects:**

| S. N. | Course Code | Course Title | L | T | P | C | Preferred Semester |
|---|---|---|---|---|---|---|---|
| 1 | BBSHS1180 | NSS | | | 2 | 1 | I |
| 2 | BBSHS2180 | YOGA | | | 2 | 1 | II |

## End Semester Examination Question Pattern

| Question Pattern | 1 Mark | 2 Marks | 5 Marks | 10 Marks | 15 Marks | 16 Marks | 20 Marks | Total |
|---|---|---|---|---|---|---|---|---|
| **A** | 10 | 15 (Out of 20) | 6 (Out of 8) | | 2 (Out of 4) | | | 100 |
| **B** | | 10 | 6 (Out of 8) | | 4 (Either or Type) | | | 100 |
| **C** | | | | | | | 1 Qn Compulsory & 4 Either or type | 100 |
| **D** | 10 | 15 | | | 4 (Either or Type) | | | 100 |
| **E** | 10 | 10 | 6(Out of 8) | 4(Either or Type | | | | 100 |
| **F** | | 10 | | | | | 4(Either or Type) | 100 |
| **G** | | 10 | | | | 1 Qn Compulsory & 4 Either or type | | 100 |

## I Semester

| Course Code | Course Title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSBS1010** | **Engineering Mathematics-I** | **3** | **1** | **0** | **4** | **A** |

**PRE - REQUISITE:**

**Course Educational Objective**

CEO1: To find critical points, and use them to locate maxima and minima

CEO2: To provide the standard methods for solving differential equations

CEO3: To study Fourier series and to express a function in Fourier series

CEO4: To use matrices, determinants and techniques for solving systems of linear equations in the different areas of Linear Algebra.

**Course Outcome**

| | |
|---|---|
| CO1 | To implement the engineering problems using the concept of Partial differentiation and series and to understand its application. |
| CO2 | To solve the initial value and boundary value problem of ODE related to SHM, Electrical circuit, Growth and Decay problem etc. |
| CO3 | To execute the technique of Fourier series for learning advanced Engineering Mathematics. |
| CO4 | To relate the tools of matrices and linear algebra including inter transformations, eigen values, diagonalization and orthogonalization in Engineering. |

**UNIT:1 MULTIVARIABLE CALCULUS (13 Hours)**

Partial differentiation, Euler's theorem, Total derivative, Taylor's theorem two variable (without proof), Maxima and Minima, Differentiation under integral sign (Leibtinz rule).

**UNIT:2 DIFFERENTIAL EQUATION-I (12 Hours)**

Ordinary differential Equation: First order and first degree differential equations and its method of solving, Application to Electrical circuits and conduction heat and their solution.

**Differential Equation-II**

Linear differential equation of higher order and its different methods of finding solution (operator method). Second order liner differential equation and its solution: Euler Cauchy equation, solution by undermined coefficient method and variation of parameter. Modeling of electrical circuit with solution.

**UNIT:3 Fourier series (10Hours)**

Fourier series, Fourier expansion of functions of any period, Even and odd functions, Half Range Expansion.

**UNIT:4 LINEAR ALGEBRA (15 Hours)**

Matrices, Types of matrices, Rank of matrix Eigen values and Eigen vectors, Cayley – Hamilton theorem (without proof), system of liner equation, Orthogonal matrices, Complex matrices, Hermitian and skew-Hermitian matrices, Unitary matrices, similarity of matrices. Quadratic forms and Canonical forms.

**Teaching Methods**: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

**Text Books** 1. Advanced Engineering Mathematics by E. Kreyszig, Tenth Edition, Willey
2. Differential Calculus by Santi Narayan and Mittal, S. Chand Publications

**Ref. Books** 1. Higher Engg. Mathematics by BS Grewal: Khanna Publishers, New Delhi.
2. Higher Engineering Mathematics by B.V.Raman, McGraw Hills Education
3. Advanced Engineer methods by N. P. Daly & Manish Goel.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | - | - | 2 | - | 2 | - | - | - | - | 2 | | | |
| **CO2** | 3 | 3 | - | - | 1 | - | | - | - | - | - | 2 | | | |
| **CO3** | 2 | | - | - | 2 | - | - | - | - | - | - | _ | | | |
| **CO4** | 2 | | - | - | 2 | - | - | - | - | - | - | 2 | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSBS1021** | **Engineering Physics** | **3** | **0** | **0** | **3** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1: To provide the students about the elementary features and the basic concepts of Physics and its applications to different physical systems.

CEO2: Students will be able to communicate these concepts clearly, develop problem solving skills and critical thinking.

Course Outcome

| | |
|---|---|
| CO1 | Solve engineering problems using the concept of oscillation and wave mechanics and recognize the scientific application of Laser. |
| CO2 | To analysis the structural properties of elemental solids |
| CO3 | Determine gradient of scalar field, divergence and curl of vector fields and solve engineering problems on electromagnetism |
| CO4 | Construct a quantum mechanical model to explain the behavior of a system at microscopic level. |

**UNIT:1 Interaction of Wave and Matter ( 12 Hours)**

Introduction to Harmonic Oscillator, Waves and its Characterstics, Superpositition of Waves, Interference by division of wavefront ( Biprism experiment) and division of amplitude (Newton's Ring experiment). Introduction to Diffraction, types of diffraction.

LASER, spontaneous & stimulated emission, Einstein's relation, Ruby Laser and He-Ne Gas Laser, application of Laser. Optical fiber, Acceptance angle, Numerical aperature, Step index and Graded index fibers, applications of optical fiber.

**UNIT:2 Physics of Materials (12 Hours)**

Crystallography, Crystal structure, crystal direction and plane, Miller indices, Interplanarspacings, Reciprocal Lattice and its characterstics, Reciprocal Lattice of SC, FCC and BCC, Brillouin Zone, Bragg's law.

Energy bands in solids (conduction band, valence band and fermi level), Classification of matter on the basis of band theory.

**UNIT:3 Electromagnetic theory and wave (10 Hours)**

Physical significance of grad, divergence and curl operators, Gauss divergence theorem and Stoke's theorem (no derivations), fundamental laws of electrostatics, magneto statics and electromagnetism, displacement current and conduction current, Maxwell's relations.

Electromagnetic wave and its characteristics, electromagnetic wave equation for free space in terms of **E** and **B**, electromagnetic energy, Poynting vector and Poynting theorem.

**UNIT:4 Quantum mechanics(12 Hours)**

Introduction to dual nature: Black body radiation, photoelectric effect, Compton effect (qualitative idea only), de-Broglie's hypothesis, uncertainty principle & its application to non-existence of electron inside the nucleus and one dimensional harmonic oscillator, wave function and its characteristics, probability, normalization and expectation value, Schrodinger's equation & its application to one dimensional potential well, potential step and potential barrier (qualitative idea).

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books
1. Engineering Physics by D. K. Bhattacharya and PoonamTanden, Oxford University Press.
2. Engineering Physics, H K Malik and A K Singh, Tata McGraw Hill, MGH

Ref. Books
1. Materials Science &Engg., V. Raghvan, Prentice Hall of India.
2. Concepts of Modern Physics, A. Beiser, S. Mahajan, S.R. Choudhary, Tata McGraw Hill.
3. Lasers & Optical engineering, P Dass, Narosa Publishers, Springer Publisher.
4. Engineering Physics by B. B. Swain and P. K. Jena, KitabMahal,Cuttack
5. Quantum Mechanics by SatyaPrakash, KitabMohal, etc. KedarNath Ram Nath Publisher

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | _ | 3 | 2 | _ | _ | _ | _ | _ | _ | _ | _ | _ | | | |
| **CO2** | _ | _ | _ | _ | 3 | _ | 1 | _ | _ | _ | _ | _ | | | |
| **CO3** | _ | 3 | _ | _ | 1 | _ | _ | _ | _ | _ | _ | _ | | | |
| **CO4** | 3 | | 2 | _ | | _ | _ | _ | _ | _ | _ | _ | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSBS1022** | **Engineering Chemistry** | **3** | **0** | **0** | **3** | **A** |
| Pre -Requisite: | | | | | | |

Course Educational Objective

CEO1: To impart the knowledge of application of chemical sciences in the field of engineering

CEO2: The course aims at elucidating principles of applied chemistry in industrial systems, Water
treatment and engineering materials.

CEO3: To give detailed knowledge about the reactivity of metal with environment and it's Prevention from corrosion.

CEO4: To give an idea about fuel and it's characteristics.

CEO5: To enlighten the students with the applications of advanced materials.

Course Outcome

| | |
|---|---|
| CO1 | Identify suitable water treatments techniques for domestic and industrial purposes |
| CO2 | Differentiate various types of corrosion, and gain knowledge on control measures associated with corrosion |
| CO3 | Classify the different types of fuel , it's analysis and gain knowledge on fractional distillation of petroleum. |
| CO4 | Understand various types of polymers, their preparation along with applications |

**UNIT:1 WATER TREATMENT (12 Hours)**

Types of water, Impurities in water, Types of Hardness, Determination of Hardness by EDTA method, treatment of water for Domestic use, Water softening processes Lime-soda process, Ion Exchange method, Boiler feed water, Scale and Sludge, Caustic embrittlement, Priming and Foaming ,Removal of dissolved gases, Carbonate and phosphate conditioning, colloidal conditioning, Calgon conditioning, Desallination of brackish water by Reverse osmosis

**UNIT:2 CORROSION CHEMISTRY (12 Hours)**

Introduction, Electrochemical cell, electrode potential E.M.F, Definition of corrosion, Types of corrosion: Dry corrosion and wet corrosion, Galvanic corrosion, Concentration cell corrosion, Factors influencing corrosion, corrosion control: Cathodic protection (Sacrificial anodic protection and Impressed current cathodic protection), Inhibitors, protective coatings: Galvanization and Tinning, Passivation.

**UNIT:3FUEL TECHNOLOGY (12 Hours)**

Introduction, Classification of Fuels, Calorific Value, Charcteristics of a good fuel, Types and analyses (Proximate and ultimate analysis) of coal, Dulong's Formula, Petroleum, (Extraction, purification and refining),Cracking(thermal cracking, catalytic cracking), Knocking, Antiknocking , Octane numbers, Cetane numbers, Unleaded and synthetic petrol, LPG and CNG, Combustion Numericals.

**UNIT:4 CHEMISTRY OF ENGINEERING MATERIALS (12 Hours)**

Introduction, polymer, Classification of polymers, Types of polymerization and mechanism, Plastics: Thermosetting and thermo plastic, PVC, PE,PS,PMMA, PTFE, Bakelite,Nylon-6,6, Nylon-6, Fiber reinforced plastic.

*ADD-ON COURSES: Conducting Polymer ( Polyaniline, Polyacetylene),Polycarbonates Bio-Degradable and Non-Bio Degradable polymer, Nano composite.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

**Text Books:** 1 Engineering chemistry by Jain & Jain, DhanpatRai publishing company (p) Ltd.

Ref. Books:

1. A Text Book of Engineering Chemistry by S.S.Dara,S Chand Publishers
2. A Text Book of Engineering Chemistry by SashiChawla,Dhanpat Rai Publishing house.
3. Text Book of Engineering chemistry, 2nd edition, by R.Gopalan,D.Venkapaya&SulochanaNagarajan, Vikas Publishing House Pvt.Ltd.
4. B. Tech Chemistry-II by P. K. Kar, S. Dash, B. Mishra kalyani publishers.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 2 | _ | 2 | 3 | _ | _ | _ | _ | _ | | | |
| **CO2** | 3 | 3 | 1 | 2 | _ | 2 | 3 | _ | _ | _ | _ | _ | | | |
| **CO3** | 3 | 3 | 2 | 1 | _ | 2 | 3 | _ | _ | _ | _ | _ | | | |
| **CO4** | 3 | 3 | 2 | 1 | _ | 2 | 3 | _ | _ | _ | _ | _ | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSES1031** | **Basics of Mechanics** | **3** | **0** | **0** | **3** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1:

CEO2:

Course Outcome

| | |
|---|---|
| CO1 | Determine the resultant force and moment for a given force system |
| CO2 | Analyze planar and spatial systems to determine the forces in members of trusses, frames and problems related to friction. |
| CO3 | Calculate the centriod and moment of inertia of plane and composite figures. |
| CO4 | Illustrate the motion parameters of a body subjected to Dynamic principles. |

**UNIT:1 STATICS OF PARTICLES (16 Hours)**

Fundamental concepts and principles of engineering mechanics. Resolution of forces - Resultant of several concurrent forces - Free body diagram. Principles of transmissibility. Moment of a force - Varignon's theorem - Equivalent system of forces -Types of supports and corresponding reactions.

**UNIT:2ANALYSIS OF TRUSSES AND FRICTION (12 Hours)**

Introduction to Truss - Analysis of Trusses - Method of joints- Method of sections.

Laws of Friction - Angle of Friction-Angle of Repose-Ladder and Wedge Friction

**UNIT:3PROPERTIES OF SURFACES (12 Hours)**

Determination of first moment area of plane figures by integration – Determination of centroid of composite figures by using standard formula.

Determination of second moment area of plane figures by integration - Parallel and perpendicular axis theorems - Determination of area moment of inertia of composite figures by using standard formula - Polar moment of inertia - Radius of gyration.

**UNIT:4 DYNAMICS OF PARTICLES (10 Hours)**

Rectilinear motion: uniform velocity and uniformly accelerated motion Newton second law- D'Alembert's principle and its applications- work and energy equation- Impulse and Momentum - Impact of elastic bodies.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

**Text Books**: 1. Timoshenko, and Young, "Engineering Mechanics", Tata Mc-Graw Hill Book Company.
2. S. S. Bhavikatti, "Engineering Mechanics", New Age International Publishers,

**Ref. Books:**


1. Dr.Bansal.R.K, & Sanjay Bansal, "A Text book of Engineering Mechanics", Lakshimi publications.
2. A.K.Tayal, "Engineering Mechanics Statics And Dynamics", Umesh Publications
3. Rajasekaran.S, &Sankarasubramanian.G, "Engineering Mechanics", Vikas Publishing House Pvt Ltd, 2011.
4. Engineering Mechanics, (3ed edition) by Statics and Dynamics K.Vijaya Kumar Reddy and J Suresh Kumar, BS Publications.


| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | - | - | - | - | - | - | - | - | - | | | |
| **CO2** | 3 | 3 | - | - | - | - | - | - | - | - | - | - | | | |
| **CO3** | 3 | 3 | - | - | - | - | - | - | - | - | - | - | | | |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | - | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSES1032** | **Basics of Thermodynamics** | **3** | **0** | **0** | **3** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1:

CEO2:

Course Outcome

| | |
|---|---|
| CO1 | Explain the basic concepts of system, control volume, thermodynamic properties, thermodynamic equilibrium, temperature, work and heat energy. |
| CO2 | Apply the laws of thermodynamics to refrigerators, heat engines, heat pumps compressors and nozzles etc. |
| CO3 | Interpret and apply the concept of entropy to thermodynamic systems |
| CO4 | Evaluate properties of pure substances, gases and their mixtures and to derive and apply to thermodynamic problems. |
| CO5 | |

**UNIT - 1** **(15 Hours)**

Basic concepts & definition, scope of thermodynamics. Macroscopic & microscopic approach. Definition of fixed mass (closed) system & control volume (open) system, isolated system. Thermodynamic properties (extensive & intensive), state & its representation on a property diagram, process and its representation, cyclic process Characteristics of properties (point & path function), reversible & irreversible process, Quasistatic Process. Thermodynamic equilibrium.
Pressure, Types of pressure, Zeroth law of thermodynamics & temperature scales, calibration of thermometers. Ideal gasses & their P-V-T relation. Energy transfer; Work transfer(definition & calculation), different modes of work Displacement work for various process, Free expansion work, Heat transfer; modes of heat transfer, basic laws in conduction, convection & radiation.

**UNIT - 2** **(13 Hours)**

First law of thermodynamics, formal statement (using cyclic process) first law for processes of fixed masses (closed system) Introduction of internal energy, enthalpy as thermodynamic properties Definition of sp.heats ($C_p$&$C_v$) and their use in calculation of internal energy & enthalpy with emphasis on ideal gas.
Application of first law to control volume (Steady Flow); nozzle, diffuser, compressor, turbine, throttling device.

**UNIT - 3** **(12 Hours)**

Second law of thermodynamics, Kelvin Planck &Clausius statements, Carnot cycle. Reversible & irreversible engines and their efficiency (Thermal and maximum Efficiency)
Entropy concepts, Clausius inequality, Entropy Principle.

**UNIT - IV** **(10 Hours)**

Properties of pure substance, P-v, T-s, h-s diagram for steam , Steam properties, Introduction to steam table with respect to specific volume, pressure, temperature, enthalpy & entropy, Mollier Diagram. Application of thermodynamics: Steam power plant, Refrigerators and Heat Pump, I C Engines (working principle with schematic diagrams only)

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books: 1 Engineering Thermodynamics by P.K.Nag, Publisher: TMH
2. Basic Engineering Thermodynamics by D S Kumar, Publisher: S K Kataria& Sons-New Delhi

Ref. Books: 1. Fundamental of Engineering Thermodynamics by E. Rathakrishnan, publisher. PHI
2. Thermodynamics: An Engineering Approach by Yunus A. Cengel, Michael A. Boles Publisher: Mcgraw Hill Education
3. Thermal engineering by R.K.Rajput, Laxmi Publications Pvt. Ltd.
4. Steam Tables in SI Units by K. Ramalingam, Scitech Publications (P) Ltd.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | | | |
| **CO2** | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - | | | |
| **CO3** | | 2 | 2 | - | - | - | - | - | - | - | - | - | | | |
| **CO4** | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSES1041** | **Basics of Electronics** | **3** | **0** | **0** | **3** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1:

CEO2:

Course Outcome

| | |
|---|---|
| CO1 | Recognize different components such as transistors, resistors, capacitors and diodes which fit on a small chip with each leg of the chip connecting to a point within the circuit. |
| CO2 | Apply modern modelling software for drafting different electronic circuits. |
| CO3 | Analyze modern electronic circuits and systems. |
| CO4 | Formulate mathematical descriptions and procedures in designing new electronic systems and technically present |

**UNIT-1** **(15 Hours)**

**Semiconductor Devices**:- Classification of material, Energy band diagram, properties of semiconductors, Types of semiconductors, Semiconductor diode (no bias, forward, reverse),temperature effects, diode equivalent circuit, zener diode, LED , Half wave rectifier, full wave rectifier, clippers ,clampers.

**UNIT-2** **(13 Hours)**

**Bipolar Junction Transistors (BJTs)**:- Introduction, transistor operation, Simplified structure and physical operation of n-p-n and p-n-p transistors in the active region, Common–Base configuration, Common–emitter configuration, Common-collector configuration Current-voltage characteristics of BJT, BJT as an amplifier and as a switch.

**Field Effect Transistors (FETs)**:- Introduction, construction and characteristics of JFETs, transfer characteristics, D-MOSFET, E –MOSFET.

**UNIT-3** **(12 Hours)**

**Communication systems: -**Analog and digital signals, block diagram of basic communication system, need for modulation, methods of modulation,AM/FM transmitters & receivers (Block diagram description only)

**Electronic Instruments**:- Basic principle of Oscilloscope, Function of the sweep generator, Block diagrams of oscilloscope, Measurement of frequency and phase by Lissajous method, Application of oscilloscope for measurement of voltage, period and frequency, Block diagram of standard signal generator, AF sine and square wave generator, and Function generator.

**UNIT-4** **(10 Hours)**

**Digital systems and binary numbers**:-Digital systems, Binary numbers, number system conversion, octal &hexa decimal number, 1's& 2's compliments, signed binary numbers, binary codes, binary logic.

**Logic Gates and Boolean Algebra**:- The inverter, The AND, OR, NAND NOR, Exclusive-OR and Exclusive-NOR gate, Boolean operations and expressions, Laws and Rules of Boolean algebra, DeMorgan's theorem, Boolean analysis of logic circuits, Standard forms of Boolean expressions, Boolean expression and truth table Combinational Logic and Their Functions: Basic combinational logic circuits, Implementation of combinational logic, The universal properties of NAND and NOR gates, Basic adders

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

**Text Books:**

1. Electronic Devices (Seventh Edition), Thomas L. Floyd, Pearson Education, 482 FIE, Patparganj, Delhi – 110 092 (Selected Portions).
2. Digital Fundamentals (Eighth Edition), Thomas L. Floyd and R.P. Jain, Pearson Education, 482 FIE, Patparganj, Delhi – 110 092.
3. Electronic Instrumentation, H.S. Kalsi, Tata McGraw-Hill Publishing Company Limited, New Delhi.

**Reference Books:**


1. Microelectronic Circuits (Fifth Edition), Adel S. Sedra and Kenneth C. Smith, Oxford University Press, YMCA Library Building Jai Singh Road, New Delhi – 110 001.
2. Electronic Devices and Circuit Theory (Ninth Edition), Robert L. Boylestad and Louis Nashelsky, Pearson Education, 482 FIE, Patparganj, Delhi – 110 092.
3. Electronics Principles (7th Edition), Albert Malvono and David J. Bates, Tata McGraw-Hill Publishing Company Limited, New Delhi.


| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | - | - | - | - | - | - | - | - | - | - | - | | | |
| **CO2** | - | - | 2 | - | - | - | - | - | - | - | - | - | | | |
| **CO3** | - | - | 2 | - | - | - | - | - | - | - | - | - | | | |
| **CO4** | 2 | - | 2 | - | - | - | - | - | - | - | - | - | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSES1042** | **Basics of Electrical Engineering** | **3** | **0** | **0** | **3** | **A** |

Pre -Requisite:

Course Educational Objective

**CEO1**: Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.

**CEO2**: This course provides comprehensive idea about DC & AC circuit analysis, magnetic circuit analysis, working principles of machines and common measuring instruments.

**CEO3**:Emphasize the effects of electric shock and precautionary measures. Improve the ability to function on multi-disciplinary teams.

Course Outcome

| | |
|---|---|
| CO1 | Understand the basic concepts of magnetic, AC & DC circuits. |
| CO2 | Explain the working principle, construction, applications of DC machines, AC machines & measuring instruments. |
| CO3 | Gain knowledge about the fundamentals concepts of power generation, domestic wiring, electric shock and preventive measures |
| CO4 | Understand Electrical power generation andtransimission process in India and function on multi-disciplinary teams. |

**UNIT-1** **(15 Hours)**

**DC Circuits:**

Introduction to electrical terminology, Ohm's Law, Equivalent Resistance, series-parallel circuits, star-delta transformation, types of elements, ideal and practical voltage & current sources; Kirchhoff's Law, Mesh and Nodal Analysis.

**Network theorems:**

Superposition Theorem, Thevenin theorem, Maximum power transfer theorem excited by independent sources, Transients in RL & RC series circuits.

**UNIT-2** **(13 Hours)**

**Single phase & Three phase Ac circuits:**

AC Fundamentals: RMS & Average value, form and peak factors, Complex algebra, concepts of reactance, impedance and their representation, AC through pure R, L, C, series RL, series RC, series RLC circuit, Concept of power & power factor; expression of power in complex notation.

**Three-phase AC circuits:**

Comparison between 1-ph & 3-ph AC circuit, Star & Delta connection, relation between line and phase quantities, Measurement of 3-phase power using 2-wattmeter method.

**Magnetic circuits:**

Magnetic flux, Magnetic flux density, Magnetic fields intensity, Relation between B & H, B-H curve, Analogy between Electric and Magnetic circuit, Leakage flux.

**UNIT-3** **(12 Hours)**

**DC Machines:**

Introduction, working principle of DC Generator, Construction, Types, EMF equation, working principle of DC Motor Back e.m.f, Application of DC machines.

**AC Machines:**

Introduction, Principle of operation of AC machines, Transformers, Construction, EMF equation, Turn ratio, Ideal transformer on no load with phasor diagram, 3-phase Induction motor principle of operation, Rotating magnetic field, Types of rotors, Synchronous speed and slip, Introduction to 1-phase Induction motor, 1-phase motors types, applications of 3-phase and 1-phase motors, AC generator and motors, Principle of operation, types of rotors, Synchronous motor operating principle.

**UNIT-4** **(10 Hours)**

**Measuring Instruments:**

Introduction, Classification of instruments, construction and working principles of PMMC and moving iron type Instruments.

**Introduction to Power System &Domestic Wiring:**

General layout of electrical power system and functions of its elements, Generation of electricity (Hydro, Thermal and Nuclear power plant), standard transmission and distribution voltages, Service main, Meter board, Fuse, MCB, Earthing (pipe & plate earthing), House wiring, Electric shock & precautions.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

**Text Books:**


1. V. Del Toro, "Principles of Electrical Engineering" Prentice Hall International.
2. P.V. Prasad, S.Sivanagaraju, R.PrasadBasic Electrical and Electronics Engineering; CENGAGE Learning.
3. I.J. Nagarath, " Basic Electrical Engineering" Tata McGraw Hill
4. D.E. Fitzgerald & A. Grabel Higginbotham, " Basic Electrical Engineering Mc- Graw Hill.


**Reference Books:**


1. Edward Hughes, " Electrical Technology" Longman
2. T.K. Nagsarkar& M.S. Sukhija, "Basic Electrical Engineering" Oxford University Press.
3. H. Cotton, " Advanced Electrical Technology" Wheeler Publishing
4. W.H. Hayt& J.E. Kennely, "Engineering Circuit Analysis" McGraw Hill.
5. Theory and Problems of Basic Electrical Engineering by D.P.Kothari& I.J. Nagrath PHI.
6. Fundamentals of Electrical Engineering and Electronics by B. L. Theraja, S. Chand & Company Ltd, Reprint Edition 2013.


| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | - | - | - | - | - | - | - | - | - | - | | | |
| **CO2** | 1 | 2 | - | - | - | - | - | - | - | - | - | - | | | |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | - | - | - | | | |
| **CO4** | 1 | 1 | - | - | - | - | - | - | - | - | - | - | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSES1050** | **Programming in 'C'** | **3** | **0** | **0** | **3** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1:To develop programming for solving problems using decision structures and loops, applications using arrays, solving scientific problems using functions.

CEO2: To design applications using pointer and structures.

Course Outcome

| | |
|---|---|
| CO1 | Develop the algorithms, apply them using C by compiling, debug and analyzing programs for solving problems and to understand the basic concepts and decision structures required to design programs. |
| CO2 | Design programs on loops for solving problems and develop applications using array data structure. |
| CO3 | Develop applications using string operations and solve scientific problems using functions. |
| CO4 | Make use of pointers to design applications and projects, dynamic memory allocation for efficient use of memory and design programs in projects involving structure. |

**UNIT- I** **(11 Hours)**

Introduction to Programming Language, Structured Programming Approach, Basic structure of C program, C compilers, Compilation and Execution Process, Error debugging.

**Tokens in C:** keywords, identifiers, data types, constants, variables, standard I/O statements, **Operators:** arithmetic operators, assignment operators, increment and decrement operators, relational operators, logical operators, conditional operator, bit-wise operators, Operator precedence and associativity, **Type casting**: Implicit and Explicit type casting.

Control Flow Statements: **Selection Logic**: if, if..else, else if ladder, nested if, switch case,

**Course Outcome:**

- ➔ Learn basic knowledge on C programming and 'C' Compilers.
- ➔ Understand different outputs given by C compiler for small programs.
- ➔ Understand the usage of selection controls.

**UNIT- II** **(11 Hours)**

**Iteration Logic:** while, do-while and for loop, break, continue, nested loop, goto statement.

**Arrays:**

Types of Arrays, 1-D Array: declaration, initialization, array operations, 2-D Array: declaration, Initialization, 2-D array operations,

**Course Outcome:**

- ➔ Understand the usage of loop controls for program development.
- ➔ Learn programming techniques on arrays.

**UNIT- III (13 Hours)**

1-D character array: String handling and string handling library functions. 2–Dcharacter array.

**Functions:**

User Defined Function: function prototype, function definition, function call, return statement, types of parameters, Function categories. Recursive functions, function with 1-D and 2-D array, nesting of functions, **Storage classes**: auto, register, static, extern.

**Course Outcome:**

- ➔ Learn programming techniques on string manipulations.
- ➔ Understand the user defined function and its advantages.

**UNIT- IV (13 Hours)Pointers:** Declaration and initialization of pointers, Pointer arithmetic, Pointer and Arrays, Advantages of character pointer , Array of Pointers, **Pointers and Functions:** call by value and call by address, Function returning pointer, pointer to function, Pointer to Pointer, Dynamic memory allocation.

**User Defined Data Types**: typedef, enumeration , structures : Declaration and initialization of structures, accessing structure elements , nested structures, structures and arrays, structures and functions, structure and pointers, self- referential structures, structures with bit fields, Union: Declaration and initialization of Union, accessing union elements, structure with union.

**Course Outcome:**

- ➔ Understand the concept of pointer, its usage and dynamic memory allocation.

➔ Learn the concept of structure, union along with their usage in programming.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

**Text Books:**

1. C Programming By E. Balagurusamy, Tata McGraw Hill Publications
2. Let us C by Yashavant P. Kanetkar, BPB Publications
3. Programming with C : Schaum's Outline Series by Byron Gottfried and JitenderChhabra, Tata McGraw Hill Publications

**References:**

1. Exploring C by Yashavant P. Kanetkar, BPB Publications
2. C: The Complete Reference : By Herbert Schildt, Tata McGraw Hill Publications

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | | | |
| **CO2** | 3 | 3 | 3 | 1 | - | - | - | - | - | - | - | - | | | |
| **CO3** | 3 | 3 | 3 | 1 | - | - | - | - | - | - | - | - | | | |
| **CO4** | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSHS1060** | **Communicative English-I** | **2** | **0** | **0** | **2** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1: To develop the communication skills and soft skills of the students

CEO2: To enhance the ability of the students to develop employability and entrepreneurial skills

CEO3: To enable students to develop intrapersonal and interpersonal communication skills

CEO4: To enable students to participate in group discussions without stage dear

CEO5: To make students understand corporate communication

Course Outcome

| | |
|---|---|
| CO1 | Understand the importance of effective communication for personal and professional development |
| CO2 | Use correct vocabulary and grammar for effective communication in English |
| CO3 | Apply ICT for professional communication |
| CO4 | Develop a positive attitude towards people, organization, and life. |

**UNIT -1Importance of English for Communication in the 21st Century (10 hours)**

1.1 Role of English in enhancing employability and entrepreneurial skills 1

1.2 The Nature and Scope of Communication 1

1. 3 Objectives of Communication: Information, advice, suggestion, order, motivation, persuasion, warning, negotiation, decision-making, etc. through English Language skills, i.e., LSRW skills 1 + 1

1.4 The process of communication and factors that influence communication: Sender, receiver, channel, code, topic, message, context, feedback, noise, filters and barriers (steps such as Ideation, Encoding, Transmission, Decoding, etc. need to be dealt with); Audience and purpose 1 + 1+ 1.

1.5 Types of Communication: General and Professional Communication; Formal and Informal Communication; Verbal and Non-verbal communication; Intrapersonal and Interpersonal communication; Written communication and Spoken communication. 1 + 1+ 1.

**UNIT -2. English Vocabulary, Grammar & Usage (16 hours)**

2.1 Synonyms and Antonyms 1 + 1

2.2 Words often confused 1

2.3 Technical terms and one word substitutes 1 + 1

2.4 Idioms and Phrasal Verbs 1 + 1

2.5 Correct Usage of Nouns, Pronouns, Verbs, Adverbs, Adjectives 1+1+1+1+1

2.6 Communicative use of the Passive Voice 1 + 1

2.7 Communicative use of Punctuation marks 1 + 1

**UNIT-3. Introduction to Corporate Communication (15 hours)**

1. Communication and Corporate structure:Organigraph; Communication network: Formal Communication network and Informal Communication network / Grapevine 1 + 1+ 1

2. Corporate Communication – Direction of Communication:Downward Communication, Upward Communication, Horizontal/Lateral Communication, Diagonal Communication 1 + 1+ 1

3. Communication challenges in today's work place: Advances in technology; culturally diverse workforce; Team-based organizational Settings; how to overcome these challenges 1 + 1+ 1

4. Information and Communication Technology (ICT) and the Corporate world:
Power point presentation using multimedia; Internet and Intranet; Fax; Teleconferencing; Videoconferencing; LaTeX 1 + 1+ 1

5. Corporate/Business etiquette:Good listening skills, proper dressing and grooming; proper handshake, mobile etiquette, table manners 1 + 1+ 1

**UNIT:4 Soft skills for corporate readiness (7 hours)**

4. 1 Importance of soft skills in personal and professional life 1hrs

4.2 Are we hardwired for success? 1hrs

4.3 Importance of developing a positive attitude 1hrs

4.4 Lateral Thinking 1hrs

4.5 Teamsmanship 1 hrs

4.6 Emotional intelligence 1 hrs

4.7 Leadership Skills 1 hrs

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

**Text Books:**

1. An Introduction to Professional English and Soft Skills by B. K. Das et al., Cambridge University Press.
2. Communicative English for Engineers and Professionals by NitinBhatnagar and MamtaBhatnagar. Published by DK/Pearson.
3. Communication Skills by Sanjay Kumar &PushpLata , Oxford University Press

**Reference Books:**

1. Technical Communication , Principle and Practice by Meenakshi Raman &Sangeeta Sharma, Oxford University Press
2. Business Communication Today by Bovee, Courtland L., Thill, John V. Prentice Hall.
3. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success by Gopalaswamy Ramesh and Mahadevan Ramesh. Pearson.
4. Oxford Guide to English Grammar by John Easthood. Oxford University Press.
5. 365 Ways to Change Your World by Norman Vincent Peale by Orient Paperbacks.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | - | - | - | - | - | 1 | - | 3 | - | - | | | |
| **CO2** | - | - | - | - | - | - | - | - | - | 1 | - | 2 | | | |
| **CO3** | - | - | - | - | - | - | - | 2 | - | - | 3 | - | | | |
| **CO4** | - | - | - | - | - | - | - | _ | 3 | - | - | 1 | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSBS1121** | **Engineering Physics Laboratory** | **0** | **0** | **2** | **1** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1: Students will understand the basic principles of physics and their mathematical description.

CEO2: Students will be able to use the laws of physics and calculus to solve problems

CEO3: Students will be able to work together in collaborative groups to perform experiments, gather data and reach conclusions.

Course Outcome

| | |
|---|---|
| CO1 | Understand the uses of various Basic Instruments for different Physical measurements. |
| CO2 | Apply the Physical Laws and verify those using standard Experiments. |
| CO3 | Organize experiments to determine different Physical quantities and anlyze those for different application to Physical Systems. |
| CO4 | Evaluate the magnitudes of Physical quantities systematically through experiments and design new experiments with the theoretical knowledge |

**EXPERIMENTS: 1** Determination of Rigidity modulus of a material of a wire using Barton's apparatus (Static method).

**EXPERIMENTS: 2** Determination of Young's modulus of a material of a wire using Searle's apparatus

**EXPERIMENTS: 3** Determination of surface tension of water by capillary rise method.

**EXPERIMENTS: 4** Determination of acceleration due to gravity by using Bar/ Kater's pendulum.

**EXPERIMENTS: 5** Verification of laws of transverse vibration by using Sonometer

**EXPERIMENTS: 6** Determination of Young's modulus of a material by bending of beam method.

**EXPERIMENTS: 7** Study the characteristics of PN junction diode.

**EXPERIMENTS: 8** Study the characteristics of RC circuit.

**EXPERIMENTS: 9** Study the characteristics of BJT / FET.

**EXPERIMENTS: 10** Determination of grating element of a plane diffraction grating

**EXPERIMENTS: 11** Determination of wavelength of light by Newton's Rings apparatus.

**EXPERIMENTS: 12** Determination of dielectric constant by Leacher wire method.

**EXPERIMENTS: 13** Study of photoemission

**EXPERIMENTS: 14** Determination of wavelength of laser by Michelson Interferometer

**EXPERIMENTS: 15** Determination of coefficient of viscosity by Stoke's method.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | _ | 2 | _ | _ | _ | _ | 1 | 2 | _ | | | |
| **CO2** | 3 | 3 | 3 | _ | 3 | 3 | 1 | _ | _ | 2 | _ | _ | | | |
| **CO3** | _ | 3 | 2 | 3 | 3 | _ | _ | _ | _ | 2 | _ | _ | | | |
| **CO4** | 3 | 3 | 3 | 3 | 3 | _ | _ | _ | 2 | 3 | 3 | _ | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSBS1122** | **Engineering Chemistry Laboratory** | **0** | **0** | **2** | **1** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1: To train the students about the applications of chemical sciences in the field of engineering and technology

Course Outcome

| | |
|---|---|
| CO1 | Understand the basic methods of chemical analysis and instrumentations involved |
| CO2 | Standardize of Chemicals |
| CO3 | Estimate the hardness, ions in salts and compositions in ores. |
| CO4 | Synthesizes the drugs and know about their applications |

**EXPERIMENTS: 1** Determination of total hardness of water by using EDTA.

**EXPERIMENTS: 2** Determination of amount of NaOH and $Na_2CO_3$ present in mixture of two.

**EXPERIMENTS: 3** Standardization of $KMnO_4$ using sodium oxalate.

**EXPERIMENTS: 4** Determination of ferrous ion in Mohr's salt by standardized $KMnO_4$.

**EXPERIMENTS: 5** Determination of % of dissolved oxygen in given water sample.

**EXPERIMENTS: 6** Estimation of available chlorine in bleaching powder solution.

**EXPERIMENTS: 7** Determination of rate constant of acid catalyst Hydrolysis reaction.

**EXPERIMENTS: 8** Preparation of aspirin

**EXPERIMENTS: 9** Estimation of calcium in limestone.

**EXPERIMENTS: 10** Estimation of Zinc in brass.

**EXPERIMENTS: 11** To determine the strength of HCl and acetic acid from the mixture of acid by strong alkali (NaOH) by Conductrometry.

**EXPERIMENTS: 12** Preparation of nanoparticle.

**EXPERIMENTS: 13** Determination of partition coefficient of iodine in benzene and water.

**EXPERIMENTS: 14** Preparation and determination of pH of buffer solution.

**EXPERIMENTS: 15** To determine the molecular weight of polymer by viscosity measurement.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | 2 | - | 2 | - | - | 2 | - | 2 | - | 3 | - | | | |
| **CO2** | - | - | - | - | - | - | 3 | - | 3 | - | 2 | - | | | |
| **CO3** | - | 2 | - | 2 | - | - | 2 | - | 2 | - | 2 | - | | | |
| **CO4** | - | 2 | - | 2 | - | - | 2 | - | 2 | - | 2 | - | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSES1141** | **Basics of Electronics Laboratory** | **0** | **0** | **2** | **1** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1:

CEO2:

Course Outcome

| | |
|---|---|
| CO1 | Generate sine, square and triangular waveforms with required frequency & amplitude using function generator. |
| CO2 | Demonstrate introductory knowledge of software for schematic capture, circuit simulation, and circuit board layout. |
| CO3 | Analyze the characteristics of different electronic devices and circuits such as diodes, transistors, rectifiers, amplifiers etc., |
| CO4 | Plan new electronic systems and technically present them |

**EXPERIMENTS: 1** Familiarization of electronic components and devices (Testing of semiconductor diodes and transistors using digital multi meter)

**EXPERIMENTS: 2** Study and use of Oscilloscope, signal generator to view waveforms and measure amplitude and frequency of a given waveform.

**EXPERIMENTS: 3** V-I characteristics of semiconductor diode

**EXPERIMENTS: 4** Studies on half-wave and full-wave rectifier circuits without and with capacitor filter; recording of the waveforms and measurement of average and rms values of the rectifier output.

**EXPERIMENTS: 5** Studies on clipper circuit.

**EXPERIMENTS: 6** Studies on clamper circuit.

**EXPERIMENTS: 7** V-I characteristic of an n-p-n or p-n-p transistor, DC biasing the transistor in common-emitter configuration and determination of its operating point (i.e., various voltages and currents).

**EXPERIMENTS: 8** MOSFET I-V characteristics

**EXPERIMENTS: 9** Studies on Logic gates (Truth table verification of various gates).

**EXPERIMENTS: 10** Studies and experiments using ADDER CIRCUITS ICs

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | 1 | 1 | - | - | - | - | - | - | - | - | - | | | |
| **CO2** | - | 2 | 2 | - | - | - | - | - | - | - | - | - | | | |
| **CO3** | - | 1 | 1 | - | - | - | - | - | - | - | - | - | | | |
| **CO4** | - | 2 | 2 | - | - | - | - | - | - | - | - | - | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSES1142** | **Basics of Electrical Engineering Laboratory** | 0 | 0 | 2 | 1 | **A** |

Pre -Requisite:

Course Educational Objective

CEO1:

CEO2:

Course Outcome

| | |
|---|---|
| CO1 | Calculate currents and voltages in ac and dc circuits using different methods. |
| CO2 | Analyze the effect of magnetization in different electrical equipments. |
| CO3 | Design the fundamental electrical circuits using hardware. |
| CO4 | Analyze different electrical and electronics instrumentations. |
| CO5 | Illustrate the design of different conventional power plants. |
| CO6 | Demonstrate different electrical machineries through visiting the laboratories. |

1. **EXPERIMENTS: 1** Study of different electrical equipments( transformer, single phase motors)
2. **EXPERIMENTS: 2** Power factor improvements using capacitor for fluorescent lamp.
3. **EXPERIMENTS: 3** Verification of Superposition and Thevenin's theorem
4. **EXPERIMENTS: 4** Measurement of reactive power by using single watt-meter method
5. **EXPERIMENTS: 5** 3phase Power measurement by using two wattmeter methods.
6. **EXPERIMENTS: 6** Calculation of current, voltage and power in series R-L-C circuit excited by single-phase AC supply and calculation of power factor.
7. **EXPERIMENTS: 7** Determination of open circuit characteristics (OCC) of DC shunt generator
8. **EXPERIMENTS: 8** Starting and speed control of a dc shunt motor by (a) field flux control method, and (b) armature voltage control method.
9. **EXPERIMENTS: 9** V-I characteristics of incandescent lamps and time-fusing current characteristics of a fuse.
10. **EXPERIMENTS: 10** Connection and testing of a single-phase energy meter.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | 1 | 2 | - | - | - | - | - | - | - | - | - | | | |
| **CO2** | - | 2 | 2 | - | - | - | - | - | - | - | - | - | | | |
| **CO3** | - | 1 | 2 | - | - | - | - | - | - | - | - | - | | | |
| **CO4** | - | 2 | 2 | - | - | - | - | - | - | - | - | - | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSES1150** | **'C' Programming Laboratory** | **0** | **0** | **2** | **1** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1: To provide the ability to understand how analyze a problem and finding logic, to write programs, compiling, tracing errors, executing programs.

CEO2: The students will be able to understand how to write effective codes using the concepts provided in C language.

Course Outcome

| | |
|---|---|
| CO1 | Develop the algorithms and then implement, compile and debug programs in C language for solving problems and to design programs on decision structures. |
| CO2 | Design programs on loops for solving problems and to develop applications using arrays. |
| CO3 | Develop applications using string operations and applying functions to solve scientific problems |
| CO4 | Design applications using pointers, dynamic memory allocation and develop simple projects involving structure. |

**Assignment-1:**

Introduction to OS: commands, Use of different application software, file and directory management.

(use of linux commands/windows operations)

**Assignment-2:**

Introduction to the C compilers, simple programs writing, Compilation and Execution Process.

| | |
|---|---|
| 2.1 | WAP to display name, address, age using a simple program |
| 2.2 | WAP to input 2 numbers and display their difference |
| 2.3 | WAP to input three numbers and find their average |
| 2.4 | WAP to input your name, age and percentage and then display |
| 2.5 | WAP to read two numbers and find their product. |

**Assignment-3:**

| | |
|---|---|
| 3.1 | WAP to input radius of a circle. Find the area and perimeter of it. |
| 3.2 | WAP to input two numbers and swap them without using intermediate variable. |
| 3.3 | WAP to input marks for physics, mathematic, chemistry, English by considering each subject have maximum 100 marks. Find and display their percentage. |
| 3.4 | Write a program to accept Fahrenheit and calculate its equivalent Celsius. |
| 3.5 | Write a program to input a number and check whether it is greater than 0 or not. |

**Assignment-4**: (Operators, type casting, getchar and putchar)

| | |
|---|---|
| 4.1 | Write a program to find the area of the triangle using formula sqrt(s*(s-a)*(s-b)*(s-c)) where's' is the half perimeter and a,b,c are three sides. |
| 4.2 | Write a program to input two numbers into variables x,y.<br>Then Find x^y (means x to the power y) |
| 4.3 | Write a program to input two integers into x and y. Apply bitwise AND, OR operations on them and display the results. |
| 4.4 | Write a program to input an integer value into a variable X. Find and display X/2 in terms of float. |

| | |
|---|---|
| 4.5 | Write a program to input a float value. Display the integer part and fractional part separately. |

**Assignment-5**: (Operators, type casting, getchar and putchar)

| | |
|---|---|
| 5.1 | Write a program to perform x=x*2 without using * operator and also x=x/2 without using / operator. |
| 5.2 | Write a program to input three numbers and find the greatest using conditional operator. |
| 5.3 | Write a program to input 4 numbers and find the greatest using conditional operator. |
| 5.4 | Write a program to input a character using getchar() and display using putchar() |
| 5.5 | Write a program to input a string using gets() and display using puts() |

**Assignment-6:** (if..else)

| | |
|---|---|
| 6.1 | Write a program to input your age and check whether age>=18 or not using if..else |
| 6.2 | Write a program to find greatest among three unequal numbers using else…if ladder. |
| 6.3 | Write a program to find the roots of a quadratic equation when three co-efficient values are given.(use if..else) |
| 6.4 | Write a program to accept arithmetic operator and two operands. Find the result as per the operator symbol entered using else if ladder. |

**Assignment -7:** (Switch..case)

| | |
|---|---|
| 7.1 | Write a program to display weekday as per the digit given within (1 to 7), i.e: 1 – Sunday, 2- Monday, 3-Tuesday etc. Use switch..case |
| 7.2 | Write a program to find the greatest among three numbers using switch case. |
| 7.3 | Write a program to accept a lower case character and test whether it is vowel or consonant using switch.. case |
| 7.4 | Write a program to accept arithmetic operator and two operands. Find the result as per the operator symbol entered using switch..case. |

**Assignment -8:** (Loop)

| | |
|---|---|
| 8.1 | Write a program to display all the 256 characters of the C language |
| 8.2 | Write a program to find the sum of individual digits of a positive integer. |
| 8.3 | Write a program to generate Fibonacci series of N numbers. |
| 8.4 | Write a program to find the greatest common divider of two positive numbers given as input |

**Assignment -9:** (Loop)

| | |
|---|---|
| 9.1 | Write a program to accept a number test whether it is palindrome or not. |
| 9.2 | Write a program to input a number and check whether it is prime or not. |
| 9.3 | Write a program to input a number and check whether it is Armstrong or not. |
| 9.4 | Write a program to input a positive integer and find its equivalent binary number. |

**Assignment -10**: (Loop)

| | |
|---|---|
| 10.1 | Write a C program to display all the natural numbers except the numbers divisible by three within the range 1 to 100 |
| 10.2 | Write a C program all the prime number between 1 to n where n is the value supplied by the user |
| 10.3 | Write a program to find the sine X value of a given number when the X value and the number of terms given input |
| 10.4 | Write a program to check a number is magic number or not. |

**Assignment -11:** (Loop)

| | |
|---|---|
| 11.1 | Write a program to generate the following pyramid.<br>1<br>1 2 3<br>1 2 3 4 5<br>1 2 3 4 5 6 7 |
| 11.2 | Write a program to generate the following pyramid.<br>1<br>1 1<br>1 2 1<br>1 3 3 1<br>1 4 6 4 1 |
| 11.3 | Write a program to generate pyramid:<br>Z<br>Z Y X<br>Z Y X W V<br>Z Y X W V U T |

**Assignment -12:** (1d array)

| | |
|---|---|
| 12.1 | Write a program to accept 10 integer in to an array and find largest and smallest integers present in them |
| 12.2 | Write a program to input a number and search how many times it is exist in the given list of elements in an array. |
| 12.3 | Write a program to accept 10 numbers in to an array and sort it in ascending order |

**Assignment -13**: (2-D Array)

| | |
|---|---|
| 13.1 | Write a program to input elements 4x4 matrix. Find the principal diagonal of them. |
| 13.2 | Write a program to input values into two matrices P(3x3). Find the sum of individual rows and individual columns or the matrix. |
| 13.3 | Write a program to input values into two matrices A(3x4), B(4x3). Perform matrix multiplication and display the resultant matrix C(3X3) matrix. |

**Assignment -14:** (String handling)

| | |
|---|---|
| 14.1 | Write a program to input a character and a sentence. Find the frequency of the character in the sentence. |
| 14.2 | Write a program to accept a string and test whether it is palindrome or not without using string handling functions |
| 14,3 | Write a program to input two strings and check whether they are equal or not using string handling functions. |

**Assignment -15**: (Functions)

| | |
|---|---|
| 15.1 | Write a C program to create a user defined function to find the factorial of a given integer. |
| 15.2 | Write a C program which contains three UDF's namely add(), subtract() and multiply(). Each function accepts two integers as their arguments and calculate and return the results |
| 15.3 | Write a program to create and UDF that tests a number is perfect or not. |

**Assignment -16**: (Functions)

| | |
|---|---|
| 16.1 | Write a C program to create an UDF to test a number is strong or not. |
| 16.2 | Write a C program to create an UDF which accepts a number and returns the sum of digits of it. |
| 16.3 | Write a program to create an UDF which accepts a string and count the vowels present in it. |

**Assignment -17**: (Recursive functions)

| | |
|---|---|
| 17.1 | Write a program to find gcd of two integers using recursive function. |
| 17.2 | Write a program to input 10 integers, then using recursive function find the largest number. |
| 17.3 | Write a program to generate Fibonacci series of N numbers using recursive function. |

**Assignment -18:** (Function with array)

| | |
|---|---|
| 18.1 | Write a program to create an UDF which accepts an integer array of 10 elements and returns the count of odd numbers present in it. |
| 18.2 | Write a program to create an UDF which accepts a square matrix along with values and displays the transpose of it. |
| 18.3 | Write a program to create an UDF which performs addition of two matrices. |

**Assignment -19**: (Pointers)

| | |
|---|---|
| 19.1 | Write a program to create user defined function called swap having two integer pointers as its arguments and it has no return value. Call this function for interchanging two values using call-by-address. |
| 19.2 | Write a program to input a set of n numbers into an integer array. Create an UDF that accepts the array using pointer and finds number of prime numbers exist in the array. |
| 19.3 | Write a program to input two numbers and using call by address concept find LCM and GCD. |

**Assignment -20**: (Pointers & Array)

| | |
|---|---|
| 20.1 | Write a program to input a string and then using pointer find how many vowels present in the string. |
| 20.2 | Write a program to create an UDF which accepts a number and finds the reverse of it using call by address concept |
| 20.3 | Write a program to create an UDF which accepts two strings and then concatenates both strings (use character pointers as parameters in UDF) |

**Assignment -21**: (Pointers & function)

| | |
|---|---|
| 21.1 | Write a program to input 10 integers into an array. Create an UDF which accepts the base address of array and finds the sum of even numbers and sum of odd numbers separately. |
| 21.2 | Write a program to input 10 integers into an array. Create an UDF which accepts the base address of the array and finds the largest element. |
| 21.3 | Write a program to create an UDF which accepts the base address of an integer matrix and it returns the address of largest element present in it. |

**Assignment -22:** (Character pointer)

| | |
|---|---|
| 22.1 | Write a program to create an user defined function which accepts a string using a character pointer and returns the length of the string |
| 22.2 | Write a program to create an array of character pointers and store a group of strings into it. |

| | |
|---|---|
| 22.3 | Write a program to accept a string using character pointer and then create an UDF which displays the reverse of the string. |

**Assignment -23:** (Dynamic memory)

| | |
|---|---|
| 23.1 | Write a program to store N integers using dynamic memory allocation. Find the mean value of it using a function. |
| 23.2 | Write a program to store N float values using DMA and create an UDF which finds the sum of them. |
| 23.3 | Write a program to store N numbers in to memory using DMA and then using UDF check how many Armstrong numbers exist in it. |

**Assignment -24:** (Structure)

| | |
|---|---|
| 24.1 | Write a program to create a structure called COLLEGE having members: name, location, pincode. Store the details of your college and print again. |
| 24.2 | Write a program to create a structure called STUDENT having members: rollno, name, age, branch. Store one student details and display it again. |
| 24.3 | Write a program to create a structure called PRODUCT having members: product no, name, manufacturing date. Create another structure called DATE which shall be used for declaring the member manufacturing date. Store a product details and print again. |

**Assignment -25:** (Structure with array)

| | |
|---|---|
| 25.1 | Write a program to create a structure CRICKET having members: player name, team name and batting average. Store 10 cricket players details in structure array. Then display only those details where batting average>=50 |
| 25.2 | Write a program to create a structure BOOKS having members : Book code, book name, author, cost. Store 10 books details using structure array. Find the total cost of all books and the costly book exist. |

**Assignment -26:** (Structure with UDF)

| | |
|---|---|
| 26.1 | Write a program to create a structure called complex to represent a complex number. Perform addition of two complex numbers using UDF |
| 26.2 | Write a program to create a structure for employee code, name and salary. Store five employee details using structure array and display only employee names whose salary is greater than 25000 using UDF |

**Assignment -27**: (Structure with pointer and array)

| | |
|---|---|
| 27.1 | Write a program to create structure called ITEM having members: item code, name, price. Create a structure array of size 10. Store the item details and then using a structure pointer display all the items whose price>=500 |
| 27.2 | Write a program to create a structure called SUBJECTS having members: rollno, physics, chemistry, maths, total marks. Create a structure array to store 10 students marks. Calculate the total marks of each student. Use a structure pointer to find the topper. |

**Assignment -28**: (Dynamic memory, structure & union)

| | |
|---|---|
| 28.1 | Write a program to create a structure for product having members like product code, product name, price and quantity. Create a structure pointer to allocate memory for five products using dynamic memory allocation. Store the product details and display. |

| | |
|---|---|
| 28.2 | Write a program to create a structure student having members like rollno, name and percentage. Store five student details using structure array. Create an user defined function that accepts the student details using a structure pointer and counts how many first division students present |

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | | - | - | - | - | - | - | - | - | | | |
| **CO2** | 3 | 3 | 3 | 1 | - | - | - | - | - | - | - | - | | | |
| **CO3** | 3 | 3 | 3 | | - | - | - | - | - | - | - | - | | | |
| **CO4** | 3 | 3 | 3 | 1 | - | - | - | - | - | - | - | - | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSHS 1160** | **Communicative English Laboratory-I** | **0** | **0** | **2** | **1** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1: To develop the vocabulary and usage skills of students by practice.

CEO2: To develop the communication skills of the students, especially Listening and Speaking skills.

CEO3: To enable students to participate in group discussions through proper listening and speaking.

CEO4: To enable students eliminate grammatical mistakes in speech and writing.

Course Outcome

| | |
|---|---|
| CO1 | Memorise and explain a good range of vocabulary and usage . |
| CO2 | Use grammer for effective speaking in GD and other formats of speaking |
| CO3 | Able and defend in conversational and public speaking comptencies. |
| CO4 | Develop active listening and speaking skill in different real life situation |
| CO5 | |

**Phonetics &Listening Skills16 hours = 8 classes [2 listening tests x 10 marks = 20 marks**]

Vowels, diphthongs, consonants, consonant clusters; The International Phonetic Alphabet (IPA); phonemic transcription; Problem sounds; Syllable division and word stress; Sentence rhythm and weak forms; Contrastive stress in sentences to highlight different words; Intonation: falling, rising, and falling-rising tunes; Listening to Newspaper reading/Video, etc.

Listening with a focus on pronunciation (ear-training): segmental sounds, stress, weak forms, intonation & Listening for comprehension. Reading of English daily newspapers and self-development books be integrated listening and speaking activities.

**Speaking skills** 16 hours = 8 classes [4 speaking tests x 10 = 40 marks]

- Topics for 1 minute, 2 minutes, and 5 minutes speaking
- Pictures, Quotations, Attitude-testing Questions may be used.
- Summarizing/responding to handouts, articles, books, magazines and newspapers.

Individual/Group presentations/discussion on given topics

**Soft skills development 14** hours = 7 classes [4 assignments x 10 = 40 marks]

- Positive thinking (Teachers to engage game/activity-oriented classes)

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

**Text/Reference Books:**

1. Business and Corporate Soft skills developed by Rai Tech. University (PDF available)

2. Spoken English (with CD). Sasikumar V and P V Dhamija. New Delhi: Tata McGraw-Hill Education Pvt. Ltd. (2nd Ed.)

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | - | - | - | - | - | - | - | 2 | 1 | - | | | |
| **CO2** | - | - | - | - | - | - | - | - | 2 | 2 | - | - | | | |
| **CO3** | - | - | - | - | - | - | - | - | 2 | 2 | - | - | | | |
| **CO4** | - | - | - | - | - | - | - | - | - | 2 | - | 1 | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSES 1171** | **Engineering Drawing** | **0** | **0** | **2** | **1** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1: To enable students to acquire and use engineering drawing skills as a means of accurately and clearly communicating ideas, information and instructions

CEO2: To enable students to acquire requisite knowledge, techniques and attitude required for advanced study of engineering drawing

Course Outcome

| | |
|---|---|
| CO1 | Prepare Orthographic projections of Lines |
| CO2 | Construct Isometric Scale |
| CO3 | Interpret Sections of various Solids including Cylinders |
| CO4 | Draw projections of lines |

**Unit 1**

1. **Introduction**: Introduction to Standards for Engineering Drawing practice, Line work and Dimensioning. **[1 – Sheets]**
2. **Co-ordinate system and reference planes:** Definitions of HP, VP, RPP & LPP. Selection of drawing size and scale. Representation of point and line. **[1 – Sheets]**

**Unit -2**

3. **Orthographic Projections :** Introduction, Definitions - Planes of projection, reference line, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only),True and apparent lengths, True and apparent inclinations to reference planes. **[1 – Sheets]**
4. **Orthographic Projections of Plane Surfaces (First Angle Projection Only):** Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, hexagon and circle. **[1 – Sheets]**
5. **Projections of Solids (First Angle Projection Only) :** Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, cylinders and cones in different positions.

**Unit -3**

6. **Sections and Development of Lateral Surfaces of Solids :** Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. **[2 – Sheets]**

**Unit -4**

7. **Isometric Projection (Using Isometric Scale Only) :**Introduction, Isometric scale, Isometric projection of tetrahedron, cones and spheres. **[1 – Sheets]**

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

**TEXT BOOKS**

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi
3. Engineering Drawing by N. S. Parthasarathy and Vela Murali Oxford University Press.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | - | 1 | - | - | - | - | - | 1 | 3 | - | | | |
| **CO2** | 1 | - | 1 | 3 | - | - | - | - | - | 2 | 1 | - | | | |
| **CO3** | - | - | - | 1 | - | - | - | - | - | 3 | - | - | - | | |
| **CO4** | - | - | - | 1 | - | - | - | - | - | 3 | - | - | - | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSES 1172** | **Engineering Workshop** | **0** | **0** | **2** | **1** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1: To enable students to work on different trades like Fitting, Carpentry, Black smithy etc… which makes the students to learn how various joints are made using wood and other metal pieces

CEO2: To familiarize with the basic manufacturing processes and to study the various tools and equipment used, hands-on training is given in different sections

Course Outcome

| | |
|---|---|
| CO1 | To follow various safety precaution and use of various hand tools |
| CO2 | To demonstrate the process configuration and basic mechanism of different machines like Lathe |
| CO3 | Identify and apply suitable tools for machining process including facing |
| CO4 | To prepare a job with a given dimension with the help of machining, welding practice. |

**Unit -1**

1. **Safety Precaution:** To study the various Safety precautions in workshop.
2. **Fitting :**

(i) Study of different hand tools and Machine tools used in fitting.
(ii) Preparation of a male and female fitting job by using different hand tools.

**Unit -2**

3. **Machining:**

(i) Study of various components and working principle of lathe machine
(ii) Preparation of a cylindrical job by lathe ( turning, Thread-cutting, knurling)
**(iii)** Study on Shaper and Milling Machine

**Unit -3**

4. **Welding Practice :**

(i) Hand on practice on Electric Arc Welding to prepare Lap Joint, Butt Joint, T- Joint and Corner Joint .
(ii) Study of Oxyacetylene Gas welding and Gas cutting.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

**Reference:**

1. Elements of Workshop Technology, Vol. I and II by Hajrachoudhary, Khanna Publishers
2. Workshop Technology by WAJ Chapman, Viva Books
3. Workshop Manual by Kannaiah / Narayana, ScitechPublicaitons(P) Ltd.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | - | 2 | - | 1 | 1 | - | - | 1 | - | 1 | - | - | - |
| **CO2** | 2 | - | - | 1 | - | | - | - | - | 1 | - | 1 | - | - | - |
| **CO3** | 1 | - | - | 1 | - | 1 | - | - | - | 1 | - | 1 | - | - | - |
| **CO4** | 2 | - | - | 2 | - | | - | - | - | 1 | - | 1 | - | - | - |

## 2ND SEMESTER

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSBS2010** | **Engineering Mathematics-II** | **3** | **1** | **0** | **4** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1: To apply Laplace Transform methods to solve initial value problems for constant coefficient linear ODEs.

CEO2: To calculate the gradients and directional derivatives of functions of several variables

CEO3: To introduce the concept of Vector differentiation and integration that finds applications in various fields like solid mechanics, fluid flow, heat problems and potential theory

Course Outcome

| | |
|---|---|
| CO1 | To Solve Ordinary differential and partial differential equation by using Laplace transform and its application in Network theory, wave equation etc |
| CO2 | To execute the technique of Fourier Integral and transform for learning in advanced Engineering Mathematics |
| CO3 | To relate gradient, curl and divergence and its application in electromagnetic theory |
| CO4 | To evaluate multiple integrals by using Green's, Stokes' and divergence theorem to give physical interpretation of the curl and divergence of a vector field |

**UNIT:1 Laplace Transforms** **[15 Hours]**

Laplace Transforms: Definition, existence of Laplace Transform, Properties of Laplace Transform, Evaluation of integrals by Laplace Transforms, Inverse transforms, convolution theorem, transforms of unit step function, unit impulse function, and periodic function.

**UNIT:2** **[12 Hours]**

Introduction of Fourier transform and Fourier Integral, Simple application to ordinary differential equations by Laplace Transform,

**UNIT:3** **[10 Hours]**

Vector differential calculus: vector and scalar functions and fields, Derivatives, Curves, tangents and arc Length, gradient, divergence, curl and their applications.

**UNIT:4** **[16 Hours]**

Definition and evaluation of double integration and triple integration.

Vector integral calculus: Evaluation of line integral, Surface integral and volume integral and their application, Greens theorem, stokes theorem, Gauss theorem (without proof)

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

**Text Books**

1. Advanced Engineering Mathematics by E. Kreyszig, John Willey & Sons Inc. 10th Edition

**Ref. Books**

1. Higher Engineering Mathematics by B. V. Ramana ,McGraw Hill Education.
2. Higher Engineering Mathematics by BS Grewal :Khanna Publishers, New Delhi.
3. Advanced Engineering mathematics by H. K. Das.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | - | - | 2 | - | 1 | - | - | - | - | 1 | | | |
| **CO2** | 3 | 3 | - | - | 1 | - | - | - | - | - | - | - | | | |
| **CO3** | 2 | | - | - | 1 | - | - | - | - | - | - | - | | | |
| **CO4** | 2 | - | - | - | 2 | - | - | - | - | - | - | 1 | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSES2050** | **Data Structure using 'C++'** | **3** | **0** | **0** | **3** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1: Understand the object oriented concepts and to develop C++ programs for performing different operations on arrays, stack, Queue, linked list. Analyze the difference between them and understand different applications.

CEO2: Understand different searching and sorting methods and compare them in terms of performance and applications.

Course Outcome

| | |
|---|---|
| CO1 | Develop algorithms for performing different operations on 1D array, matrix, stack, Queue, analyze the difference between them and understand different applications. |
| CO2 | Understand different searching and sorting methods, Linked lists and them compare them in terms of performance and applications. |
| CO3 | Understand the Binary Tree and its memory representation; analyze Binary search Tree and its applications, compare the BST with AVL Tree and examine the advantages. |
| CO4 | Design Heap Tree, observe its applications in sorting. Understand the memory representation of graph; analyze traversal methods and applications of graph. Analyze the Hashing techniques in compare with other sorting techniques. |

**Unit I** **[12 hours]**

Basic concepts: Data abstraction, Algorithm specification, Memory Representation of 1D and 2D Array.Stack: Introduction to stack, basic operations and implementation of stack using arraysQueue: Introduction to linear queue, basic operations and implementation of linear queue using arrays, circularqueue, basic circular queue operations& Representation of Double ended Queue.

Applications on stack – Recursion, infix to postfix conversion, Evaluation of postfix

**Unit II** **[12 hours]**

Searching: Linear search and Binary search using linear array

Sorting: Bubble sort, Insertion sort, Selection sort, Quick sort, Bucket Sort using linear array.

Linked Lists: Basic operations of singly, doubly and circular linked lists, implementation of stack and queue using singly linked list.

**Unit III** **[12 hours]**

Trees: Introduction, Terminology, Binary Trees, Representation of Binary Trees using arrays and linked lists, Binarytree traversals, Creation of binary tree from in-order&pre-order sequences - Creation of binary tree from in-order & post-order

Binary Search Trees: definition, basic operations of BST (Searching, Insertion and deletion) Introduction to AVL trees, Height of an AVL Tree, Balancing AVL tree by rotations afterinsertions and deletions ofa data node.

**Unit IV** **[12 hours]**

Heaps: Introduction to binary heaps, definition of a Max-heap, Min-heap, creating Max-Heap, Applications: Heapsort, Priority queue.

Graphs: Definitions, Graph representation - Adjacency matrix, Incidence Matrix, adjacency lists, Graph Traversals (BFS & DFS), Single source shortest path algorithm (Dijkstra's Algorithm) Topological Sorting.

Hashing: Hashing Functions, Open hashing (chaining), closed hashing (Open addressing – linear probing, quadraticprobing, double hashing), rehashing.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

**Text Books:**


1. Gilberg and Forouzan: "Data Structure- A Pseudo code approach with C" by Thomson Publication.
2. "Data structure in C" by Tanenbaum, PHI publication / Pearson publication.
3. Pai: "Data Structures & Algorithms; Concepts, Techniques & Algorithms "Tata McGraw Hill.

**Reference Books:**


1. "Fundamentals of data structure in C" Horowitz, Sahani& Freed, Computer Science Press.
2. "Fundamental of Data Structure" ( Schaums Series) Tata-McGraw-Hill.


| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | | | |
| **CO2** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | | | |
| **CO3** | 3 | 3 | 3 | 1 | - | - | - | - | - | - | - | - | | | |
| **CO4** | 3 | 3 | 1 | 1 | - | - | - | - | - | - | - | - | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSHS 2060** | **Communicative English-II** | **2** | **0** | **0** | **2** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1: To develop the communication skills and soft skills of the students

CEO2: To enhance the ability of the students to develop employability and entrepreneurial skills

CEO3: To enable students to successfully participate in GDs and PIs

CEO4: To make students communicate effectively using technologies and techniques

CEO5: To inculcate a sense of professionalism in students

Course Outcome

| | |
|---|---|
| CO1 | Understand the nature and scope of corporate communication and try to be industry ready |
| CO2 | Able to use language skills for professional growth |
| CO3 | Distinguish fact from opinion in reading passages from different text books |
| CO4 | Create professional documents like Resume, Job Application letter for their career needs |

**UNIT-1** Introduction to Technical Communication **[7 hours]**

1.1 Essence of Technical Communication 1

1.2 Nature and Scope of Technical Communication: 1 +1 +1

Technical Communication -- Interactive and Adaptable; Technical Communication -- Reader Centered; Technical Communication and teamwork; Technical Communication Has Ethical, Legal, and Political Dimensions; Technical Communication – its International and Cross-Cultural nature; Technical communication and use of ICT.

1.3 Need of Technical communication for career development 1

1.4 Computer Assisted Language Learning (CALL) – Self learning through use of technology, Effectiveness of CALL for developing English Language Skills; Use of Internet 1 +1

**UNIT - 2** Career Communication **[17 hours]**

2.1. Career making: Setting Goals, SWOT analysis 1

2.3 Preparing a Résumé: Elements of a Résumé; Types of Résumés: Chronological Résumé, Functional Résumé; Use of job portals 1 +1 +1

2.4 Effective Job Application Letter/Cover letter 1 +1

2.5 Group Discussion 1 +1

2.6 Job Interview 1 +1 +1+1 +1

2.7 Effective Oral Presentation 1+1

2.7 Handling a Meeting 1+1

**UNIT-3** Technical Approach to Reading **[8 Hours]**

3.1 Know your Reading speed; Advantages of speed reading 1

3.2 SQ4R Techniques of Reading 1+1

3.3. Techniques of Rapid reading: skimming, scanning 1+1

3.4 Understanding coherence and cohesion 1

3.5 Note taking, Mind maps 1+1

**UNIT-4** Technical Writing **[14 hours]**

4.1 Writing a technical paper 1+1

4.2 Writing business letters – significance, purpose, structure and elements, layout; types of business letters 1+1+1+1

4.3 Memos 1+1

4.4 Business Reports and Technical proposals 1+1+1+1

4.5 Using the Social media for better communication 1+1

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

**Text Books:**

1. Business Communication Today by Bovee, Courtland L., Thill, John V. Prentice Hall.

2. Technical Communication Today by Richard Johnson-Sheehan. Edition 5. Pearson.

3. Communicative English for Engineers and Professionals by NitinBhatnagar and MamtaBhatnagar. Published by DK/Pearson.

**Reference Books**

1. Basic Communication Skills for Technology by Andre J. Rutherford, Pearson Education Asia, Patparganj, New Delhi.
2. Business Communication by Varinder Kumar and Bodh Raj. Kalyani Publishers.
3. A Textbook of English Phonetics for Indian Students by T. Balasubramanian
4. Technical Communication, Principle and Practice by Meenakshi Raman &Sangeeta Sharma, Oxford University Press.
5. How to Read better and Faster by Norman Lewis. 4th Edition. Publisher: Crowell.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | - | - | - | - | - | 2 | 2 | 3 | - | - | | | |
| **CO2** | - | - | - | - | - | - | - | - | - | 3 | 2 | - | | | |
| **CO3** | - | - | - | - | - | 1 | - | - | - | 3 | - | - | | | |
| **CO4** | - | - | - | - | - | - | - | - | - | 3 | 1 | | | | |

| Subject Code | Title of the subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSES2150** | **Data Structures using 'C++' Laboratory** | 0 | 0 | 2 | 1 | **A** |

Pre -Requisite:

Course Educational Objective

CEO1: Develop algorithms for performing different operations on arrays, stack, Queue, linked list. Analyze the difference between them and understand different applications.

CEO2: Understand different searching and sorting methods and compare them in terms of performance and applications. Understand and analyze Binary search Tree, AVL Tree, Heap Tree and their applications.

CEO3: Understand the memory representation of graph, its traversal methods and applications. Analyze the Hashing techniques in compare with other sorting techniques.

Course Outcome

| | |
|---|---|
| CO1 | Understand and implement the object oriented concepts by in developing the programs for different operations. |
| CO2 | Develop programs for performing different operations on 1D array, matrix, stack, Queue, analyze the difference between them and understand their applications. |
| CO3 | Design code for different searching and sorting methods and analyze their performance. |
| CO4 | Develop the codes for different operations on Linked lists and compare with other data structures. |

**Lab1: introduction to OOPs (C++ features), cin, cout, object, class, Simple programs.**

**Lab2: Access Specifiers, inline, private, public, arrays of objects, programs on them.**

**Lab3: Experiment No.1**

1) Write a C++ program to create a class called student to store your rollno, name, age. Create an array of object to input 5 students data and then display where age>=20.
2) Write a C++ program to create a class having methods for operations insertion, deletion and display to perform operations on 1D array of elements.

**Lab4: Experiment No.2**

Write a C++ program to create a class having methods: insertion, multiply and display for performing multiplication on a matrix of elements.

**Lab5: Experiment No.3**

Write a program using C++ to create a stack using class and perform:
(i) push operation (ii) pop operation (iii) display operation

**Lab6: Experiment No.4**

Write a C++ program that uses Stack operations to converting an infix expression into equivalent postfix expression.

**Lab7: Experiment No.5**

Write a C++ program to create a linear queue and perform the following operations: (i) insertion ii) deletion and iii) Traversal

**Lab8: Experiment No.6**

Write C++ programs that use both recursive and non-recursive functions to perform the linear & binary searchoperation for a Key value in a given list of integers.

**Lab9: Experiment No.7**

Write a C++ menu driven program to implement bubble sort, selection sort and insertion sort for a given list of integers in increasing order.

**Lab10: Experiment No.8**

Write a C++ program to implement quick sort to a given list of integers to sort in ascending order.

**Lab11: Experiment No.9**

Write a C++ program that uses functions to perform the following operations on linear linked list: i) Creation ii) Insertion iii) Deletion iv) Traversal

**Lab12: Experiment No.10**

Write a C++ program that uses functions to perform the following operations on Double linked list: i) Creation ii) Insertion iii) Deletioniv) Traversal.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | | | |
| **CO2** | 2 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | | | |
| **CO3** | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | | | |
| **CO4** | 2 | 2 | 3 | 3 | 1 | - | - | - | - | - | - | - | | | |

| Title of the subject | | | | | | |
|---|---|---|---|---|---|---|
| Subject Code | | L | T | P | C | QP |
| **BBSHS2160** | **Communicative English Laboratory-II** | **0** | **0** | **2** | **1** | **A** |

Pre -Requisite:

Course Educational Objective

CEO1: To enable students to successfully participate in GDs and PIs

CEO2: To make students communicate effectively by classroom practice.

CEO3: To inculcate a sense of professionalism in students

Course Outcome

| | |
|---|---|
| CO1 | Memorise and explain a good range of vocabulary and usage |
| CO2 | Use grammer for effective speaking in GD and other formats of speaking |
| CO3 | Able and defend in conversational and public speaking comptencies |
| CO4 | Develop active listening and speaking skill in different real life situation |

1. Writing an Effective Job Application Letter/Cover letter [4 hours]
2. Writing a winning resume and posting in job portals [4 hours]
3. Group Discussion [8 hours]
4. Job Interview [8 hours]
5. Oral presentation [6 hours]
6. Organizing a Meeting [4 hours]
7. Note making and Note taking [4 hours]
8. Memo writing [2 hours]
9. Profiling a company [4 hours]
10. Summarizing books/research paper/news report.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

**Text Books:**

1. Business Communication Today by Bovee, Courtland L., Thill, John V. Prentice Hall.
2. Technical Communication Today by Richard Johnson-Sheehan. Edition 5. Pearson.
3. Communicative English for Engineers and Professionals by NitinBhatnagar and Mamta Bhatnagar. Published by DK/Pearson.

**Reference Books:**

1. Basic Communication Skills for Technology by Andre J. Rutherford, Pearson Education Asia, Patparganj, New Delhi.
2. Business Communication by Varinder Kumar and Bodh Raj. Kalyani Publishers.
3. A Textbook of English Phonetics for Indian Students by T. Balasubramanian
4. Technical Communication, Principle and Practice by Meenakshi Raman &Sangeeta Sharma, Oxford University Press.
5. How to Read better and Faster by Norman Lewis. 4th Edition. Publisher: Crowell.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | - | - | - | - | - | - | - | 2 | 1 | - | | | |
| **CO2** | - | - | - | - | - | - | - | - | 2 | 2 | - | - | | | |
| **CO3** | - | - | - | - | - | - | - | - | 2 | 2 | - | - | | | |
| **CO4** | - | - | - | - | 2 | - | - | - | - | 2 | - | 1 | | | |

## III Semester

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPC3010** | **MECHANICS OF SOLIDS** | 3 | 1 | - | 4 | A |

CEO1-TO solve advanced solid mechanics problems using classical methods

CEO2- TO apply commercial software on select, applied solid mechanics problems

Pre-requisites: Basic Concepts of Physics and Mathematics (especially Trigonometry, Geometry and Calculus), Engineering Mechanics

| Course Outcomes | |
|---|---|
| CO-1 | Analyze the statically determinate and indeterminate problems |
| CO-2 | Determine the stresses and strains in the members subjected to axial, bending and torsional loads |
| CO-3 | Evaluate the slope and deflection of beams subjected to loads |
| CO-4 | Determine the principal stresses and strains in structural members |
| CO-5 | Understand the concept of buckling and be able to solve the problems related to isolated bars |

**UNIT-1** **(10 Hours)**

**Simple Stress and Strain** -Load, Stress, Principle of St.Venant, Principle of Superposition, Strain, Hooke's law, Modulus of Elasticity, Stress-Strain Diagrams, Working Stress, Factor of safety, Strain energy in tension and compression, Resilience, Impact loads, Analysis of Axially Loaded Members, Composite bars in tension and compression, temperature stresses in composite rods, Statically indeterminate problems, Shear stress, Complimentary shear stress, Shear strain, Modulus of rigidity, Poisson's ratio, Bulk Modulus, Relationship between elastic constants.

**Compound Stress and strain-** Stresses in thin cylinders, thin spherical shells under internal pressure, wire winding of thin cylinders. Analysis of Biaxial Stress. Plane stress, Principal stress, Principal plane, Mohr's Circle for Biaxial Stress, Two dimensional state of strain, Mohr's circle for strain, Principal strains and principal axes of strain, strain measurements, Calculation of principal stresses from principal strains.

**UNIT-2** **(11 Hours)**

Shear Force and Bending Moment for Determinate Beams - Types of load and Types of support. Support reactions, Shear force and bending moment, Relationship between bending moment and shear force, Point of inflection, Shear Force and Bending Moment diagrams for determinate beams.

**UNIT-3** **(12Hours)**

Simple Bending of Beams - Theory of simple bending of initially straight beams, Bending stresses, Shear stresses in bending, Distribution of normal and shear stress, beams of two materials, Composite beams.

Deflection of Beams - Differential equation of the elastic line, Slope and deflection of beams by integration method and area - moment method.

**UNIT-4** **(14Hours)**

Theory of Columns - Eccentric loading of a short strut, Long columns, Euler's column formula, Lateral buckling, Critical Load, Slenderness ratio

Torsion in solid and hollow circular shafts - Twisting moment, Strain energy in shear and torsion, strength of solid and hollow circular shafts. Stresses due to combined bending and torsion, Strength of shafts in combined bending and twisting

Teaching mehod:-Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text books:-1. Elements of Strength of Materials by S.P.Timoshenko and D.H.Young, Affiliated East West Press

2. Strength of Materials by G. H. Ryder, Macmillan Press

Ref.books:- 1. Mechanics of Materials by Beer and Johnston, McGraw Hill

2. Mechanics of Materials byR.C.Hibbeler, Pearson Education

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | - | - | - | - | - | - | - | - | - | - | | | |
| **CO2** | 2 | 3 | - | - | - | - | - | - | - | - | - | - | | | |
| **CO3** | 2 | 1 | - | - | - | - | - | - | - | - | - | - | | | |
| **CO4** | 2 | 3 | - | - | - | - | - | - | - | - | - | - | | | |

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPC3020** | **BUILDING MATERIALS AND BUILDING CONSTRUCTIONS** | 3 | - | - | 3 | **A** |

CEO1- To study about the basic building materials, properties and their applications

CEO2- To know the smart building materials, external paints and their uses.

CEO3 -To understand different types of masonries and their applications

Course Outcomes

| | |
|---|---|
| CO1 | Identify and characterize building materials |
| CO2 | Understand the manufacturing process of bricks and cement |
| CO3 | Identify the methods for preservation of timber and metals |
| CO4 | To select suitable type of flooring, Arch geometry, Plastering and also suitable color to face lift the building. |
| CO5 | To select and design suitable type of formwork. |

**Unit:1** **(10 Hours)**

***Bricks*:** Brick as a construction material and its importance, materials suitable for manufacture of bricks, methods of brick manufacture, types of bricks, qualities of a good brick, testing of bricks, uses of bricks.

**Stone:** Introduction, classification, composition and characteristics, useful Indian stone, method of quarrying and dressing

***Cement*:** Classification, chemical composition, Manufacturing of cement, hydration, tests for cement, uses of cement, types of cement, *Mortar*: Definition, composition and uses of mortar.

**Concrete:** Quality of mixing water, Workability, Factors affecting workability, Measurement of workability, Segregation, Bleeding, Uniformity of mixing, Mixing time, vibration of concrete, concrete mix design, admixtures, Grade and strength of Concrete.

**Unit:2** **(11Hours)**

**Foundation**: Types of foundation, spread foundations, pile foundations, pier foundations, excavation of foundation

**Brick Masonry:** Terminology used, Materials used, Causes of failure of brick masonry, Types of bonds, Brick laying, Joints in brickwork, Reinforced brickwork, Joint between old and new masonry, Maintenance of brick work.

**Stone Masonry:** Terminology used, Materials used, Cutting and dressing of stones, Types of stone masonry-Rubble and Ashlar, General principles of construction, Joints of stone, Stone lining, maintenance of stone work, Artificial stones. ***Cavity walls*:** Purpose and method of construction

**Unit:3** **(14 Hours)**

***Damp Proofing*:** Causes and effects, materials used for damp proofing, methods of preventing dampness, Damp Proof Course.

***Stairs*:** Terms used, types of stairs, essential requirements, wooden stairs, concrete stairs, metal stairs.

***Flooring:*** Types of flooring and their construction- brick, stone, concrete, tile, mosaic, terrazzo, asphalt

***Plastering*:** Definition. Materials used for plastering, types of plastering, methods of plastering, defects and remedial measures in plastering.

Unit:4 (10 Hours)

Building Maintenance and Safety Measures: Purpose, need, importance, methods, Causes and types of defects in buildings, Preparation of report on maintenance work, Remedial measures and execution procedure of any one type of building maintenance work, Importance of various Laws / Norms / Regulations / Acts for safety, Precautions and precautionary Measures, Post-accident procedures

Teaching Method(s): Chalk & Board/ PPT/Video Lectures

Text Books

1. “Material of Construction “, D.N.Ghose, TMH Publishing Company Ltd.
2. “Engineering Materials” by S. C. Rangwala et al., Charotar Publishing House
3. A text book of Building Construction by S K Sharma and B.K Kaul, S Chand & Company Limited.
4.” Building Construction”, Sushil Kumar, Standard Publishers Distributors, New Delhi

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | 2 | - | 2 | - | - | 2 | - | 2 | - | 2 | | | | |
| **CO2** | - | - | - | - | - | - | 3 | - | 3 | - | 2 | | | | |
| **CO3** | - | 2 | - | 2 | - | - | 2 | - | 2 | - | - | | | | |
| **CO4** | - | 2 | - | 2 | - | - | 2 | - | 2 | - | - | | | | |

| Subject Code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPC3030** | **SURVEYING I** | 3 | - | - | 3 | **A** |

CEO1- Have the ability to apply knowledge of mathematics, science, and engineering to understand the measurement techniques and equipment used in land surveying

CEO2-Gain an appreciation of the need for lifelong learning through the discussion of recent changes in survey procedures and equipment.

CEO3 -Have the ability to use techniques, skills, and modern engineering tools necessary for engineering practice.

CEO4 -Ability to function as a member of a team.

CEO5 -Understand the importance of professional licensure to protect the public in the Practice of land surveying.

| | |
|---|---|
| CO1 | undertake measurement and plotting in civil engineering |
| CO2 | Ability to perform levelling and contouring of given ground |
| CO3 | Ability to set different types of curves |
| CO4 | Ability to apply the basic principles of surveying and can carry out the survey in the field for various purposes using chain, compass, plane table and Theodolite. |
| CO5 | plan a survey, taking accurate measurements, field booking, plotting and adjustment of traverse |

**Unit:1** **(10 Hours)**

**Linear measurement and chain survey**: Use of chains and tapes for measurement of correct length of lines, direct and indirect ranging, chaining along sloping ground. Obstacle in chaining, errors and their elimination.

**Compass surveying**: Use of prismatic compass, temporary adjustment, bearing of a line, local attractions, and correction of bearing

**Unit:2** **(8 Hours)**

**Leveling**: Use of dumpy level and leveling staff. Temporary and Permanent adjustment of dumpy level, Reduction of levels by height of instrument and rise and fall method. Curvature and refraction error, sensitiveness of level tube, reciprocal leveling, leveling difficulties and common errors, Automatic and Electronic or Digital levels

**Unit:3** **(10 Hours)**

**Contouring**: Contour interval and horizontal equivalent, characteristics of contours, methods of contouring- different and indirect method, contour gradient

**Theodolite Survey**: Use of theodolite, temporary adjustment, measuring horizontal and vertical angles, theodolite traversing

**Unit:4** **(10 Hours)**

**Modern Surveying Instruments** – Electromagnetic Spectrum, Radar, Electronic Distance Measurement, EDM Equipment, Corrections to measurement, Digital Theodolite, Total Stations, Introduction to Remote Sensing and GIS

Teaching Method(s): Chalk & Board/ PPT/Video Lectures

Text Books

*1. Surveying &Levelling. Vol-I by T.P.Kanethar&S.V.Kulkarni, Pune VidyarthiGrihaPrakashan*

*2. Surveying and Leveling by R. Subramanian, Oxford University Press*

*3. Surveying- Vol.I, by B.C. Punmia, Laxmi Publications*

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | 2 | - | 2 | 2 | - | 2 | - | - | - | | | | |
| **CO2** | 3 | - | 3 | - | 2 | - | - | - | - | - | - | | | | |
| **CO3** | 2 | - | 2 | - | - | 2 | - | 2 | - | - | - | | | | |
| **CO4** | 2 | - | 2 | - | - | - | - | - | - | - | - | | | | |

| Subject Code | Course Title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSBS3040** | **ENGINEERING MATHEMATICS-III** | 3 | 1 | - | 4 | **A** |

CEO1- Mathematics fundamental necessary to formulate, solve and analyze engineering problems

CEO2- An understanding of Fourier Series and Laplace Transform to solve real world problems.

CEO3 - An understanding of Linear Algebra through matrices.

CEO4 - An understanding of Complex integration.

Pre-Requisites (If any)

Course Outcomes

| | |
|---|---|
| CO1 | Apply the fundamental concepts of Ordinary differential equations and partial differential equations and basic numerical methods for their resolution. |
| CO2 | Solving the problems choosing the best suitable method |
| CO3 | Use computational tools to solve problems and applications of Ordinary Differential Equations and Partial Differential Equations. |
| CO4 | Use an adequate scientific language to formulate the basic concepts of the course. |
| CO5 | Formulate and solve differential equation problems in the field of Industrial Organization Engineering. |

**Unit:1** **(10 Hours)**

**special functions :**

Beta and Gamma functions, relation between Beta and Gamma functions, Error function, Series solution of differential equations (up to second order), Legendre equation, Legendre polynomials and their properties, Bessel's function.

**Unit:2** **(8 Hours)**

**Complex Analysis**:

Analytic function, Cauchy-Riemann equations, Laplace equation, Complex integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions

**Unit:3** **(10 Hours)**

Taylor's series, Laurent's series, Singularities and zeros, Residue integration, evaluation of real integrals.

**Unit:4** **(10 Hours)**

Approximation and round of errors, Roots of equation: fixed point iteration, the Newton-Raphson method.

Interpolation: Lagrange Interpolation, Newton divided difference interpolation, Newton's forward and backward interpolation. Numerical Differentiation, Numerical integration: The trapezoidal rule, The Simpson's rules, Ordinary differential equation: Euler's method, modified Euler's method.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures

**Text Books**

1. E. Kreyszig," Advanced Engineering Mathematics:, Eighth Edition, Wiley India
2. Numerical method for Engineers by M. K. Jain and Iyenger.

**Ref. Books**

1. Higher Engineering Mathematics by B S Grewal :Khanna Publishers, New Delhi.
2. Numerical Analysis by Dutta and Jena

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | - | - | - | - | - | - | - | - | - | - | | | |
| **CO2** | 2 | 2 | - | - | - | - | - | - | - | - | - | - | | | |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | - | - | - | | | |
| **CO4** | 2 | 2 | - | - | - | - | - | - | - | - | - | - | | | |

| Subject Code | **Course title** | **L** | **T** | **P** | **C** | **QP** |
|---|---|---|---|---|---|---|
| **BCSES3051** | **OBJECT ORIENTED PROGRAMMING THROUGH JAVA** | 3 | - | - | 3 | **A** |

CEO1- To understand fundamentals of object-oriented programming in Java which includes defining classes, invoking methods, using class libraries.

CEO2-To create Java application programs using sound OOP practices such as interfaces, APIs and error exception handling.

CEO3 -Using API to solve real world problems.

Pre-Requisites (If any)

Course outcome

| | |
|---|---|
| CO1 | Knowledge of the structure and model of the Java programming language, (knowledge) |
| CO2 | Use the Java programming language for various programming technologies (understanding) |
| CO3 | Develop software in the Java programming language, (application) evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis) |
| CO4 | Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis) |
| CO5 | Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation) |

**Unit:1** **(10 Hours)**

An introduction Object Oriented Programming, Features of Object Oriented Programming Introduction to Java. Difference between C/C++ and Java, Features of Java, First Java Program, Writing the java program, Compiling the program, JVM and its significance in executing a program?, Architecture of JVM. Understanding, Java Tokens, Datatypes, Operators, Control Structures and Arrays, Conditional Statements, Loops/ Iterators, Jumping Statements, Java Arrays, Multidimensional Arrays, Taking Input from keyboard, Command Line Arguments, Using Scanner Class, Using Buffered Reader class.

**Unit:2** **(10 Hours)**

Introduction to Classes and Objects. Constructors, static Keyword , this Keyword, Array of Objects, Access Modifiers (Public, Private, Protected, Default). Inheritance ,Types of Inheritance and Java supported Inheritance, super, Polymorphism, Method Overloading, Constructor Overloading, Method Overriding, Dynamic Method Dispatching. String Manipulations. Wrapper classes, Auto boxing and unboxing. Abstract classes, Interfaces, Multiple Inheritance Using Interfaces, Java API Packages, User-Defined Packages, Accessing Packages, Error and Exception Handling, Types of exceptions Hierarchy of Exception classes, try, catch, finally, throw, throws, Commonly used Exceptions and their details ,User defined exception classes.

**Unit:3** **(8 Hours)**

Multithreading , Thread in Java, Thread execution prevention methods. (yield(), join(), sleep()), Concept of Synchronization, Inter Thread Communication, Basics of Deadlock, Demon Thread, Improvement in Multithreading, Inner Classes, Introduction, Member inner class, Static inner class, Local inner class, Anonymous inner class. IO Streams (java.io package) ,Byte Stream and

Character Stream, Files and Random Access Files, Serialization, Collection Frame Work (java.util), Util Package interfaces, List, Set, Map.

**Unit:4** **(8 Hours)**

Applet Introduction, Life Cycle of an Applet, GUI with an Applet, Abstract Window Toolkit (AWT), Introduction to GUI, Description of Components and Containers, Component/Container hierarchy, Understanding different Components/Container classes and their constructors, Event Handling, Different mechanisms of Event Handling, Listener Interfaces, Adapter classes.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

**Text Books:**

1. Programming in Java. Second Edition. Oxford higher education. (SachinMalhotra/SauravChoudhary)
2. Core Java for beginners. (RashmiKanta Das), Vikas Publication

**Ref. Books:**

JAVA Complete Reference (9th Edition) HerbaltSchelidt.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | | | | | | | | | | | | | | | |
| **CO2** | | | | | | | | | | | | | | | |
| **CO3** | | | | | | | | | | | | | | | |
| **CO4** | | | | | | | | | | | | | | | |

| Subject Code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCSES3052** | **DATA BASE MANAGEMENT SYSTEMS** | 3 | - | - | 3 | **A** |

Course Outcomes

Pre-Requisites (If any) –

| | |
|---|---|
| CO1 | Design and create a ERD (Entity Relationship Diagram) using software tool. |
| CO2 | Learn how to design and create and use a relational database system. |
| CO3 | Learn basic and advanced SQL command operations.. |
| CO4 | Design, develop and demonstrate a small database application. |
| CO5 | Impart familiarity to a non-relational DBMS, such as Mongo DB |

**Unit:1** **(9 Hours)**

Introduction to database Systems, advantages of database system over traditional file system, Basic concepts & Definitions, Database users, Database Language, Database System Architecture, Schemas, Sub Schemas, & Instances, database constraints, 3-level database architecture, Data Abstraction, Data Independence, Mappings, Structure, Components & functions of DBMS, Data models.

**Unit:2** **(11 Hours)**

Entity relationship model, Components of ER model, Mapping E-R model to Relational schema, Relational Algebra, Tuple & Domain Relational Calculus, Relational Query Languages: SQL and QBE. Database Design :-Database development life cycle (DDLC), Automated design tools, Functional dependency and Decomposition, Join strategies, Dependency Preservation & lossless Design, Normalization, Normal forms:1NF, 2NF,3NF, and BCNF, Multi-valued Dependencies, 4NF & 5NF. Query processing and optimization: Evaluation of Relational Algebra Expressions, Query optimization, Query cost estimation.

**Unit:3** **(8 Hours)**

Network and Object Oriented Data models, Storage Strategies: Detailed Storage Architecture,

Storing Data, Magnetic Disk, RAID, Other Disks, Magnetic Tape, Storage Access, File & Record Organization, File Organizations & Indexes, Order Indices, B+ Tree Index Files, Hashing Data Dictionary.

**Unit:4** **(10 Hours)**

Transaction processing and concurrency control: Transaction concepts, properties of transaction, concurrency control, locking and Timestamp methods for concurrency control schemes. Database Recovery System, Types of Data Base failure & Types of Database Recovery, Recovery techniques. fundamental concepts on Object-Oriented Database, Object relational database, distributed database, Parallel Database, introduction to Data warehousing & Data Mining.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures

Text Books

1. Sudarshan, Korth: **Database System Concepts**, 6th edition, McGraw-Hill Education.

***Ref.Books:***

1. Elmasari&Navathe: **Fundamentals of Database System**, Pearson Education.
2. Ramakrishnan: **Database Management Systems**, McGraw-Hill Education.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 1 | | 1 | - | - | - | 2 | - | - | | | |
| **CO2** | 3 | 3 | 3 | 1 | 3 | - | 2 | - | 3 | - | 3 | 2 | | | |
| **CO3** | 3 | 2 | 3 | - | 1 | - | - | 1 | 3 | - | 3 | 1 | | | |
| **CO4** | 3 | 3 | - | 3 | - | 2 | - | - | - | 1 | 3 | - | | | |

| Subject Code | Course Title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSBS3061** | **ENVIRONMENTAL ENGINEERING & SAFETY** | 3 | 0 | 0 | 3 | **A** |

Pre -Requisite:

Course Educational Objective

CEO1:The course introduces the students to the environmental consequences of industries

: CEO2: To provide minimization of their impacts through technology and legal systems.

Course Outcome

| | |
|---|---|
| CO1 | Students will understand the ecological system of environment. |
| CO2 | They will learn about treatment of water/waste water |
| CO3 | Students should know about cause and remedies of environment pollution and technological approaches |
| CO4 | They will understand the importance of environmental safety. |

UNIT:1 **(10 Hours)**

Ecological Concepts: Biotic components, Ecosystem Process: Energy, Food Chain, Water cycle, Oxygen cycle, Nitrogen cycle etc., Environmental gradients, Tolerance levels of environment factor, EU, US and Indian Environmental Law. Chemistry in Environmental Engineering: Atmospheric chemistry, Soil chemistry. Noise pollution- Noise standards, measurement and control. Water Treatment: water quality standards and parameters, Ground water. Water treatment processes, Pre-treatment of water, Conventional process, Advanced water treatment process.

UNIT:2 **(12 Hours)**

Waste Water Treatment: DO and BOD of Waste water treatment process, pretreatment, primary and secondary treatment of waste water, Activated sludge treatment: Anaerobicdigestion,Reactor configurations and methane production. Air Pollution: Air pollution and pollutants, criteria pollutants, Acid deposition, Global climate change –greenhouse gases, non-criteria pollutants, Air pollution meteorology, Atmospheric dispersion. Industrial Air Emission Control. Flue gas desulphurization, NOxremoval,Fugitive emissions.

UNIT:3 **(10 Hours)**

Solid waste, Hazardous waste management, Solid Waste Management, Source classificationand composition of MSW: Separation, storage and transportation, Reuse and recycling, WasteMinimization Techniques. Hazardous Waste Management, Hazardous waste and theirgeneration, Transportation and treatment: Incinerators, Inorganic waste treatment. E.I.A.,Environmental auditing.

UNIT:4 **(10 Hours)**

OccuptionalSafety and Health Acts, Safety procedures, Type of Accidents, Chemical and Heat Burns, Prevention of Accidents involving Hazardous substances, Human error. Hazard Control Measures in steel industry, Petroleum Refinery, Pharmaceutical industry. Fire Prevention - Detection, Extinguishing Fire, Safety Management- Safety Handling and Storage of Hazardous Materials, Corrosive Substances, Hydro Carbons Wastes. Personal Protective Equipments.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books 1. Environmental Engineering, Irwin/ McGraw Hill International Edition, 1997, G. Kiely,
2.Environmental Engineering by Prof B.K. Mohapatra, Seven Seas Publication, Cuttack
3. Environmental Engineering and Safety ,Raut&Sen Scientific Publishers.

Ref. Books 1. Environmental Engineering by Arcadio P. Sincero&Gergoria A. Sincero PHI Publication
2 Environmental Science, Curringham&Saigo, TMH

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 3 | - | 1 | 1 | - | 2 | - | - | 2 | | | |
| **CO2** | 3 | 2 | 3 | 2 | - | 2 | - | 1 | - | 2 | 2 | 2 | | | |
| **CO3** | 3 | 2 | 3 | 1 | 1 | - | 3 | 2 | - | - | - | - | | | |
| **CO4** | 2 | 1 | 3 | 2 | 1 | 3 | 1 | | 2 | 2 | 2 | 1 | | | |

| Subject Code | Subject | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BMSHS3062** | **Engineering Economics & Costing** | 3 | 0 | 0 | 3 | A |

**Course Educational Objectives**

| | |
|---|---|
| CEO1 | To teach the knowledge of economic principles and engineering principles to solve engineering problems |
| CEO2 | To make proficient in the evaluation of engineering proposals in terms of worth and cost |
| CEO3 | To convey various economics concepts and theories towards making rational economic decision |

**Course Outcomes:** On successful completion of the course students will be able to:

| | |
|---|---|
| CO1 | Explain the basic economic concepts on micro economics in terms of the law of demand and supply. |
| CO2 | Outline the various theories of production in short run as well as in long run |
| CO3 | Evaluate the tool of break even analysis to make production decisions of the firm and make use of depreciation calculations |
| CO4 | Formulate and apply interest factors to real life engineering problems and evaluate engineering alternatives with the help of economic analytical techniques |
| CO5 | Understand the financial structure of Indian economy, measuring national income, and measures of controlling inflation. |

**CO-PO & PSO Mapping**

| POS/COs | PROGRAMME OUTCOMES | | | | | | | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | | |
| CO1 | | | | | | 1 | | | | | 2 | 2 | | | |
| CO2 | | | | | | 1 | | | | | 3 | 1 | | | |
| CO3 | | | | | | 1 | | | | | 3 | 2 | | | |
| CO4 | | | | | | 2 | | | | | 3 | 1 | | | |
| CO5 | | | | | | 2 | | | | | 3 | 2 | | | |
| Avg. | | | | | | 1.4 | | | | | 2.8 | 1.6 | | | |

**SYLLABUS**

UNIT:1 (No of Hours):12hrs

Engineering Economics –

Meaning, Nature, Scope, Basic problems of an economy, Micro economics and Macro Economics.

Demand and Supply Analysis -

Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand &its measurement (Simple numerical problems to be solved)

Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, and Determination of market equilibrium (Simple numerical problems to be solved).

Theory of Production -Production function, Laws of returns: Law of variable proportion, Law of returns to scale

UNIT:2 (No of Hours):12hrs

Cost and revenue concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into Fixed and variable costs. Basic understanding of different market structures, Price and output Determination under perfect competition (Simple numerical problems to be solved),
Break Even Analysis -
Linear approach (Simple numerical problems to be solved). Depreciation-Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method

UNIT:3 (No of Hours):12hrs

Time value of money -
Interest Analysis - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.
Evaluation of engineering projects-
Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects. Sensitivity Analysis, Replacement Analysis-Determination of economic life of an asset, Replacement of existing asset with a new asset.

UNIT:4 (No of Hours):9 hrs

Overview of Indian financial system. Commercial bank, Functions of commercial bank, Credit creation, Central bank, Functions of Central Bank. Inflation-
Meaning of inflation, types, causes, measures to control inflation.
National Income - Definition, Concepts of national income, Method of measuring national income

Teaching Methods: Chalk& Board/ PPT

Text Books

1, Vengedasalam, Deviga. Madhavan, Karunagaran, Principles of Economics, Oxford University Press.
2. R. Paneer Seelvan, " Engineering Economics", PHI
3. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
4.Paul, R.R., Money, Banking and International Trade, Kalyni Publishers.

***Reference Book:***

1. Riggs,J.L., Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Park, Chan.S, "Fundamental of Engineering Economics", Pearson.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. Thuesen, G.J.,Fabrycky,. Engineering Economy, PHI.

## IV SEMESTER

| Subject Code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPC4010** | **GEOTECHNICAL ENGINEERING-I** | 3 | 1 | - | 4 | **A** |

CEO1- Prepare civil engineering students for a career in foundation engineering.

CEO2- Prepare civil engineering students to design foundation excavations/retaining walls and analyze the stability of structures on or below slopes.

CEO3 - Prepare civil engineering students to analyze groundwater conditions in geotechnical engineering practice.

CEO4 - Prepare civil engineering students to design and determine construction requirements for buried conduits.

**Pre-Requisites (If any) –**

**Course Outcomes**

| | |
|---|---|
| CO1 | Ability to understand soil type classifications. |
| CO2 | Solve any practical problems related to soil stress estimation, permeability , seepage including flow net diagram |
| CO3 | Estimate the stress under any system of foundation loads |
| CO4 | Ability to solve practical problems related to consolidation settlement and time rate of settlement |
| CO5 | Ability to understand bearing capacity of soil for creating foundation |

**Unit:1** **(10 Hours)**

Origin of Soil and Grain Size: Rock Cycle and the origin of soil, soil particle size, clay minerals, mechanical analysis of soil, grain size distribution curve, particle shape, weight volume relationships, specific gravity, unit weight, void ratio, moisture content, and relationships, relative density, Consistency of soil: Atterberg limits - liquid limit, plastic limit, shrinkage limit. Liquidity index and consistency index, activity, soil structure. Engineering classification of soil: IS, USCS, HRB and ASTM.

**Unit:2** **(12 Hours)**

Soil Hydraulics: Modes of occurrence of water in soil. Stress conditions in soil- total, effective and neutral stresses and relationships. Permeability - Bernaulli's equation, Darcy's Law, hydraulic conductivity, laboratory determination of hydraulic conductivity, equivalent hydraulic conductivity in stratified soil. Seepage- Laplace equation of continuity, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, critical hydraulic gradient and quick sand condition. Soil Compaction: mechanism and principles, Standard and Modified Proctor Test, factors affecting compaction, effect of compaction on soil properties, field compaction techniques.

**Unit:3** **(10 Hours)**

Consolidation of soils: Consolidation and compaction, primary and secondary consolidation, Terzhaghi's theory of one dimensional consolidation, consolidation test, determination of coefficient of consolidation. Stresses in Soil: Normal and shear stresses on a plane, Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas, Isobar and pressure bulb concept, stress distribution on horizontal and vertical planes, Newmark's chart and its application, contact pressure.

**Unit:4** **(10 Hours)**

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination: direct and tri-axial shear test, unconfined compression test, vane shear test. Other methods of determining the un-drained shear strength of soil, sensitivity and thixotripy of clay. Stability of Slopes: Terminology, stability of finite and infinite slopes, Swedish slip circle method and friction circle method of analysis of slopes, Taylor stability Number and stability curves, Bishops Method.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures

Text Books
1. Principles of Geotechnical Engineering by Braja M. Das, Cengage Learning
2. Soil Mechanics and Foundation Engineering by B. C Punmia et al., Laxmi Publications Pvt Ltd

Ref. Books
1. Basic and applied soil mechanics, New Age International Publishers
2. Geotechnical Engineering by T.N. Ramamurthy & T.G. Sitharam,S. C

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 2 | 2 | - | 2 | - | - | - | - | - | | | | |
| **CO2** | - | 3 | - | 2 | - | - | - | - | - | - | - | | | | |
| **CO3** | 2 | 2 | 2 | - | - | 2 | - | - | - | - | 2 | | | | |
| **CO4** | - | 2 | - | - | - | - | - | - | - | - | - | | | | |

| Subject Code | Course Title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPC4020** | **SURVEYING -II** | 3 | - | - | 3 | **A** |

CEO 1- To study the use of advanced surveying instruments.

CEO 2- To computerize the distances and angles by using advanced equipments

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Ability to set out curves , buildings, culverts, tunnels |
| CO2 | Ability to carry out geodetic survey, taking accurate measurements with instruments and adjusting with traverse. |
| CO3 | Applying mathematical adjustment of accidental errors involved in survey |
| CO4 | Planning a survey for road alignment and height of building |
| CO5 | Gaining confidence for advance surveying techniques over conventional techniques. |

**Unit:1** **(10 Hours)**

**Tachometry:** General principles of stadia system, determination of tachometric constants, analytic lens, fixed and movable hair methods, inclined sights with staff vertical, inclined sight with staff normal to the line of sight, tangential system, errors in tachometer

**Curves:** Types of curves, elements of curve, different methods of setting out simple circular curves, compound curves, reverse curves, transition curves, types of transition curves, super elevation, vertical curves.

**Unit:2** **(10 Hours)**

**Triangulation:** Classification of triangulation system, operation in triangulation survey, reconnaissance, selection of site for base line, its measurement and extension, correction to base line measurement using EDM and Total station, selection of stations, triangulation figures, scaffolds and signals, marking of stations, inter visibility, strength of figures, reduction to centre.

**Unit:3** **(9 Hours)**

**Setting out of work:** Laying out of buildings and sewer lines.

**Photogrammetric**: Basic concepts, type of photographs, Terrestrial Photogrammetry, Aerial Photogrammetric: stereoscopy and parallax.

**Unit:4** **(9 Hours)**

**Theory of Errors**: Definitions, law of weight, probable errors, most probable value, distribution of error, normal equations, method of least square

Teaching Method(s): Chalk & Board/ PPT/Video Lectures

Text Books

1. Surveying Volume II and III : B.C. Punmia
2. Surveying –Volume II: S.K.Duggal, TMH Publications
3. Advance Surveying : R. Agor

*Ref.Books:*

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | - | - | - | 2 | 2 | 3 | 3 | 2 | - | | | | |
| **CO2** | - | - | - | - | - | - | 2 | 2 | 2 | - | - | | | | |
| **CO3** | 2 | - | - | - | - | 2 | - | 2 | - | - | - | | | | |
| **CO4** | - | - | - | - | - | 2 | - | 2 | - | 2 | - | | | | |

| Subject Code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPC4030** | **FLUID MECHANICS & HYDRAULIC MACHINES** | 3 | 1 | - | 4 | **A** |

CEO 1- To study and know Physical quantities and terms important in fluid flow and analyze fluid problems under static conditions.

CEO 2- To study and know the different equations governing fluid behaviour with respect to hydrostatics and hydrodynamics forces

CEO 3- To Study the importance of dimensionless number and fluid kinematics in governing fluid behaviour in rest and motion

CEO4- To apply the knowledge of fluid statics and dynamics in studying and redesigning hydraulic machineries and equipments

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Abilityto know the fundamental concepts of fluid mechanics |
| CO2 | Ability to apply the basic equations of fluid statics to determine forces |
| CO3 | Ability to know the concept of fluid kinematics and stream functions. |
| CO4 | Ability to use Euler's and Bernoulli's equation and the conservation of mass to determine the velocities, pressure and acceleration of fluids |
| CO5 | Ability to understand the concept of turbines and pumps of different types used in industry |

**Unit:1** **(10 Hours)**

**Introduction** - Physical property of Fluid: Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

**Fluid statics** - Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer. Hydrostatic pressure on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface. Buoyancy and floatation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.

**Unit:2** **(10 Hours)**

**Fluid kinematics** - Introduction, description of fluid flow, classification of fluid flow. Reynolds's number, Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity, Mathematical definitions of irrotational and rotational motion. Circulation, potential function and stream function. Flow net

**Unit:3** **(10 Hours)**

**Fluid dynamics** - Introduction, Euler's equation along a streamline, energy equation, Bernoulli's equation and its application to siphon, venturimeter, orificemeter, pitottube.Flow in pipes and ducts: Loss due to friction, Minor energy losses in pipes Hydraulic Gradient Line (HGL), Total Energy Line (TEL), Power transmission in the fluid flow in pipes, fluid flow in pipes in series and parallel. Flow through nozzles.

**Unit:4** **(10 Hours)**

**Hydraulic turbine**: Classification, Impulse and Reaction turbine; Tangential, Radial and axial turbine. Impulse turbine, Pelton wheel, bucket dimensions, number of buckets in pelton wheel, efficiency and performance curves. Reaction Turbines: Francis turbine and Kaplan turbine, velocity triangle and efficiencies, performance curve. Function of draft tube and casing cavitation Centrifugal Pump: constructional features, vane shape, velocity triangles, Efficiencies, Multi stage centrifugal pumps, Pump Characteristic, NPSH and Cavitation. Positive displacement pumps: Reciprocating Pump, Working principle, Discharge, work done and power requirement, Slip, Indicator diagram

Teaching Method(s): Chalk & Board/ PPT/Video Lectures

**Text Books**:-*1. Fluid Mechanics and Hydraulic Machines, P. N. Modi&S.MSeth,STANDARDBOOK HOUSE*

*2. A Text Book of Fluid Mechanics and Hydraulic Machines, R.K.Bansal, Laxmi Publications*

**Ref. Books**

*1. Fluid Mechanics , J. F. Douglas, J. M. Gasiorek, J. A. Swaffield, , Pearson Education,*

***2.*** *Fluid Mechanics, F. M. White, McGraw-Hill*

***3.*** *Fluid Mechanics Foundations and Application of Mechanics, C.S.Jog, Cambridge University Press*

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 2 | - | - | - | - | 2 | 2 | 3 | | | | |
| **CO2** | 2 | - | - | - | - | - | - | - | - | 2 | 2 | | | | |
| **CO3** | - | - | - | 2 | - | - | - | - | 2 | - | 2 | | | | |
| **CO4** | - | 2 | - | - | - | - | - | - | 2 | - | 2 | | | | |

| Subject Code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPC4040** | **STRUCTURAL ANALYSIS –I** | 3 | - | - | 3 | **A** |

CEO 1- To understand the concept of analysis of indeterminate structures by various classical methods

CEO 2- To study the use of ILD for determinate structure

CEO 3- To learn the concepts of moving loads and its effect on structures

CEO4- To understand the concept of equivalent UDL

CEO5- To study the reversal of stress under live load

| | |
|---|---|
| CO1 | Ability to determine various internal forces in beams and frame from bending moment and shear force diagram |
| CO2 | Ability to select appropriate method to determine slope and deflection of determinate beams and frames |
| CO3 | Ability to determine internal forces in the members of plane & space truss, three hinged arch and cables. |
| CO4 | Ability to determine absolute maximum internal forces due to rolling or moving loads from Influenced line Diagrams |
| CO5 | Ability to determine structural stability of beam, column etc. |

**Unit:1** **(10 Hours)**

Concept of determinate and indeterminate structures, determination of degree of static and kinematic indeterminacy in plane frame and continuous structures. Methods of Analysis: Equilibrium equations, compatibility requirements, Introduction to force and displacement methods.

Analysis of propped cantilever by consistent deformation method, Analysis of fixed and continuous beams by Moment-Area method, Conjugate beam method and theorem of three moments.

**Unit:2** **(10 Hours)**

Energy theorems and its application, Strain energy method, Virtual work method, unit load method, Betti's and Maxwell's laws, Castigliano's theorem, concept of minimum potential energy. Analysis of redundant plane trusses. Deflection of pin jointed plane trusses. Analytical method and Williot –Mohr diagram. Introduction to space truss.

**Unit:3** **(8 Hours)**

Rolling loads and influence lines for determinate structures, simply supported beams, cantilever,

ILD for reaction, shear force and bending moment at a section, ILD for wheel loads, point loads Andudl, maximum bending moment envelope.

**Unit**:**4** **(10 Hours)**

Analysis of three hinged arches, Suspension cable with three hinged stiffening girders subjected to dead and live loads, ILD for Bending Moment, Shear Force, normal thrust and radial shear for three hinged arches

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

**Text Books**

1. Theory and Problems in Structural Analysis by L Negi, McGraw Hill
2. Structural Analysis by T.S. Thandamoorthy, Oxford University Press
3. Basic Structural Analysis by C S Reddy, McGraw Hill

**Ref. Books**

1. Elementary Structural Analysis by Norris and Wilber, McGraw Hill
2. Structural Analysis by AslamKassimali, CengageLearing
3. Structural Analysis by R.C. Hibbeler, Pearson Education

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 3 | - | - | - | 2 | - | 2 | - | 3 | | | | |
| **CO2** | - | 2 | 2 | - | - | - | - | - | - | - | 2 | | | | |
| **CO3** | 2 | - | 2 | - | - | - | 2 | - | - | - | - | | | | |
| **CO4** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |
| **CO5** | | | | 2 | 3 | - | 3 | | - | - | - | | | | |

## V SEMESTER

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPC5010** | **DESIGN OF CONCRETE STRUCTURE** | 3 | 1 | - | 4 | **A** |

CEO 1- understand the design concept of various structures and detailing of reinforcements

CEO 2-To study the stress strain behaviour of steel and concrete

CEO 3-To understand the concept of working stress and limit state methods

CEO4-To gain the knowledge of limit state design for flexure, shear, torsion, bond and anchorage

CEO5-To understand the behaviour of columns subjected to eccentric load and use of interaction diagrams

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | They have acquired in-depth knowledge and critical understanding of the theory and principles of design and solution of Reinforced Concrete structures, since they could use new technologies and information systems in the design of civil Engineering structures with Reinforced concrete. |
| CO2 | Be able to perceive, design and analyze Reinforced Concrete structures (Beams, Columns, Frames). |
| CO3 | To have the ability to compose, solve and evaluate the internal forces (N, Q, M), the deformations, the stresses and reinforcements in various structures made of Reinforced Concrete. |
| CO4 | Ability to determine strength of reinforced concrete beams and slabs at various support conditions as per Limit state design |
| CO5 | Ability to design reinforced concrete beams and slabs at various support conditions for different loadings as per Limit state design |

**Unit:1** **(9 Hours)**

Properties of concrete and reinforcing steel, philosophy, concept and methods of reinforced concrete design, introduction to limit state method, limit state of collapse and limit state of serviceability, application of limit state method to rectangular beams for flexure, shear, bond and torsion

**Unit:2** **(8 Hours)**

Design of doubly reinforced beams, design of T and L beams, design of one way and two way slabs, design of staircases.

**Unit:3** **(8 Hours)**

Design of short and long columns with axial and eccentric loadings, Design of isolated and combined column footings

**Unit:4** **(8 Hours)**

Retaining walls, various forces acting on retaining wall, stability requirement, design of cantilever and counterfort retaining walls, Design of water tanks, design requirements, design of tanks on ground, underground and elevated water tanks.

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Design of Reinforced Concrete Structue by N. Subramanian, Oxford University Press
2. Limit State Design by A.K.Jain, Neemchand& Bros
3. Reinforced Concrete Design by S U Pillai& D. Menon, McGraw Hill

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | 2 | 2 | 1 | - | - | 2 | | - | 2 | | | | |
| **CO2** | 2 | - | - | - | 2 | - | - | - | | - | - | | | | |
| **CO3** | 2 | - | - | 2 | - | - | - | 2 | 1 | - | 2 | | | | |
| **CO4** | - | - | 2 | - | 2 | - | - | 2 | 2 | - | 2 | | | | |

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPC5020** | **TRANSPORTATION ENGINEERING-I** | 3 | - | - | 3 | **A** |

CEO 1- To understand the importance of transportation and characteristics of road transport

CEO 2- To know about the history of highway development, surveys and classification of roads

CEO 3- To study about the geometric design of highways

CEO4- To study about traffic characteristics and design of intersections

CEO5- To know about the pavement materials and design

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Ability to identify the current trends of transportation. |
| CO2 | Ability to determine the characteristics of pavement materials and develop the acceptance criteria. |
| CO3 | Ability to analyze and design the highway geometric elements & ability to design the pavement |
| CO4 | Ability to design traffic managing infrastructure based on given situation. |
| CO5 | Ability to design the super elevation of road for safe road |

**Unit:1** **(10 Hours)**

Modes of transportation, importance of highway transportation, history of road construction. Principle of highway planning, road development plans, highway alignments requirements, engineering surveys for highway location.

**Geometric design**- Design controls, highway cross section elements, cross slope or camber, road width, road margins, typical cross sections of roads, design speed, sight distance, design of horizontal and vertical alignments, horizontal and vertical curves.

**Unit:2** **(8 Hours)**

**Highway Materials:-**

Properties of sub grade, sub-base , base course and surface course materials , test on sub grade soil, aggregates and bituminous materials .

Traffic Engineering definition , fundamentals of traffic flow , traffic management, prevention of road accidents , elements of transport planning , highway drainage, pavement failures and maintenance , strengthening.

**Unit:3** **(6 Hours)**

Factors affecting flexible pavement and rigid pavement design. Introduction to IRC method of pavement design. Construction procedure of flexible and rigid pavements.

**Unit:4** **(7 Hours)**

Bridge site selection, economic span of bridge , bridge superstructures , foundations , sub-structures and approaches.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

**Text Books**

**1.** Highway Engineering, by S.K.Khanna and CEG Justo

**Ref. Books**

2. A course in Highway Engineering by Dr. S.P. Bindra

3. Principles and practice of Bridge Engineering by Dr. S.P. Bindra

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 1 | - | - | - | 2 | 2 | - | - | - | | | | |
| **CO2** | - | - | - | - | - | - | - | - | - | - | - | | | | |
| **CO3** | 2 | 2 | 1 | - | - | - | - | 2 | - | - | - | | | | |
| **CO4** | 2 | 2 | - | - | - | - | 2 | - | - | - | 1 | | | | |

| Subject Code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPC5030** | **IRRIGATION ENGINEERING** | 3 | - | - | 3 | **A** |

CEO 1- To build on the student's background in hydrology and hydraulics and understanding of water resources systems

CEO 2-To develop the skills in modelling of flood flows and flood routing

CEO 3-To develop skills in the ground water flow, type of aquifer and yield from the well

CEO4-To provide the knowledge of design of reservoir, operation and sedimentation

CEO5-To study the effect, causes and remedial measures of water logging

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Ability to solve problem on flood routine and design various hydraulic structures |
| CO2 | Assess the irrigation need of crops |
| CO3 | Design weirs in previous foundations. |
| CO4 | design gravity dam and earthen dam design the canal systems |
| CO5 | Select and design canal fall |

**Unit:1** **(10 Hours)**

Introduction: Necessity of Irrigation in India, Advantages and disadvantages of Irrigation, Techniques of water distribution in firms, Quality of irrigation water.

Water requirements of Crops: Crops and crop season, Duty and Delta, Consumptive use, Irrigation requirements, Estimation of consumptive use of water by climatic approaches, Irrigation efficiencies, Soil moisture-irrigation relationship.

**Unit:2** **(9 Hours)**

Canal Irrigation: Classification of canals, Canal losses, Alignment of canals, Design of stable channels using Kennedy's and Lacey's theory, Garret's diagram, Cross section of irrigation canals Lining of Irrigation Canals: Advantages and economics of lining, Various types of lining, Design of lined canals.

**Unit:3** **(10 Hours)**

**Reclamation of Water Logged and Saline Soils**: Causes and control of water logging. Reclamation of saline and alkaline land, Surface and Sub-surface drainage.

**Types of Cross-Drainage Works**: Types of CD works, Selection of a suitable type to suite a particular condition, Design consideration for CD works.

**Diversion Head works**: Weirs and Barrages, Types of weirs and barrages, Layout of a diversion head works, Introduction to different components of a diversion head works. Design of weirs and barrages: Bligh's creep theory, Design of weir using Bligh's theory, Lane's weighted creep theory, Khosla's theory, Khosla's method of independent variables, Exit gradient.

**Canal Falls**: Necessity, Proper location, Types, Design and detailing of one type of fall

**Unit:4** **(8 Hours)**

**Gravity Dams**: Typical cross section, various forces acting on gravity dam, Combination of forces for design, Modes of failure and criteria for structural stability, High and low gravity dam, Design of high dam, typical section of low gravity dam.

**Earth Dams**: Types, Causes of failure, Preliminary section of an earth dam, Seepage control in earth dams

**Spillways**: Descriptive study of various types of spillways.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Irrigation Engineering and Hydraulic Structures by S. K. Garg, Khanna Publication, New Delhi
2. Irrigation Engg. By B.C. Punmia and Pande, Laxmi Publication, New Delhi

**Ref. Books**

1. Irrigation Engg. By Birdie and Das, DhanpatRai, New Delhi
2. Irrigation Engg. By Sharma and Sharma, S. Chanda and Company, New Delhi

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | 2 | - | 2 | - | - | 2 | - | - | - | - | | | | |
| **CO2** | 2 | - | 2 | - | 2 | 2 | - | 2 | - | - | - | | | | |
| **CO3** | 3 | - | 3 | - | 2 | - | - | - | - | - | - | | | | |
| **CO4** | 2 | - | 2 | - | - | 2 | - | 2 | - | - | - | | | | |

| Subject Code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE5041** | **CONCRETE TECHNOLOGY** | 3 | - | - | 3 | **A** |

CEO 1- To understand the properties of ingredients of concrete

CEO 2-To study the behaviour of concrete at its fresh and hardened state

CEO 3-To study about the concrete design mix

CEO4-To know about the procedures in concreting

CEO5-To understand special concrete and their use

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Identify the functional role of ingredients of concrete and apply this knowledge to mix design philosophy |
| CO2 | Acquire and apply fundamental knowledge in the fresh and hardened properties of concrete |
| CO3 | Evaluate the effect of the environment on service life performance, properties and failure modes of structural concrete and demonstrate techniques of measuring the Non Destructive Testing of concrete structure |
| CO4 | Develop an awareness of the utilization of waste materials as novel innovative materials for use in concrete |
| CO5 | Design a concrete mix which fulfills the required properties for fresh and hardened concrete |

**Unit:1** **(10 Hours)**

**Cement**: Portland cement- chemical composition, Hydration, Setting of cement, Structure of hydrate cement, Test on physical properties, Different grades of cement.

**Admixtures**: Types of admixtures - mineral and chemical admixtures -properties – dosages effects

**Aggregates:** Classification of aggregate, Particle shape & texture, Bond, strength & other mechanical properties of aggregate, Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate, Bulking of sand, Deleterious substance in aggregate, Soundness of aggregate, Alkali aggregate reaction, Thermal properties, Sieve analysis, Fineness modulus , Grading curves, Grading of fine & coarse Aggregates, Gap graded aggregate, Maximum aggregate

**Unit:2** **(10 Hours)**

**Fresh concrete:** Workability - Factors affecting workability, Measurement of workability by different tests, Setting times of concrete, Effect of time and temperature on workability , Segregation & bleeding, Mixing and vibration of concrete, Steps in manufacture of concrete Quality of mixing water.

**Hardened concrete:** Water Cement ratio , Abram's Law, Nature of strength of concrete, Maturity concept , Strength in tension & compression, Factors affecting strength, Relation between compression & tensile strength, Curing.

**Unit:3** **(9 Hours)**

**Testing of hardened concrete**: Compression tests, tension tests, factors affecting strength , flexure tests , splitting tests , pull-out rest, non-destructive testing methods – codal provisions for NDT.

**Elasticity, creep & shrinkage** : modulus of elasticity, dynamic modulus of elasticity, posisson's ratio, creep of concrete, factors influencing creep, relation between creep & time , nature of creep, effects of creep , shrinkage , types of shrinkage.

**Unit:4** **(9 Hours)**

**Mix design** : Factors in the choice of mix proportions , Durability of concrete, Quality Control of concrete , Statistical methods , Acceptance criteria, Proportioning of concrete mixes by various methods , BIS method of mix design.

**Special concretes:** Light weight aggregates - Light weight aggregate concrete – Cellular concrete - **No-fipes concrete** - High density concrete -Fibre reinforced concrete – Polymer concrete - Types of Polymer concrete - High performance concrete - Self compacting concrete.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures

**Text Books**

*1. Concrete Technology - Gambhir, M.L., , McGraw Hill*
*2. Properties of Concrete by A.M.Neville*

**Ref. Books**

*1. Concrete Technology by M.S.Shetty. - S.Chand& Co.*
*2. Concrete Technology by Santakumar A.R, Oxford University Press*

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | 2 | 2 | - | - | - | - | - | - | - | 2 | | | | |
| **CO2** | 2 | - | 2 | - | - | - | 2 | - | - | - | - | | | | |
| **CO3** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |
| **CO4** | | | | 2 | 3 | - | 3 | | - | - | - | | | | |

| Subject Code | Course Title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE5042** | **REMOTE SENSING TECHNIQUES AND GIS** | 3 | - | - | 3 | **A** |

CEO 1- To know about the principles of remote sensing and spectral signatures

CEO 2- To know about satellites, types of remote sensing and digital image processing

CEO 3- To study about the history and components of GIS

CEO4- To study about data types and operations

CEO5- To know the applications of remote sensing and GIS

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | demonstrate the concepts of Electro Magnetic energy, spectrum and spectral signature curves |
| CO2 | apply the concepts of satellite and sensor parameters and characteristics of different platforms |
| CO3 | apply the concepts of DBMS in GIS analyze raster and vector data and modeling in GIS |
| CO4 | apply GIS in land use, disaster management, ITS and resource information system |
| CO5 | Awareness of soft wares used for remote sensing techniques |

**Unit:1** **(13 Hours)**

**Remote sensing**- introduction, physics of remote sensing- electromagnetic radiations and their characteristics, thermal emissions, multi-concept in remote sensing, remote sensing satellites and their data products, sensors and orbital characteristics, spectral reflectance curves for earth surface features, methods of remotely sensed data interpretation- visual interpretation, concept of FCC, digital image processing- digital image and its characteristics, satellite data formats, image rectification and restoration, image enhancement- contrast manipulation, spatial feature manipulation, multi-image manipulation

**Unit:2** **(10 Hours)**

**Fundamentals of GIS**: introduction, definition of GIS, evolution of GIS, roots of GIS, definition, GIS architecture, models of GIS, framework for GIS, GIS categories, map as a model, spatial referencing system, map projections, commonly used map projections, grid systems, cartographic symbolization

**Unit:3** **(12 Hours)**

Data management, models and quality issues: conceptual models, geographical data models, data primitives, data types - raster and vector approach, digital terrain modeling , approaches to digital terrain data modeling , acquisition of digital terrain data, data modeling and spatial analysis, sources of geographical data, data collectors and providers, creating digital data sets, data presentation, data updating, data storage

**Unit:4** **(11 Hours)**

GIS data processing, analysis and visualization: raster based GIS data processing, vector based GIS data processing, human computer interaction and GIS, visualization of geographic information, principles of cartographic design in GIS, generation of information product, image classification and GIS, visual image interpretation, types of pictorial data products, image interpretation strategy, image interpretation process.

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Remote Sensing and GIS, BasudebBhatta, Oxford University Press
2. Remote Sensing And GIS, M.A. Reddy, B.S. Publication, Hyderabad

**Ref. Books**

1. Fundamental of Remote Sensing by G. Joseph, Universities Press
2. Introduction Of GIS, Kang-Tsung Chang, Mcgraw-Hill
3. GIS, N. Panigrahi, Universities Press

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |
| **CO2** | 2 | 2 | 1 | 2 | 3 | - | 3 | | - | - | - | | | | |
| **CO3** | 2 | 2 | 1 | 2 | 2 | - | 2 | 2 | - | - | - | | | | |
| **CO4** | - | - | - | - | 2 | - | - | - | - | - | - | | | | |

| Subject Code | Course Title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE5043** | **TRAFFIC ENGINEERING AND TRANSPORTATION PLANNING** | 3 | - | - | 3 | **A** |

CEO-1- To introduce fundamental knowledge of traffic engineering so that students can understand and be able to deal with traffic issues including safety, planning, design, operation and control.

CEO-2- Students will learn and be able to use software such as Highway Capacity Software and Synchrony in traffic engineering projects

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Understand the factors influencing road vehicle performance characteristics and design. |
| CO2 | Apply basic science principles in estimating stopping and passing sight distance requirements. |
| CO3 | Design basic traffic signal phasing and timing plan. |
| CO4 | Design of flexible pavement layers. |
| CO5 | Be familiar of the four stages of the transport planning and prediction models. |

**Unit:1** **(10 Hours)**

Organization of traffic engineering department and its importance under Indian conditions. Road user characteristics, Human factors governing road user behavior, Vehicle characteristics, Slow moving traffic characteristics in Indian conditions.

**Unit:2** **(10 Hours)**

Speed, Journey time and delay surveys, Traffic Volume and Origin-Destination survey, Traffic flow parameters, Speed, density and volume relationships.

Parking types, ill effects of parking, off street parking facilities, Traffic regulations, Traffic management measures.

**Unit:3** **(10 Hours)**

High capacity analysis, Capacity of freeways and express ways in rural areas. Design of rotary intersection and capacity of rotary intersection.

**Unit:4** **(8 Hours)**

Systems approach to transport planning, Stages in transport planning, Trip generation and distribution, Traffic assignment and modal split, Economic evaluation of transportation plans

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

Traffic Engineering and Transport Planning, L.R. Kadiyali, Khanna Publishers, New Delhi

**Ref. Books**

12. Transportation Planning, C. S. Papacostas and P. D. Prevedouros, PHI

3. Transportation Engg: An introduction, C. J. Khisty& B. K. Lall, PHI

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | 2 | 2 | 1 | - | - | 2 | | - | 2 | | | | |
| **CO2** | 2 | - | - | - | 2 | - | - | - | | - | - | | | | |
| **CO3** | 2 | - | - | 2 | - | - | - | 2 | 1 | - | 2 | | | | |
| **CO4** | - | - | 2 | - | 2 | - | - | 2 | 2 | - | 2 | | | | |

| Subject Code | Course Title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEOE5051** | **BRIDGE STRUCTURES** | 3 | - | - | 3 | **A** |

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Discuss the IRC standard live loads and design the deck slab type bridges. |
| CO2 | Analyze the box culverts for the given loading and detail the box culverts. |
| CO3 | Design and detail of T-Beam bridges. |
| CO4 | Design and check the stability of piers and abutments. |
| CO5 | Discuss the bridge foundations and prepare the bar bending schedule. |

**Unit:1** **(10 hrs)**

Introduction, historical review, engineering and aesthetic requirements in bridge design. Introduction to bridge codes. Economic evaluation of a bridge project. Site investigation and planning. Bridge hydrology, economic span, Scour - factors affecting the scour and evaluation of scour.

**Unit:2** **(8 hrs)**

Standards for loadings for bridge design. IRC loadings, Bridge foundations - open, pile, well and caisson. Piers, abutments and approach structures; Superstructure - right, skew and curved slabs.

**Unit:3** **(8 hrs)**

Girder bridges - types, load distribution, Orthotropic plate analysis of bridge decks, solution of typical problems using Courbon's method of analysis

**Unit:4** **(10 hrs)**

Introduction to long span bridges - cantilever, arch, cable stayed and suspension bridges. Methods of construction of R.C Bridges, Prestressed concrete bridges and steel bridges Fabrication, Lounching& creation. construction joints (use of relevant codes of practice are permitted in the examination).

Teaching Method(s): Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Principles and practice of Bridge engineering by S.P Bindra, Dhanapatrai publications

**Ref. Books**

1. Bridge Engineering – Victor Jognson, TMH Publication
3.V. K. Raina, *Concrete Bridges Practice – Analysis, Design and Economics*, Shroff Pub, New Delhi 2nd Ed. 2005.
4. Design of Concrete Bridges, Vazirani, Ratwani and Aswani, Khanna Pub. 2nd Ed.
5. B. M. Das, *Principles of Foundation Engineering,* Thomson, Indian Edition, 2003.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | 2 | - | 2 | - | - | 2 | 2 | - | 2 | | | | |
| **CO2** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |
| **CO3** | | | | 2 | 3 | - | 3 | | - | - | - | | | | |
| **CO4** | 2 | 2 | 1 | 2 | 2 | - | 2 | 2 | - | - | - | | | | |

| Subject Code | Course Title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEOE5052** | **TOWN PLANNING** | 3 | - | - | 3 | **A** |

Course Outcomes

Pre-Requisites (If any) –

| | |
|---|---|
| CO1 | Apply a range of key urban design, research and problem solving skills to complex real-world situations |
| CO2 | Analyze a case study site, drawing on theoretical approaches and a range of available documents including plans, photographs and written documents |
| CO3 | Create and communicate urban design ideas and proposals to a wide audience using a range of presentation skills and media, including drawings |
| CO4 | Demonstrate effective interpersonal communication and project management skills both as part of a team and independently |
| CO5 | Demonstrate creativity, critical thinking and innovation when identifying and solving urban and regional problems in diverse contexts and assessing implications of decisions and action |

**Unit:1** **(10 Hours)**

Principles of architectural design –primary elements, form, space, organization, circulation, proportion and scale, ordering principles. Functional planning of buildings: Planning, designing and construction, General building requirements, Permit and Inspection (as per the National building Code)

**Unit:2** **(10 Hours)**

Town Planning ; Evolution of towns : History and trends in town planning:-origin and growth, Historical development of town planning in ancient valley civilizations; Objects and necessary of town planning; Surveys and analysis of a town

Unit:3 **(8 Hours)**

New Concepts in town planning : Garden city movement, Linear city and Satellite city concepts, Neighborhood Planning.

**Unit:4** **(8 Hours)**

Planning Principles, Practice and Techniques: Elements of City plan, Estimating future needs, Planning standards, Zoning:- its definition, procedure and districts, height and bulk zoning, F.A.R., Master Plan; Concepts of urban planning , design and landscaping.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Town Planning, B. Charotar Publications. rangawala

**Ref. Books**

1. B. Gallion and S. Eisner, The Urban Pattern: City planning and Design - C B S publishers.
2. D. K. Francis Ching, Architectures: Form, Space and Order, John Wiley.
3. S. Eisner, A. B. Gallion and S. Eisner, The Urban Pattern: City planning and Design, JohnWiley

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | - | - | 2 | - | - | - | - | - | - | | | | |
| **CO2** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |
| **CO3** | | | | 2 | 3 | - | 3 | | - | - | - | | | | |
| **CO4** | 2 | 2 | 1 | 2 | 2 | - | 2 | 2 | - | - | - | | | | |

| Subject Code | Course Title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEOE5053** | **SYSTEM APPROACH IN CIVIL ENGINEERING** | 3 | - | - | 3 | **A** |

Course Outcomes

Pre-Requisites (If any) –

| | |
|---|---|
| CO1 | Formulate and solve deterministic optimization models |
| CO2 | Apply deterministic optimization techniques for resource allocation, scheduling, inventory control, capacity expansion and transportation problems |
| CO3 | Students are exposed to advances in experimental and computational technologies |
| CO4 | Apply decision theory and stochastic optimization techniques for decision making under uncertainty |
| CO5 | Formulate and solve optimization models for planning and design of civil engineering systems |

**Unit:1** **(10 Hours)**

Introduction to System approach, Operations Research and Optimization Techniques, Use of systems approach in Civil Engineering, Methods, Introduction to Linear and Non linear programming methods (with reference to objective function, constraints), Local & Global optima, unimodal function, convex and concave function

**Unit:2** **(10 Hours)**

Single variable unconstrained optimization: Sequential Search Techniques-Dichotomous, Fibonacci, Golden section Multivariable optimization without constraints-The gradient vector and Hessian Matrix, Gradient techniques, steepest ascent/decent technique, Newton's Method Multivariable optimization with equality constraints - Lagrange Multiplier Technique

**Unit:3** **(8 Hours)**

Sequencing– n jobs through 2, 3 and M machines

Queuing Theory : elements of Queuing system and its operating characteristics, waiting time and ideal time costs, Kendall's notation, classification of Queuing models, single chanel Queuing theory : Model I (Single channel Poisson Arrival with exponential services times, Infinite population (M/M/1) : (FCFS/ / ) $\infty$ $\infty$

Simulation : Monte Carlo Simulation

**Unit:4** **(8 Hours)**

Formulation of Linear optimization models for Civil engineering applications. The simplex method, Method of Big M, Two phase method, duality.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

**Text Books**

1. Engineering Optimization: Methods and Application-- A. Ravindran, K. M. Ragsdell— Wiley India
2. Engineering Optimization by S.S.Rao
3. Operations Research by Hamdy A. Taha
4. Quantitative Techniques in Management by N.D. Vohra ( McGraw Hill )
5 Operations Research by Premkumar Gupta and D.S.Hira, S. Chand Publications (2014).

**Ref. Books**

1. Topics in Management Science by Robert E. Markland( Wiley Publication)
2. An Approach to Teaching Civil Engineering System by Paul J. Ossenbruggen
3. A System Approach to Civil Engineering Planning & Design by Thomas K. Jewell (Harper Row Publishers)

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | - | - | 2 | - | - | - | - | - | - | | | | |
| **CO2** | 2 | - | - | 2 | - | - | - | 2 | 1 | - | 2 | | | | |
| **CO3** | - | - | 2 | - | 2 | - | - | 2 | 2 | - | 2 | | | | |
| **CO4** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |

| Subject Code | Course Title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BBSBS5061** | **Optimization In Engineering** | **3** | **0** | **0** | **3** | **A** |

Pre -Requisite:

**Course Educational Objective**

CEO1:To introduce the students how to use variables for formulating complex mathematical models in management science, industrial engineering and transportation science

CEO2:To provide students with opportunity using various software package for solving liner programming and integer programming models

CEO3:To introduce the students to use of basic methodology for solution of linear programs and integer programs

CEO4:To introduce the students to advance methods for large scale transportation and assignment problems

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

| | |
|---|---|
| CO1 | **Analyze,** formulate and solve linear programming problems using appropriate techniques. |
| CO2 | **Conduct** and **interpret** post-optimal and sensitivity analysis and explain the primal-dual relationship |
| CO3 | **Develop** mathematical skills related to transportation and assignment problem can analyze and solve integer programming problem arising from a wide range of applications. |
| CO4 | **Communicate** ideas, explain procedures and interpret results and solutions related to nonlinear programming problem |

**UNIT:1** **[14 Hours]**

**Introduction**

Historical overview of operations research, fundamentals of OR Modeling Approach. Linear Programming: Basic assumptions, formulation, graphical method, simplex method, Big-M method, duality theory, primal-dual relationships, sensitivity analysis.

**UNIT:2** **[14 Hours]**

**Transportation and Assignment Problems**

Specific features of transportation problem, streamlined simplex method for solving transportation problems, special features of assignment problems, Hungarian method for solving assignment problems. Integer programming: Special features, binary integer programming models-branch-and-bound technique.

**UNIT:3** **[10 Hours]**

**Dynamic Programming**

Characteristics, principle of optimality, solution procedure, deterministic problems. Concepts relating to queuing systems, basic elements of queuing model, role of Poison & exponential distribution, concepts of birth and death process.

**UNIT:4** **[10 Hours]**

**Non-linear programming**

Introduction to non-linear programming. Unconstraint optimization: Fibonacci and Golden Section Search method. Constrained optimization with equality constraint: Lagrange multiplier, Projected gradient method Constrained optimization with inequality constraint: Kuhn-Tucker condition, Quadratic programming Introduction to Genetic Algorithm.

Teaching Methods: Chalk& Board/PPT

**Text Books**:

1. Taha H.A., Operations Research 9th Edition, Prentice Hall of India, New Delhi, 2010Book 2.KantiSwarup., Man Mohan., and Gupta, P.K., Introduction to Operations Research 7thEdition, Sultan chand& Sons, New Delhi, 2005

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | - | - | - | - | - | - | - | - | - | 1 | | | |
| **CO2** | 3 | 3 | - | - | - | - | - | - | - | - | - | 1 | | | |
| **CO3** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | | | |
| **CO4** | - | 3 | - | - | - | - | - | - | - | - | - | 1 | | | |

| Subject Code | Course Title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BMSHS5062** | **Organisational Behaviour** | 3 | 0 | 0 | 3 | A |

| **Course Educational Objectives** | |
|---|---|
| CEO1 | To develop an understanding of the behaviour of individuals and groups inside organizations |
| CEO2 | To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations. |
| CEO3 | To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes. |

| **Course Outcomes** | |
|---|---|
| CO1 | Define, explain and illustrate a range of organizational behaviour theories. |
| CO2 | Analyse the behaviour of individuals and groups in organizations in terms of organizational behaviour theories, models and concepts. |
| CO3 | To explain group dynamics and demonstrate skills required for working in groups (team building) |
| CO4 | Communicate effectively in oral and written forms about organizational behaviour theories and their application using appropriate concepts, logic and rhetorical conventions. |
| CO5 | To explain organizational culture and describe its dimensions and to examine various organizational designs |

**SYLLABUS**

**Unit – I**

**[14Hrs]**

**Fundamentals of OB**: Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behaviouristic and social cognitive), Limitations of OB.

**Attitude:** Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behaviour and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes.

**Personality and values**: Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications.

**Perception:** Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect).

**Motivation:** Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.

**Unit-II**

**[12Hrs]**

**Foundations of Group Behaviour:** The Meaning of Group & Group behaviour & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development.

**Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building.

**Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.

**Unit – III**
**[14 Hrs.]**
**Organizational Culture** : Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.

**Unit – IV**
**[8 Hrs.]**
**Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change.
Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change &Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | 2 | - | 2 | 2 | - | 2 | - | - | - | | | | |
| **CO2** | 3 | - | 3 | - | 2 | - | - | - | - | - | - | | | | |
| **CO3** | 2 | - | 2 | - | - | 2 | - | 2 | - | - | - | | | | |
| **CO4** | 2 | - | 2 | - | - | - | - | - | - | - | - | | | | |

## VI SEMESTER

| Subject Code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPC6010** | **DESIGN OF STEEL STRUCTURE** | 3 | 1 | - | 4 | **A** |

CEO-1- To learn IS 800-2007 code of practice for the design of Compression, Tension and Flexural members using various cross-sections

CEO-2- To study the behaviour and design of compression and tension members using simple and built-up sections

CEO-3- To understand behaviour of flexural members and the design laterally restrained and unrestrained beams

CEO-4- To study the components of truss, loads on trusses, analysis and design of purlins and truss members

CEO-5- To study the design of bolted and welded connections and arranging field visit to industries

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Identify and compute the design loads on a typical steel building. |
| CO2 | Identify the different failure modes of steel tension and compression members and beams, and compute their design strengths. |
| CO3 | Select the most suitable section shape and size for tension and compression members and beams according to specific design criteria. |
| CO4 | Apply relevant AISC provisions to ensure safety and serviceability of structural steel elements. |
| CO5 | Design bolted and welded connections for tension and compressive members and beams. |

**Unit:1** **(10 Hours)**

Introduction, advantages/disadvantages of steel, structural steel, rolled steel section, various types of loads, design philosophy.

Limit state design method; limit states of strength and serviceability, probabilistic basis for design Riveted, bolted and pinned connections, Welded connections-assumptions, types, design of fillet welds, intermittent fillet weld, plug and slot weld, failure of welded joints, welded joints vs bolted and riveted joints

**Unit:2** **(8 Hours)**

Tension members, types, net cross-sectional area, types of failure, slenderness ratio, design of tension members, gusset plate.

Compression members, effective length, slenderness ratio, types of cross-section, classification of cross section, design of axially loaded compression members, lacing, battening, design of column bases, and foundation bolts.

Unit:3 **(9 Hours)**

Design of beams, types of c/s, lateral stability of beams, lateral torsional buckling, bending and shear strength, web buckling and web crippling, deflection, design procedure.

**Unit:4** **(9 Hours)**

Plate girders- various elements and design of components Eccentric and moment connections, roof trusses

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

**Text Books**

1. Design of Steel Structures- Limit State Method by N. Subramanian, Oxford University Press
2. Limit State Design of Steel structures by S.K. Duggal, Mc-Graw Hill

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | 2 | - | - | - | - | - | - | - | 2 | | | | |
| **CO2** | 2 | 2 | 2 | 2 | - | 2 | - | - | - | - | - | | | | |
| **CO3** | - | 2 | - | 2 | - | - | 2 | - | 2 | - | - | | | | |
| **CO4** | 2 | - | 2 | - | 2 | 2 | - | 2 | - | - | - | | | | |

| Subject Code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPC6020** | **STRUCTURAL ANALYSIS II** | 3 | - | - | 3 | **A** |

CEO-1- To understand the influence line concepts for indeterminate structures

CEO-2- To understand the methods of analysis of intermediate trusses for external loads, lack of fit and thermal effect

CEO-3- To study behaviour of arches and their methods of analysis

CEO-4- To know the concept and analysis of cable stayed bridge

CEO-5- To study the multi storey frames subjected to gravity loads and lateral loads

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | An ability to apply knowledge of mathematics, science, and engineering to understand indeterminate structure |
| CO2 | An ability to identify, formulate and solve engineering problems using slope deflection method. |
| CO3 | An ability to identify, formulate and solve structural analysis problems involving analysis of two pinned arches. |
| CO4 | An ability to identify, formulate and solve structural analysis problems involving moving loads |
| CO5 | An ability to use the techniques, skills, and modern engineering tools like stiffness method necessary for engineering practice. |

**Unit:1** **(10 Hours)**

Analysis of continuous beams and plane frames by slope deflection method and moment distribution method, analysis of continuous beam and simple portals by Kani's method

**Unit:2** **(9 Hours)**

Analysis of two hinged and fixed arches for dead and live loads, Suspension cables with two hinged stiffening girders

**Unit:3** **(9 Hours)**

Matrix methods of analysis: flexibility and stiffness methods; Application to simple trusses and beams

**Unit:4** **(10 Hours)**

Plastic Analysis: Plastic modulus, shear factor, plastic moment of resistance, Load factor, Plastic analysis of continuous beam and simple rectangular portals, Application of upper bound and lower bound theorems

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Structural analysis by C.S. Reddy McGraw Hill
2. Structural Analysis by T.S. Thandamoorthy, Oxford University Press
3. Structural analysis a matrix approach by Pandit& Gupta, McGraw Hill.

**Ref. Books**

1. Indeterminate Structures: J.S.Kinney
2. Indeterminate Structural Analysis: C.K.Wang ,McGraw Hill
3. Structural Analysis by D.S.PrakashRao, Universities Press

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | 3 | - | 2 | - | - | - | - | 2 | 2 | | | | |
| **CO2** | 2 | - | 2 | - | - | - | - | - | - | - | 2 | | | | |
| **CO3** | 2 | - | 2 | - | - | - | - | - | - | - | 2 | | | | |
| **CO4** | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | | | | |

| Subject Code | Course Title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPC6030** | **TRANSPORTATION ENGINEERING-II** | 3 | - | - | 3 | **A** |

CEO-1- To know about the basics and design of various components of railway engineering

CEO-2- To study about the types and functions of track, junctions and railway stations

CEO-3- To learn about the aircraft characteristics, planning and components of airport

CEO-4- To study about the types and components of docks and harbours

CEO-5- To know about various urban transportation systems and Intelligent Transportation Systems

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Differentiate the working of various transport systems and their working in different scenarios. |
| CO2 | Understanding the functions of various components in Rail, Air, Water transport systems and their importance. |
| CO3 | Have a in depth knowledge on curve sections super elevations and many other design elements |
| CO4 | Prepare master plans for Airports, harbor site considering natural phenomenon and different harbor railway airport elements |
| CO5 | Predict the upcoming trends and changes which are likely to take place in transport and travel modes. |

**Unit:1** **(10 Hours)**

History of Indian railways, component parts of railway track, problems of multi gauge system, coning of wheels, alignments and survey, permanent way track components , Type of rail sections ,creep of rails, wear and failure in rails , Ballast requirements, sleeper requirements, types of sleepers, various train resistances

**Unit:2** **(8 Hours)**

Geometric design: Gradients and grade compensation, various speeds on a railway track, super elevation, horizontal and vertical curves, Points and crossings, Design of simple turn-out, Signaling and interlocking,

**Unit:3** **(10 Hours)**

Airport site selection, Air craft characteristics, various surface of an airport, Wind rose diagram, Geometric elements of run way and taxiway , holding apron, parking configuration , terminal building , visual aids, air traffic control, airport marking and lighting.

**Unit:4** **(8 Hours)**

Harbor Engineering: Classification of Harbor basin, general layout of harbors, Docks, Different components of docks.

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Air-port Engineering by S.K.Khanna and M.G.Arora

**Ref. Books**

1. A text book of railway engineering , By S.C.Saxena and M.G.Arora
2. Railway Engineering by Satish Chandra & MM Agrawal, Oxford University Press.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | 2 | - | - | 2 | - | 2 | - | - | 2 | | | | |
| **CO2** | 2 | - | 2 | - | - | - | - | - | - | - | 2 | | | | |
| **CO3** | - | 2 | - | 2 | - | - | 2 | - | 2 | - | - | | | | |
| **CO4** | 2 | - | 2 | - | 2 | 2 | - | 2 | - | - | - | | | | |

| Subject Code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE6041** | **WATER SUPPLY & SANITARY ENGINEERING** | 3 | - | - | 3 | **A** |

CEO-1- To make the students conversant with sources and its demand of water

CEO-2- To understand the basic characteristics of water and its determination

CEO-3- To expose the students to understand the design of water supply lines

CEO-4- To provide adequate knowledge about the water treatment processes and its design

CEO-5- To have adequate knowledge on operation and maintenance of water supply

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Select appropriate treatment toraw water useful for domestic aswell as construction purpose. |
| CO2 | Maintain the pipe-network for water supply and Sewage disposal effectively. |
| CO3 | Calculate and Estimate the impurities present in water used for domestic as well as constructionworks. |
| CO4 | Prepare lay out plan and maintain water distribution and sewer-networks. |
| CO5 | Plan and implement house plumbing work effectively. |

**Unit:1** **(10 Hours)**

General requirement for water supply, sources, quality of water, intake, pumping and transportation of water. Physical, chemical and biological characteristics of water and their significance, water quality criteria, water borne diseases, natural purification of water sources.

**Unit:2** **(9 Hours)**

Engineered systems for water treatment: aeration, sedimentation, softening coagulation, filtration, adsorption, ion exchange, and disinfection. Design of water distribution system.

**Unit:3** **(9 Hours)**

Generation and collection of waste water, sanitary, storm and combined sewerage systems, quantities of sanitary waste and storm water, design of sewerage system ,Primary, secondary and tertiary treatment of wastewater. Waste water disposal standards.

**Unit:4** **(10 Hours)**

Basic of microbiology. Biological wastewater treatment system : Aerobic processes activated sludge process and its modifications, trickling filter, RBC, Anaerobic Processes conventional anaerobic digester, High rate and hybrid anaerobic reactors, Sludge digestion and handling, Disposal of effluent and sludge, Design problems on water distribution, sewerage, water treatment units, wastewater treatment units and sludge digestion.

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

**Text Books**


1. Water Supply Engineering-Environmental Engineering v.1 by S.K.Garg, Khanna Publishers
2. Sewage Disposal and Air Pollution Engineering - Environmental Engineering v.2 by S.K. Garg,Khanna Publishers
3. Water Supply and Sanitary Engineering by B.S.BirdiDhanpatRai Publishing Company


**Ref. Books**


1. Water Supply Engineering by B. C. Punmia and A.K.Jain, Laxmi Publications Water and Wastewater Technology by M.J. Hammer, PHI

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | - | - | 2 | - | - | - | | - | - | | | | |
| **CO2** | 2 | - | - | 2 | - | - | - | 2 | 1 | - | 2 | | | | |
| **CO3** | - | - | 2 | - | 2 | - | - | 2 | 2 | - | 2 | | | | |
| **CO4** | 2 | 2 | 1 | - | 2 | - | - | 2 | - | - | - | | | | |

| Subject Code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE6042** | **PREFABRICATED STRUCTURES** | 3 | - | - | 3 | **A** |

CEO-1- To impart knowledge to students on modular construction, industrialized construction and design of prefabricated elements and construction methods.

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Student will get the knowledge about the main processes of building constructions using prefabricated technology. |
| CO2 | In particular, will have knowledge regarding the types of prefabricated buildings (flat houses) construction, and will know the classification of these types of buildings. |
| CO3 | Student will also know the basic types of construction of prefabricated reinforced concrete, timber and steel structures (skeleton systems). |
| CO4 | He will have a basic knowledge of building technology applied in bridge structures using prefabricated technology (cantilever, methods of Prestressing reinforcement), and construction of underground structures using prefabrication (secondary segmental lining). |
| CO5 | The knowledge of types and technology of construction of wood-frame buildings will be the expected results also. |

**Unit:1** **(8 Hours)**

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

**Unit:2** **(10 Hours)**

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

**Unit:3** **(10 Hours)**

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

**Unit:4(8 Hours)**

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

Teaching Method(s): Chalk & Board/ PPT/Video Lectures

**Text Books**

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., "Knowledge based process planning for construction and manufacturing", Academic Press Inc., 1994

**Ref. Books**

1. Koncz T., "Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH, 1976.
2. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland BetorVerlag, 2009

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | 2 | - | 2 | - | - | 2 | - | - | - | 1 | | | | |
| **CO2** | 1 | - | 2 | 2 | 1 | - | - | 2 | - | - | 2 | | | | |
| **CO3** | 2 | - | - | - | 2 | - | - | - | | - | - | | | | |
| **CO4** | - | - | - | 2 | - | - | - | 2 | 1 | - | 2 | | | | |

| Subject Code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE6043** | **PAVEMENT ENGINEERING** | 3 | - | - | 3 | **A** |

CEO-1- To study the behaviour of pavements under various loads

CEO-2- To design the flexible and rigid pavements using different Empirical, semi-empirical and theoretical approaches

CEO-3- To understand the concept of Pavement Management System, pavement failures and its evaluation.

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Characterize the response characteristics of soil, aggregate, asphalt, and asphalt mixes |
| CO2 | Analyze flexible pavements |
| CO3 | Analyze rigid pavements |
| CO4 | Design a flexible pavement using IRC, Asphalt Institute, and AASHTO methods |
| CO5 | Design a rigid pavement using IRC, and AASHTO methods |

**Unit:1** **(10 Hours)**

Introduction: Classification of pavements, Difference between highway and runway pavements, Factors affecting structural design, Characteristics of traffic loading, Concept of VDF and Computation of design traffic.

**Unit:2** **(10 Hours)**

Principles of pavement design: Concepts of structural and functional failures, Performance criteria; Analysis of pavements: ESWL, Analysis of flexible and concrete pavements.

**Unit:3** **(11 Hours)**

Design of pavements: IRC, AASHTO and other important methods of design of bituminous and concrete pavements.

**Unit:4** **(8 Hours)**

Pavement evaluation techniques: Benkelman beam, Falling weight deflect meter and other equipment's, Concepts of pavement maintenance management.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

**Text Books**

1. Pavement Analysis and Design, Y. H. Huang, Prantice Hall

**Ref. Books**

1. Principles of Pavement Design, E. J. Yoder & M.W. Witzack, John Wiley and Sons, New York.
2. Principles of Transportation Engineering, P. Chakroborty& A. Das, PHI Publication

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | 2 | 2 | - | - | - | - | - | - | - | 2 | | | | |
| **CO2** | 2 | - | 2 | - | - | - | 2 | - | - | - | - | | | | |
| **CO3** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |
| **CO4** | | | | 2 | 3 | - | 3 | | - | - | - | | | | |

| Subject Code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEOE6051** | **HOUSING PLANNING AND MANAGEMENT** | 3 | - | - | 3 | **A** |

Course Outcomes

Pre-Requisites (If any) –

| | |
|---|---|
| CO1 | To understanding require knowledge of plan drawings |
| CO2 | This knowledge will be useful to the student to planning to the buildings, as per the law and rules and regulations. |
| CO3 | To know the approval of house building is to be base on the national policies and state level laws. |
| CO4 | The students should have the knowledge to analyze the slum clearance project, to prepare plan for plot map cost flow . |
| CO5 | Ability to analyze the types of Housing |

**Unit:1** **(8 Hours)**

Definition of Basic Terms – House, Home, Household, Apartments, Multi storied Buildings, Special Buildings, Objectives and Strategies of National Housing Policies including Slum Housing Policy, Principle of Sustainable Housing – Integrated approach on arriving holding capacity and density norms - All basic infrastructure consideration - Institutions for Housing at National, State and Local levels.

**Unit:2** **(10 Hours)**

Basic Concepts, Contents and Standards for Housing Programs - Sites and Services, Neighborhoods- Plotted land development programs, Open Development Plots, Apartments, Gated communities, Townships, Rental Housing, Co-operative Housing, Slum Housing Programs – Slum improvement – Slum redevelopment and Relocation – Use of GIS and MIS in Slum Housing Projects,, Role of Public housing agencies, and Private sector in supply , quality, infrastructure and pricing – Role of Non-Government Organizations in slum housing.

**Unit:3** **(8 Hours )**

Formulation of Housing Projects – Land Use and Soil suitability analysis -Building Byelaws and Rules and Development Control Regulations - Site Analysis, Layout Design, Design of Housing Units (Design Problems) – Housing Project Formulation.

**Unit:4** **(8 Hours)**

New Constructions Techniques – Cost Effective Modern Materials and methods of Construction- Green building concept- Building Centers – Concept, Functions and Performance Evaluation. Evaluation of Housing Projects for sustainable principles – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy- Public Private Partnership Projects – Viability Gap Funding - Pricing o f Housing Units (Problems).

**Teaching Method(s)**: Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

**Text Books**

1. Meera Mehta and Dinesh Mehta, "Metropolitan Housing Markets", Sage Publications Pvt. Ltd., New Delhi, 1999.
2. Francis Cherunilam and Odeyar D Heggade, "Housing in India", Himalaya Publishing House, Bombay, 1997.

**Ref. Books**

1. Wiley- Blackwell, "Neufert Architects" Data, 4th Edition, Blackwell Publishing Ltd, 2012
2. Donald Watson and Michael J.Crosbie, "Time Saver Standards for Architectural Design", 8th Edition, Tata McGraw Hill Edition, 2011

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |
| **CO2** | | | | 2 | 3 | - | 3 | | - | - | - | | | | |
| **CO3** | 2 | - | - | 2 | - | - | - | 2 | 1 | - | 2 | | | | |
| **CO4** | - | - | 2 | - | 2 | - | - | 2 | 2 | - | 2 | | | | |

| Subject Code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEOE6052** | **GREEN BUILDING TECHNIQUES** | 3 | - | - | 3 | **A** |

Course Outcomes

Pre-Requisites (If any) –

| | |
|---|---|
| CO1 | Identify and compare existing energy codes, green building codes and green rating systems |
| CO2 | Identify and compare cost and performance of building materials with recycled components, non-petroleum based materials, materials with low volatile organic compounds, materials with low embodied energy and salvaged materials and incorporate them into design. |
| CO3 | Identify and use construction materials and methods that more easily allow for salvage and re-use of building materials |
| CO4 | Perform demolition in ways that allow for salvage of re-usable building materials. |
| CO5 | Identify and make use of techniques for weatherization and sustainable remodeling of existing structures. |

**Unit:1** **(10 Hours)**

Fundamental Principles of Green Building, Introduction to high-performance green buildings, Conventional versus green building delivery systems - Design and construction relationships - Green building project execution - the integrated design process - green building documentation requirements - design versus ecological design - historical perspective - contemporary ecological design - future ecological design - green design to regenerative design.

**Unit:2** **(8 Hours)**

Sustainable sites Design and landscaping – enhancing ecosystems - building envelop – selection of green materials - products and practices - passive design strategy – internal load reduction – indoor environment quality strategies - Building energy system strategies – Water cycle strategies- building water and waste management – relevance to LEED / IGBC standards.

**Unit:3** **(10 Hours)**

Site protection planning - health and safety planning - construction and demolition waste management - reducing the footprint of construction operations - maximizing the value of building commissioning in HVAC System, lighting and non mechanical Systems - costs and benefits relevance to LEED / IGBC standards.

**Unit:4** **(10 Hours)**

Methods and tools for building assessment- USGBC LEED building assessment standard - LEED certification process – Green Globes building assessment protocol- international building assessment systems - LEED-NC Platinum / gold / silver building case studies – trends in building rating systems – IGBC standards – ECBC compliances. Florida Green Building Coalition. Future directions in green high performance building technologies- Carbon accounting-Green Building specifications. Business case for high-performance green buildings - the economics of green building - benefits - managing initial costs - cost barrier in project management – long term environment benefits.

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

**Text Books**

1. Jerry Yudelson, Green building A to Z, Understanding the buildings, 2008.
2. Green building guidelines: Meeting the demand for low-energy, resource efficient homes. Washington, D.C.: Sustainable Buildings Industry Council, 2004.

**Ref. Books**

1. Jerry Yudelson, Green Building through Integrated Design, McGraw Hill, 2008
2. Alex Wilson and Mark Peipkorn., Green Building Products: the GreenSpec guide to residential building materials, 2nd Edition, Gabriola Island, BC:

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | | | | 2 | 3 | - | 3 | | - | - | - | | | | |
| **CO2** | 2 | - | - | 2 | - | - | - | 2 | 1 | - | 2 | | | | |
| **CO3** | - | - | 2 | - | 2 | - | - | 2 | 2 | - | 2 | | | | |
| **CO4** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |

| Subject Code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEOE6053** | **AIR & NOISE POLLUTION** | 3 | - | - | 3 | **A** |

Course Outcomes

Pre-Requisites (If any) –

| | |
|---|---|
| CO1 | Identify sampling and analysis techniques for air quality assessment |
| CO2 | Describe the plume behavior for atmospheric stability conditions |
| CO3 | Apply plume dispersion modeling and assess the concentrations |
| CO4 | Design air pollution controlling devices |
| CO5 | Ability to understand the behavior of air pollution characteristics |

**Unit:1** **(8Hours)**

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and

**Unit:2** **(10 Hours)**

Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate – Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications.

**Unit:3** **(10 Hours)**

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries.

**Unit:4** **(8 Hours)**

Air quality standards – Air quality monitoring – Preventive measures - Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality .Sources of noise pollution – Effects – Assessment - Standards – Control methods – Prevention

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Anjaneyulu, D., “Air Pollution and Control Technologies”, Allied Publishers, Mumbai, 2002.
2. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.

**Ref. Books**

1. Heumann. W.L., "Industrial Air Pollution Control Systems", McGraw Hill, New Yark, 1997.
2. Mahajan S.P., "Pollution Control in Process Industries", Tata McGraw Hill Publishing Company, New Delhi, 1991.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | | | | 2 | 3 | - | 3 | | - | - | - | | | | |
| **CO2** | 2 | 2 | 1 | 2 | 2 | - | 2 | 2 | - | - | - | | | | |
| **CO3** | - | - | - | - | 2 | - | - | - | - | - | - | | | | |
| **CO4** | - | - | 2 | - | 2 | - | - | 2 | 2 | - | 2 | | | | |

## VII SEMESTER

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPC7010** | **GEOTECHNICAL ENGINEERING-II** | 3 | - | - | 3 | **A** |

CEO-1- plan a site investigation program, including: types, number, and location of borings

CEO-2- the calculation of bearing capacity for both shallow and deep foundations

CEO-3- -the calculation of predicted settlements for both shallow and deep foundations

CEO-4- -be able to choose an appropriate foundation method based on soil conditions and structural loads.

CEO-5- design methods for deep foundations and shallow foundations

**Pre-Requisites (If any)** – It is expected you have passed a course in undergraduate soil mechanics.

Course Outcomes

| | |
|---|---|
| CO1 | Determine the earth pressures on foundations and retaining structures |
| CO2 | Analyze shallow and deep foundations |
| CO3 | Calculate the bearing capacity of soils and foundation settlements |
| CO4 | Understand soil exploration methods |
| CO5 | Student will have an understanding of shear stress and shear strength properties in soils, Mohr diagrams, and methods of finding the shear strength parameters of soils using direct shear test, unconfined compression test and tri-axial shear tests |

**Unit:1** **(10 Hours)**

Lateral Earth Pressure and Retaining Structures: Concept of earth pressure, Earth pressure at rest, active and passive earth pressure for both cohesionless and cohesive soils, Earth pressure theories: Rankine's theory, Coumb's Wedge theory, Graphical methods: Rebhan's and Culmann's graphical solutions, Stability conditions for retaining walls.

**Unit:2** **(9 Hours)**

Bearing Capacity: Definitions, Rankine's analysis, Types of failures: General and local shear failure, Terzaghi's Analysis, Brinch-Hansen analysis, Meyerhof's analysis, Vesics's bearing capacity equation, Effect of water table on bearing capacity, IS code method for computing bearing capacity

**Field Methods**: Plate load test and its limitations, Standard penetration test. Shallow **Foundations**: Types of foundations: Spread footing, combined and strap footing, mat or raft Footing, Settlement of footings.

**Unit:3** **(10 Hours)**

Deep Foundations: Difference between shallow and deep foundations, Types of deep foundations. Pile Foundations: Types of piles, pile driving, load carrying capacity of piles-static and dynamic formulae, Pile load test and its limitations, correlation with penetration tests, Group action in piles settlement and efficiency of pile groups in clay, negative skin friction, Under reamed pile foundation. Basics of well foundation - types, component parts and ideas about the forces acting on a well foundation.

**Unit:4** **(10 Hours)**

Subsoil Exploration: Necessity and planning for subsoil exploration, Methods - direct (test pits and trenches), indirect (sounding, penetration tests and geophysical methods).

Soil sampling – types of samples, standard penetration test, static and dynamic cone penetration test, in-situ vane shear test, Rock coring, soil exploration report.

Rock Mechanics: Introduction, problems, defects in rock mass, joints, faults, folds, methods of geophysical prospecting, seismic and electrical method.

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

**Text Books**

1. Principles of Foundation Engineering by B. M. Das, Cenage Learning
2. Foundation Analysis and Design by Joseph E. Bowles, McGraw Hill

**Ref. Books**

1. Geotechnical Engineering by S. K. Gulati&Monoj Gupta, McGraw Hill
2. Soil Mechanics and Foundations by Dr B. C. Punmia et al., Laxmi Publications

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | 3 | - | 2 | - | - | - | 2 | 2 | 2 | | | | |
| **CO2** | 2 | - | 2 | - | - | 2 | - | 2 | - | - | 2 | | | | |
| **CO3** | 2 | - | 2 | - | - | - | - | - | - | - | 2 | | | | |
| **CO4** | 2 | 2 | 2 | 2 | - | 2 | - | - | - | - | - | | | | |
| **CO5** | - | 2 | - | 2 | - | - | 2 | - | 2 | - | - | | | | |

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPC7020** | **WATER RESOURCE ENGINEERING** | 3 | - | - | 3 | **A** |

CEO-1- To prepare the students for a successful career as hydrologist and water resources engineers

CEO-2- To develop the ability among students to synthesis data and technical concepts for application in hydrology and water resources engineering

CEO-3- - To provide students with a sound foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, analyze, solve engineering problems and to prepare them for their career

CEO-4- - To promote student awareness of the life-long learning and to introduce them professional ethics and codes of professional practice in water resource engineering

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Various components of hydrologic cycle that affect the movement of water in the earth |
| CO2 | Various Stream flow measurements technique |
| CO3 | the concepts of movement of ground water beneath the earth |
| CO4 | Enable the students to understand the basic aquifer parameters and groundwater resources for different hydro-geological boundary conditions |
| CO5 | The student is exposed to the application of systems concept, advanced optimization techniques to cover the socio-technical aspects in the field of water resources |

**Unit:1** **(10 Hours)**

Precipitation, its Measurement and Analysis: Hydrologic cycle, catchment area and watershed, Rainfall and its characteristics, Rain gauges, Non-Recording and Recording type, Average rainfall over a catchment, Evapo-transpiration, Pan evaporation, Pan coefficient, Infiltration, Windex and -Index.

**Unit:2** **(8 Hours)**

Discharge Measurement: Stream gauging, Flow rating curve, Use of current meters for velocity measurement, Dye-dilution method of discharge measurement, Estimation of discharge.

**Unit:3** **(10 Hours)**

**Hydrograph**: Characteristics of a Run off hydrograph, Unit hydrograph, S-hydrograph, Instantaneous Unit hydrograph, Synthetic Unit hydrograph, Duration Curve, Mass flow hydrograph.

**Flood Control**: Flood flows, Frequency studies, Statistical analysis for flood prediction, Method of flood control, Flood routing, Reservoir routing and Channel routing, River training works.

**Unit:4** **(8 Hours)**

**Open Channel Flow**: Definition, Uniform flow, Chezy'sKutter's equation, Most economical section, specific energy, critical, subcritical, supercritical flow, Non-uniform flow, Gradual varied flow, Hydraulic jump,

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Engg. Hydrology by K. Subramanian, McGraw-Hill
2. Hydrology and Water Resources Engineering by K. C. Patra, Narosa Publishing House, New Delhi

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | 2 | - | 2 | - | - | 2 | - | 2 | - | - | | | | |
| **CO2** | 2 | - | - | - | - | 2 | - | - | - | - | - | | | | |
| **CO3** | 3 | - | - | - | - | - | - | - | 2 | 2 | 2 | | | | |
| **CO4** | 2 | - | - | - | - | 2 | - | - | - | - | 2 | | | | |

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE7031** | **ADVANCED DESIGN OF CONCRETE STRUCTURES** | 3 | - | - | 3 | **A** |

CEO-1- To understand the design concept of various structures and detailing of reinforcements

CEO-2- To understand the design of underground and elevated liquid retaining structures

CEO-3- To study the design of material storage structures

CEO-4- To know the effect of temperature on concrete structures

CEO-5 To study the design of bridges subjected to IRC loading

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Design cantilever and counter fort retaining walls |
| CO2 | Design underground and elevated water tanks |
| CO3 | Design bunkers and silos |
| CO4 | Ensure serviceability criteria for reinforced concrete structural elements |
| CO5 | Analysis and design of raft foundation, strip footing and pile caps |

**Unit:1** **(10 Hours)**

Introduction to earthquake design and detailing, cyclic behaviour of concrete and reinforcement, significance of ductility, design and detailing for ductility, codal provisions, simple problems based on above concept, computation of earthquake forces on building frames using seismic coefficient method as per IS 1893-2002

**Unit:2** **(9 Hours)**

Retaining walls, various forces acting on retaining wall, stability requirement, design of cantilever and counterfort retaining walls.

Design of water tanks, design requirements, design of tanks on ground, underground and elevated water tanks.

**Unit:3** **(9 Hours)**

Introduction to Prestressed concrete: Prestressing system, Pre-tensioning and post-tensioning systems, materials and codes, need for high strength steel and concrete, basic concepts, losses of prestress, analysis of beams under prestress and bending stresses.

**Unit:4** **(10 Hours)**

Types of bridges, components , various types of loads and forces acting on bridges, types of IRC loading, Design of slab culverts

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Prestressed Concrete- N.Krishnaraju, TMH
2. RCC Design-B.C.Punmia,A.K.Jain& A.K Jain-Laxmi Publications

**Ref. Books**

3. Limit State Design-A.K.Jain, Nemchand& Bros, Roorkee
4. Advanced RCC Design-P.C.Verghese, PHI
5. Earthquake Resistant Design of Structures, Shrikhande and Agrawal, PHI

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | 2 | 2 | 1 | - | - | 2 | | - | 2 | | | | |
| **CO2** | 2 | - | - | - | 2 | - | - | - | | - | - | | | | |
| **CO3** | 2 | - | - | 2 | - | - | - | 2 | 1 | - | 2 | | | | |
| **CO4** | - | - | 2 | - | 2 | - | - | 2 | 2 | - | 2 | | | | |

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE7032** | **PRESTRESSED ENGINEERING** | 3 | - | - | 3 | **A** |

CEO-1- To learn the principles, materials, methods and systems of prestressing

CEO-2- To know the different types of losses and deflection of prestressed members

CEO-3- To learn the design of prestressed concrete beams for flexural, shear and tension and to calculate ultimate flexural strength of beam

CEO-4- To learn the design of anchorage zones, composite beams, analysis and design of continuous beam

CEO-5 To learn the design of water tanks

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Understand the basic properties of pre-stressed concrete constituents. |
| CO2 | Analyze the flexural behavior of simple and composite pre-stressed concrete girders. |
| CO3 | Capable to calculate pre-stress losses for simple pre-stressed concrete girders. |
| CO4 | To acquire knowledge in knowing Analysis for stress of composite pre-stressed concrete girders for flexure using current design procedures |
| CO5 | Able to design pre-stressed concrete members. |

**Unit:1** **(9 Hours)**

Prestressing system, materials and codes: Basic concept, Losses of prestress, analysis of prestress and bending stresses. Need for high strength steel and concrete. Advantages and applications. Pre-tensioning and post tensioning systems.

**Unit:2** **(12 Hours)**

Design of beams : Analysis and design of section for bending and shear, pressure line, concept of load balancing, cracking moment, bending of cables, limit state analysis and design, anchorage zone stresses, design of end block, Application to bridges.

**Unit:3 (10 Hours)**

Selection of prestress concrete members, short term and long term deflections of uncracked members.

**Unit:4(10 Hours)**

Flexural strength of prestresed concrete sections Continuous beams, Design concept concordancy of cables, Secondary design consideration. Design pre-tensioned and post tensioned beam

Teaching Method(s): Chalk & Board/ PPT/Video Lectures

Text Books

Ref. Books

1. Prestressed Concrete, Raju,N.K., Tata McGraw Hill
2. Prestressed Concrete, T. Y. Lin

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 1 | 2 | 2 | - | 2 | 2 | - | - | - | | | | |
| **CO2** | - | - | - | - | 2 | - | - | - | - | - | - | | | | |
| **CO3** | 2 | 2 | 1 | - | 2 | - | - | 2 | - | - | - | | | | |
| **CO4** | 2 | 2 | - | 2 | - | - | 2 | - | - | - | 1 | | | | |

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE7033** | **EARTHQUAKE GEOTECHNICAL ENGINEERING** | 3 | - | - | 3 | **A** |

CEO-1- Become familiar with the terminology used in geotechnical earthquake engineering

CEO-2- Understand the fundamental principles and practical methods associated with each topic

CEO-3- Appreciate the assessment, remedial and monitoring techniques in relation to seismic hazards

CEO-4- Demonstrate the ability to apply the understanding gained

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Understand the earthquake mechanisms |
| CO2 | Understand earthquake motion on soil properties and soil-structure interaction |
| CO3 | Evaluate the seismic susceptibility of the ground |
| CO4 | Design foundations, slopes and pavements for seismic loading |
| CO5 | Ability to analyze seismic load analysis |

**Unit:1** **(12 Hours)**

Internal Structure of the Earth – Continental Drift and Plate Tectonics – Faults – Elastic rebound theory – Different sources of Seismic Activity – Geometric Notation – Location of Earthquakes – Size of Earthquakes.

**Unit:2** **(10 Hours)**

Measurement of Dynamic Properties of soils – Field Tests – Low strain – Seismic Reflection – Seismic Refraction – Horizontal layering – Steady State Vibration – Spectral analysis of surface wave – Seismic cross hole – Down Hole – Up hole – tests – Laboratory tests – Resonance Column Test – Bender Element – Cyclic Tri-axial test.

**Unit:3** **(10 Hours)**

Identification and Evaluation of Earthquake Sources – Geologic Evidence – Tectonic Evidence – Historical Seismicity – Instrumental Seismicity – Deterministic Seismic Hazard Analysis – Probabilistic Seismic Hazard Analysis.

**Unit:4** **(12 Hours)**

Ground Response Analysis – One Dimensional Linear – Evaluation of Transfer Function – Uniform undamped soil on rigid rock – Uniform damped soil on Rigid Rock – Uniform damped soil on elastic rock – layered damped soil on elastic rock – Equivalent linear Approximation –

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Krammer S.L., "Geotechnical Earthquake Engineering", Prentice Hall, International Series, Pearson Education Inc and Donling Kindersley Publishing Inc. 2013

2. Roberto Villaverde, “Fundamental Concepts of Earthquake Engineering”,CRC Press Taylor & Francis Group, 2009.

**Ref. Books**

1. KameswaraRao, N.S.V., "Dynamics soil tests and applications", Wheeler Publishing – New Delhi, 2000.

2. KameswaraRao, "Vibration Analysis and Foundation Dynamics", Wheeler Publishing, New Delhi, 1998.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | - | - | 2 | - | - | - | | - | - | | | | |
| **CO2** | 2 | - | - | 2 | - | - | - | 2 | 1 | - | 2 | | | | |
| **CO3** | - | - | 2 | - | 2 | - | - | 2 | 2 | - | 2 | | | | |
| **CO4** | 2 | 2 | 1 | - | 2 | - | - | 2 | - | - | - | | | | |

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE7041** | **ESTIMATION COSTING AND PROFESSIONAL PRACTICE** | 3 | - | - | 3 | **A** |

CEO-1- To know the importance of preparing the types of estimates under different conditions.

CEO-2- To know about the rate analysis and bill preparations

CEO-3- To study about the specification writing

CEO-4- To understand the valuation of land and buildings .

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | To know the importance of preparing the types of estimates under different conditions |
| CO2 | To comprehend detailed report on estimation and valuation process |
| CO3 | To apply logical thoughts and prepare the rate analysis and bills |
| CO4 | To analyze and synthesize cost effective approach for civil engineering projects. |
| CO5 | To evaluate the cost of expenditure and prepare a detailed rate analysis report |

**Unit:1** **(10 Hours)**

Quantity estimation:
Principles of estimation, methods and units, Estimation of materials in buildings, Culverts and bridges.

**Unit:2** **(10 Hours)**

Principles of general and detailed specification for various types building works. Analysis of rates, description, Prime cost, Schedule rates, Analysis of rates for various types of works. Estimate of R.C.C and Steel works, Scheduling, Slab, beam, column

**Unit:3** **(9 Hours)**

Estimation of Road – earthwork fully in banking, cutting, partly cutting & partly filling. Detailed estimate for WBM, Bituminous road. Valuation, rent fixation, tenders, contracts, accounting procedure, measurement book, stores, cost & quality control, PWD & CPWD practice, Software Applications for Estimation of Buildings.

**Unit:4** **(10 Hours)**

Network techniques, Introduction to CPM/ PERT methods and their use in project planning construction schedules for jobs, materials equipments, labour and finance.

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

**Ref. Books:**

Estimating and Costing in Civil Engineering Theory & Practice, B.N. Dutta, UBS Publishers
PERT and CPM, L.S. Sreenath, East West Press
Civil engineering contracts and estimates by B.S. Patil, University Press.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | - | - | 2 | - | - | - | | - | - | | | | |
| **CO2** | 2 | - | - | 2 | - | - | - | 2 | 1 | - | 2 | | | | |
| **CO3** | - | - | 2 | - | 2 | - | - | 2 | 2 | - | 2 | | | | |
| **CO4** | 2 | 2 | 1 | - | 2 | - | - | 2 | - | - | - | | | | |

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE7042** | **TALL BUILDINGS** | 3 | - | - | 3 | **A** |

CEO-1- Identify a structure's designer and location from an image.

CEO-2- Explain the social, symbolic, and scientific significance of the structure (GWB, Eiffel Tower, Hancock, and Salginatobel Bridge, etc.).

CEO-3- Explain qualitatively how the loads are transferred by the structural system to the ground.

CEO-4- Perform simple calculations to determine the forces in the main structural members.

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Critically examine current trends in growth of tall buildings and future urban habitats including the principles of green buildings. |
| CO2 | Explain hybrid structural systems widely used in tall buildings and conduct conceptual design |
| CO3 | Model tall buildings for analysis. |
| CO4 | Evaluate wind sensitivity, user comfort and dynamic response. |
| CO5 | Complete a conceptual design of lateral and gravity load resisting systems |

**Unit:1** **(10 Hours)**

Development of High Rise Structures - General Planning Considerations - Design philosophies - Materials used for Construction - High Strength Concrete - High Performance Concrete – Self Compacting Concrete - Glass - High Strength Steel

**Unit:2** **(10 Hours)**

Gravity Loading - Dead Load - Live Load - Live load reduction technique - Impact Load - Construction Load - Sequential Loading. Lateral Loading - Wind load - Earthquake Load. Combination of Loads.

**Unit:3** **(9 Hours)**

Factors affecting growth, Height and Structural form. High rise behaviour of Various structural systems - Rigid frames, braced frames, In filled frames, shear walls, coupled shear walls, wall frames, tubular structures, cores, outrigger - braced and hybrid mega systems. Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of buildings as total structural system considering overall integrity and major subsystem interaction,

**Unit:4** **(10 Hours)**

Analysis for member forces, drift and twist, computerized general three dimensional analysis. Overall buckling analysis of frames, wall-frames, Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first-order and P-Delta analysis, Translational, Torsional instability, out of plumb effects, stiffness of member in stability, effect of foundation rotation.

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

**Text Books**

1. Bryan Stafford Smith, Alex coull, "Tall Building Structures, Analysis and Design", John Wiley and Sons, Inc., 1991.
2. Taranath B.S., "Structural Analysis and Design of Tall Buildings", McGraw Hill, 2011.

**Ref. Books**

1. Lin.T.Y, StotesBurry.D, "Structural Concepts and systems for Architects and Engineers", John Wiley, 1988.
2. Lynn S.Beedle, "Advances in Tall Buildings", CBS Publishers and Distributors, Delhi, 1986.
3. Wolfgang Schueller "High Rise Building Structures", John Wiley and Sons, New York 1977.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | 2 | - | 2 | - | - | 2 | - | - | - | 1 | | | | |
| **CO2** | 1 | - | 2 | 2 | 1 | - | - | 2 | - | - | 2 | | | | |
| **CO3** | 2 | - | - | - | 2 | - | - | - | | - | - | | | | |
| **CO4** | - | - | - | 2 | - | - | - | 2 | 1 | - | 2 | | | | |

| Subject Code | Course Title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE7043** | **BRIDGE STRUCTURES** | 3 | - | - | 3 | **A** |

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Discuss the IRC standard live loads and design the deck slab type bridges. |
| CO2 | Analyze the box culverts for the given loading and detail the box culverts. |
| CO3 | Design and detail of T-Beam bridges. |
| CO4 | Design and check the stability of piers and abutments. |
| CO5 | Discuss the bridge foundations and prepare the bar bending schedule. |

**Unit:1** **(10 hrs)**

Introduction, historical review, engineering and aesthetic requirements in bridge design. Introduction to bridge codes. Economic evaluation of a bridge project. Site investigation and planning. Bridge hydrology, economic span, Scour - factors affecting the scour and evaluation of

**Unit:2** **(8 hrs)**

Standards for loadings for bridge design. IRC loadings, Bridge foundations - open, pile, well and caisson. Piers, abutments and approach structures; Superstructure - right, skew and curved slabs.

**Unit:3** **(8 hrs)**

Girder bridges - types, load distribution, Orthotropic plate analysis of bridge decks, solution of typical problems using Courbon's method of analysis

**Unit:4** **(10 hrs)**

Introduction to long span bridges - cantilever, arch, cable stayed and suspension bridges. Methods of construction of R.C Bridges, Prestressed concrete bridges and steel bridges Fabrication, Lounching & creation. construction joints (use of relevant codes of practice are permitted in the

Teaching Method(s): Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Principles and practice of Bridge engineering by S.P Bindra, Dhanapatrai publications

**Ref. Books**

1. Bridge Engineering – Victor Jognson, TMH Publication
3.V. K. Raina, *Concrete Bridges Practice – Analysis, Design and Economics*, Shroff Pub, New Delhi 2nd Ed. 2005.
4. Design of Concrete Bridges, Vazirani, Ratwani and Aswani, Khanna Pub. 2nd Ed.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | 2 | - | 2 | - | - | 2 | - | - | - | 1 | | | | |
| **CO2** | 1 | - | 2 | 2 | 1 | - | - | 2 | - | - | 2 | | | | |
| **CO3** | 2 | - | - | - | 2 | - | - | - | | - | - | | | | |
| **CO4** | - | - | - | 2 | - | - | - | 2 | 1 | - | 2 | | | | |

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEOE7051** | **MUNICIPAL SOLID WASTE MANAGEMENT** | 3 | - | - | 3 | **A** |

Course Outcomes

Pre-Requisites (If any) –

| | |
|---|---|
| CO1 | Explain municipal solid waste management systems with respect to its physical properties, and associated critical considerations in view of emerging technologies. |
| CO2 | Outline sources, types and composition of solid waste with methods of handling, sampling and storage of solid waste. |
| CO3 | Select the appropriate method for solid waste collection, transportation, redistribution and disposal. |
| CO4 | Describe methods of disposal of hazardous solid waste. |
| CO5 | Ability to understand the treatment procedure of solid wastes |

**Unit:1** **(10 Hours)**

Sources and types of municipal solid wastes-waste generation rates-factors affecting generation, characteristics-methods of sampling and characterization; Effects of improper disposal of solid wastes-Public health and environmental effects. Elements of solid waste management –Social and Financial aspects – Municipal solid waste (M&H) rules – integrated management-Public awareness; Role of NGO's.

**Unit:2** **(8Hours)**

On-site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and economic aspects of open storage – waste segregation and storage – case studies under Indian conditions – source reduction of waste – Reduction, Reuse and Recycling.

**Unit:3** **(12 Hours)**

Methods of Residential and commercial waste collection – Collection vehicles – Manpower– Collection routes – Analysis of collection systems; Transfer stations – Selection of location, operation & maintenance; options under Indian conditions – Field problems- solving.

**Unit:4** **(10 Hours)**

Objectives of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions.

Land disposal of solid waste; Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor– Dumpsite Rehabilitation

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Tchobanoglous, G., Theisen, H. M., and Eliassen, R. "Solid. Wastes: Engineering Principles and Management Issues". McGraw Hill, New York, 1993.
2. Vesilind, P.A. and Rimer, A.E., "Unit Operations in Resource Recovery Engineering", Prentice Hall, Inc., 1981

**Ref. Books**

1. Government of India, "Manual on Municipal Solid Waste Management", CPHEEO, Ministry of Urban Development, New Delhi, 2000.
2. Bhide A.D. and Sundaresan, B.B. "Solid Waste Management Collection", Processing and Disposal, 2001

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |
| **CO2** | | | | 2 | 3 | - | 3 | | - | - | - | | | | |
| **CO3** | 2 | - | - | 2 | - | - | - | 2 | 1 | - | 2 | | | | |
| **CO4** | - | - | 2 | - | 2 | - | - | 2 | 2 | - | 2 | | | | |

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEOE7052** | **DISASTER MANAGEMENT** | 3 | - | - | 3 | **A** |

Course Outcomes

Pre-Requisites (If any) –

| | |
|---|---|
| CO1 | To increase the knowledge and understanding of the disaster phenomenon and, its factors. |
| CO2 | Understand the relationship of hazard, risk and vulnerability |
| CO3 | To obtain the skills in role of education and training in disaster prevention. |
| CO4 | To ensure skills in post disaster management activities |
| CO5 | To get the knowledge in understanding various prone zones in India |

**Unit:1** **(8Hours)**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

**Unit:2** **(10 Hours)**

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority (SDMA) – Early Warning System – Advisories from Appropriate Agencies.

**Unit:3** **(10 Hours)**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, Programmes and legislation –

**Unit:4** **(10 Hours)**

Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]

**Ref. Books**

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |
| **CO2** | | | | 2 | 3 | - | 3 | | - | - | - | | | | |
| **CO3** | 2 | 2 | 1 | 2 | 2 | - | 2 | 2 | - | - | - | | | | |
| **CO4** | - | - | - | - | 2 | - | - | - | - | - | - | | | | |

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEOE7053** | **CONSTRUCTION PLANNING AND SCHEDULING** | 3 | - | - | 3 | **A** |

Course Outcomes

Pre-Requisites (If any) –

| | |
|---|---|
| CO1 | Outline the knowledge of construction contracts, tenders and deposits. |
| CO2 | Plan construction organization, construction planning and scheduling for projects. |
| CO3 | Infer the knowledge of networks PERT, CPM and crashing. |
| CO4 | Estimate different types of resources and their optimization in projects. |
| CO5 | Explain about quality management, safety, construction disputes and legislation. |

**Unit:1** **(8Hours)**

Basic Concepts in the Development of Construction Plans – Choice of Technology and Construction Method – Defining Work Tasks – Defining Precedence Relationships among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.

**Unit:2** **(10 Hours)**

Scheduling procedures and techniques, cost control, monitoring and accounting, quality control and safety during construction, organization and use of project information.

Introduction to Construction Management - Project Organization – Construction Economics – Economic Decision Making - Time value of money - cash flow diagrams - Evaluation Alternatives - Effect of Inflation on cash flow - Evaluation of Public Projects.

Construction contract – contract document - classification of engineering contract - bidding process - CPWD contract conditions - FIDIC form contract agreement – subcontracting - earnest money deposit - security deposit - arbitration.

**Unit:3** **(8 Hours)**

Basic concepts of resource management-class of labour - labour productivity - Classification construction equipment - selection of construction equipment - methods of calculating depreciation – replacement model - material management functions - inventory management - project cost management.

**Unit:4** **(10 Hours)**

Construction quality - inspection, quality control and quality assurance - total quality management - quality gurus and their teachings - cost of quality - ISO standards - conquas - audit - evaluation of safety - accident causation theories - foundation of a major injury - health and safety act and regulations - cost of 143 CE-Engg&Tech-SRM-2013 accidents - role of safety personnel - causes of accidents -principles of safety - safety and health management system.

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

**Ref. Books**

1. Calin M. Popescu, ChotchaiCharoenngam, Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications, Wiley, New York, 1995.

2. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, McGrawHill Publishing Company, New Delhi, 1998.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | - | - | 2 | - | - | - | - | - | - | | | | |
| **CO2** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |
| **CO3** | | | | 2 | 3 | - | 3 | | - | - | - | | | | |
| **CO4** | 2 | 2 | 1 | 2 | 2 | - | 2 | 2 | - | - | - | | | | |

## VIII SEMESTER

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE8011** | **TOWN PLANNING** | 3 | - | - | 3 | **A** |

CEO 1- To understand the trend of urbanization and planning process

CEO 2- To study about various types of plans

CEO 3- To study about the planning principles

CEO4- To know how to implement the plan and financing for plan

CEO5- To know about the urban development control regulations

Pre-Requisites (If any) –

Course Outcome

| | |
|---|---|
| CO1 | To understand the human factors in traffic engineering design |
| CO2 | To design the cross-section and alignment of highway |
| CO3 | To use an appropriate traffic flow theory for traffic characteristics. |
| CO4 | To comprehend the capacity and signalized intersection analysis. |
| CO5 | To analyze the origin of town |

**Unit:1** **(12 Hours)**

Principles of architectural design –primary elements, form, space, organization, circulation, proportion and scale, ordering principles. Functional planning of buildings: Planning, designing and construction, General building requirements, Permit and Inspection (as per the National building Code)

**Unit:2** **(10 Hours)**

Town Planning ; Evolution of towns : History and trends in town planning:-origin and growth, Historical development of town planning in ancient valley civilizations; Objects and necessary of town planning; Surveys and analysis of a town

**Unit:3** **(10 Hours)**

New Concepts in town planning : Garden city movement, Linear city and Satellite city concepts,

**Unit:4** **(9 Hours)**

Planning Principles, Practice and Techniques: Elements of City plan, Estimating future needs, Planning standards, Zoning:- its definition, procedure and districts, height and bulk zoning, F.A.R., Master Plan; Concepts of urban planning , design and landscaping.

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Town Planning, B. Charotar Publications. rangawala

**Ref. Books**

1. B. Gallion and S. Eisner, The Urban Pattern: City planning and Design - C B S publishers.
2. D. K. Francis Ching, Architectures: Form, Space and Order, John Wiley.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | - | - | 2 | - | - | - | - | - | - | | | | |
| **CO2** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |
| **CO3** | | | | 2 | 3 | - | 3 | | - | - | - | | | | |
| **CO4** | 2 | 2 | 1 | 2 | 2 | - | 2 | 2 | - | - | - | | | | |

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE8012** | **COMPUTER AIDED DESIGN OF STRUCTURES** | 3 | - | - | 3 | **A** |

CEO 1- To learn the software developing skills for structural design

CEO 2- To understand the computing techniques in the field of transportation

CEO 3- To gain knowledge in networking and flowcharts in water resources

CEO4- To understand the computing skills in the field of geotechnical engineering

CEO5- To study the different software packages for analysis and design

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Students can create 3D models of engineering objects, engineering drawings with different views, and an assembly of the objects that make up engineered systems, using a CAD system |
| CO2 | Obtain a basic understanding of various engineering materials and the manufacturing techniques used to process these materials into useful products |
| CO3 | Students are able to understand engineering drawings with different views, including orthographic views, hidden lines and cross sectional views, and the representations of tolerances and surface finish on engineering drawings |
| CO4 | Students develop an awareness of CAM and rapid prototyping, and the capabilities of these processes |
| CO5 | Students are able to use the cumulative distribution of the normal distribution to predict probabilities in the context of dimensional tolerances |

**Unit:1** **(12 Hours)**

Fundamental reason for implementing CAD - Software requirements – Hardware components in CAD system – Design process - Applications and benefits.

**Unit:2** **(12 Hours)**

Graphic Software – Graphic primitives - Transformations - 2 Dimensional and 3 Dimensional transformations – Concatenation - Wire frame modeling - Solid modeling - Graphic standards - Drafting packages – Auto CAD.

**Unit:3** **(8 Hours)**

Principles of structural analysis - Fundamentals of finite element analysis - Concepts of finite elements – Stiffness matrix formulation – Variational Method – Weighted residual method – Problems – Conditions of convergence of functions – Analysis packages and applications.

**Unit:4** **(10 Hours)**

Principles of design of steel and RC structures - Beams and Columns - Applications to simple design problems - Optimization techniques - Algorithms - Linear programming.

Introduction to artificial intelligence - Knowledge based expert systems – Applications of KBES- Rules and decision tables - Inference mechanisms - simple applications

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books :**

1. Groover M.P. and Zimmers E.W. Jr., “CAD/CAM, Computer Aided Design and Manufacturing”, Prentice Hall of India Ltd, New Delhi, 1993.
2. KrishnamoorthyC.S.Rajeev S., “Computer Aided Design”, Narosa Publishing House, New Delhi, 1993

**Ref. Books:**

1. Harrison H.B., “Structural Analysis and Design”, Part I and II Pergamon Press, Oxford, 1990.
2. Rao S.S., “Optimisation Theory and Applications”, Wiley Eastern Limited, New Delhi, 1977.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 1 | 2 | 2 | - | 2 | 2 | - | - | - | | | | |
| **CO2** | - | - | - | - | 2 | - | - | - | - | - | - | | | | |
| **CO3** | 2 | 2 | 1 | - | 2 | - | - | 2 | - | - | - | | | | |
| **CO4** | 2 | 2 | - | 2 | - | - | 2 | - | - | - | 1 | | | | |

| Subject code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE8013** | **REPAIR AND REHABILITATION OF STRUCTURES** | 3 | - | - | 3 | **A** |

CEO 1- To learn various distress and damages to concrete and masonry structures

CEO 2- To understand the importance of maintenance of structures

CEO 3- To study the various types and properties of repair materials

CEO4- To assess the damage to structures using various tests

CEO5- To learn various repair techniques of damaged structures, corroded structures

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Assess strength and materials deficiency in concrete structures |
| CO2 | Suggest methods and techniques used in repairing / strengthening existing concrete structures |
| CO3 | Apply Non Destructive Testing techniques to field problems |
| CO4 | Apply cost effective retrofitting strategies for repairs in buildings |
| CO5 | Study on causes of building damage and deterioration |

**Unit:1** **(10 Hours)**

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

**Unit:2** **(10 Hours)**

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness

**Unit:3** **(9 Hours)**

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

**Unit:4** **(12 Hours)**

Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – DEMOLITION TECHNIQUES - Engineered demolition methods – Case studies.

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Denison Campbell, Allen and Harold Roper, “Concrete Structures, Materials, Maintenance and Repair”, Longman Scientific and Technical UK, 1991.
2. Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987

**Ref. Books**

1. ShettyM.S., "Concrete Technology - Theory and Practice", S.Chand and Company, 2008.
2. DovKominetzky.M.S., "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2001 Ravishankar.K.,Krishnamoorthy.T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | 2 | 2 | 1 | - | - | 2 | | - | 2 | | | | |
| **CO2** | 2 | - | - | - | 2 | - | - | - | | - | - | | | | |
| **CO3** | 2 | - | - | 2 | - | - | - | 2 | 1 | - | 2 | | | | |
| **CO4** | - | - | 2 | - | 2 | - | - | 2 | 2 | - | 2 | | | | |

| Subject code | Course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE8021** | **GROUND IMPROVEMENT TECHNIQUES** | 3 | - | - | 3 | **A** |

CEO 1- To introduce engineering properties of soft, weak and compressible deposits, principles of Treatment for granular and cohesive soils and various stabilization techniques.

CEO 2- To bring out concepts of reinforced earth

CEO 3- Applications of geotextiles in various civil engineering projects.

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Identify ground conditions and suggest method of improvement |
| CO2 | Design and assess the degree of improvement |
| CO3 | Understand the principles of soil reinforcement and confinement in engineering constructions |
| CO4 | Design reinforced soil structures |
| CO5 | Ability to analyze the ground water conditions. |

**Unit:1** **(10 Hours)**

Introduction, Necessity of ground improvement, Dewatering, methods, Analysis and design of dewatering systems. Grouting types, Properties, Method of grouting, Ground selection and control

**Unit:2** **(10 Hours)**

Compaction, Methods of compaction, Engineering properties of compacted soil, Field compaction and its control.

**Unit:3** **(8 Hours)**

Soil stabilization, Use of chemical additives, Stone columns, Principle, design and method of installation

**Unit:4** **(9 Hours)**

Reinforced earth, Concept, Materials, Application and design, Use of geo-synthetics and geo-cells

Teaching Method(s): Chalk & Board/ PPT/Video Lectures

Text Books

Ref. Books

1. Grond improvement techniques by P.P.Raj, Laxmi Publications. .
2. Foundation Design and Construction, M.J. Tomlinson

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |
| **CO2** | | | | 2 | 3 | - | 3 | | - | - | - | | | | |
| **CO3** | 2 | 2 | 1 | 2 | 2 | - | 2 | 2 | - | - | - | | | | |
| **CO4** | - | - | - | - | 2 | - | - | - | - | - | - | | | | |

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE8022** | **FINITE ELEMENT TECHNIQUES** | 3 | - | - | 3 | **A** |

CEO 1- To provide the fundamental concepts of the theory of the finite element method

CEO 2- To develop proficiency in the application of the finite element method (modeling, analysis, and interpretation of results) to realistic engineering problems through the use of a major commercial general-purpose finite element code.

CEO 3- To learn the theory and characteristics of finite elements that represent engineering structures.

CEO4- To learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others.

CEO5- Learn to model complex geometry problems and solution techniques

Pre-Requisites (If any) –

Course Outcomes

| | |
|---|---|
| CO1 | Understand the fundamental concepts of the Finite Element Method (FEM). |
| CO2 | Apply the basic properties, behavior and usage of different types of finite elements. |
| CO3 | Create Finite Element models and solve typical Civil Engg. Problems using FEM. |
| CO4 | Interpret and evaluate the quality of the results of FE simulations using Software. |
| CO5 | to understand the application and use of the FE method for heat transfer problems. |

**Unit:1** **(12 Hours)**

Introduction - Basic Concepts of Finite Element Analysis - Introduction to Elasticity - Steps in Finite Element Analysis - Virtual Work and Variational Principle - Galerkin Method- Finite Element Method: Displacement Approach - Stiffness Matrix and Boundary Conditions

**Unit:2** **(12 Hours)**

Natural Coordinates - Triangular Elements - Rectangular Elements - Lagrange and Serendipity Elements - Solid Elements -Isoperimetric Formulation - Stiffness Matrix of Isoperimetric Elements Numerical Integration: One, Two and Three Dimensional

**Unit:3** **(12 Hours)**

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.

**Unit:4** **(12 Hours)**

Constant Strain Triangle - Linear Strain Triangle - Rectangular Elements -Numerical Evaluation of Element Stiffness -Computation of Stresses, Geometric Nonlinearity and Static Condensation Ax symmetric Element -Finite Element Formulation of Axisymmetric Element -Finite Element Formulation for 3 Dimensional Elements Plate Bending Problems - Finite Elements for Elastic Stability - Finite Elements in Fluid Mechanics -Dynamic Analysis

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

1. Chandrupatla, T.R., and Belegundu, A.D., “Introduction to Finite Element in Engineering”, Third Edition, Prentice Hall, India, 2003.
2. Krishnamoorthy C. S. ,"Finite Element Analysis Theory and Programming", Tata McGraw Hill Education, 1994

**Ref. Books**

1. Reddy J.N., “An Introduction to Finite Element Method”, McGraw-Hill, Intl. Student Edition, 1985.
2. Zienkiewics, “The finite element method, Basic formulation and linear problems”, Vol.1, 4th Edition, McGraw-Hill, Book Co., 1987

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | - | 2 | - | - | - | 2 | 1 | - | 2 | | | | |
| **CO2** | - | - | 2 | - | 2 | - | - | 2 | 2 | - | 2 | | | | |
| **CO3** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |
| **CO4** | | | | 2 | 3 | - | 3 | | - | - | - | | | | |

| Subject code | course title | L | T | P | C | QP |
|---|---|---|---|---|---|---|
| **BCEPE8023** | **CONSTRUCTION PLANNING AND SCHEDULING** | 3 | - | - | 3 | **A** |

CEO 1- To graduate a student who has strong construction related communication skills including

CEO 2- To graduate a student who knows how to interact with fundamental and construction specific software

CEO 3 To graduate a student who uunderstands the project development process and the fundamentals of architecture

CEO4- To graduate a student who can utilize basic structural concepts to analyze engineering design problems.

CEO5- To graduate a student who has demonstrated the ability to identify and analyze problems commonly encountered by construction managers, and to solve them

Pre-Requisites (If any) – The Construction Industry

Course Outcomes

| | |
|---|---|
| CO1 | Outline the knowledge of construction contracts, tenders and deposits. |
| CO2 | Plan construction organization, construction planning and scheduling for projects. |
| CO3 | Infer the knowledge of networks PERT, CPM and crashing. |
| CO4 | Estimate different types of resources and their optimization in projects. |
| CO5 | Explain about quality management, safety, construction disputes and legislation. |

**Unit:1** **(12 Hours)**

Basic Concepts in the Development of Construction Plans – Choice of Technology and Construction Method – Defining Work Tasks – Defining Precedence Relationships among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.

**Unit:2** **(10 Hours)**

Scheduling procedures and techniques, cost control, monitoring and accounting, quality control and safety during construction, organization and use of project information.

Introduction to Construction Management - Project Organization – Construction Economics – Economic Decision Making - Time value of money - cash flow diagrams - Evaluation Alternatives - Effect of Inflation on cash flow - Evaluation of Public Projects.

Construction contract – contract document - classification of engineering contract - bidding process - CPWD contract conditions - FIDIC form contract agreement – subcontracting - earnest money deposit - security deposit - arbitration.

**Unit:3** **(12 Hours)**

Basic concepts of resource management-class of labour - labour productivity - Classification construction equipment - selection of construction equipment - methods of calculating depreciation – replacement model - material management functions - inventory management -project cost management.

**Unit:4** **(10 Hours)**

Construction quality - inspection, quality control and quality assurance - total quality management - quality gurus and their teachings - cost of quality - ISO standards - conquas - audit - evaluation of safety - accident causation theories - foundation of a major injury - health and safety act and regulations - cost of 143 CE-Engg&Tech-SRM-2013 accidents - role of safety personnel - causes of accidents -principles of safety - safety and health management system.

**Teaching Method(s):**Chalk & Board/ PPT/Video Lectures

**Text Books**

**Ref. Books**

1. Calin M. Popescu, ChotchaiCharoenngam, Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications, Wiley, New York, 1995.

2. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, McGrawHill Publishing Company, New Delhi, 1998.

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 1 | 2 | 2 | - | 2 | 2 | - | - | - | | | | |
| **CO2** | - | - | - | - | 2 | - | - | - | - | - | - | | | | |
| **CO3** | 2 | - | 2 | - | - | - | - | - | 2 | - | - | | | | |
| **CO4** | 2 | - | - | 2 | - | - | - | 2 | 2 | - | 2 | | | | |