| | K.S.R. COLLEGE OF ENGINEERING (Autonomous)<br>(Approved by AICTE, New Delhi & Affiliated to Anna University)<br>K.S.R. Kalvi Nagar, Tiruchengode – 637 215 | CURRICULUM<br>UG<br>R - 2018 |
|---|---|---|

| Department | Civil Engineering |
|---|---|
| Programme | B.E. – Civil Engineering |

### SEMESTER - I

| Sl.<br>No. | Course<br>Code | Course Name | Category | L | T | P | C | CA | ES | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | | | | |
| 1. | 18EN151 | Technical English – I<br>(Common to all Branches) | HSC | 2 | 0 | 1 | 3 | 30 | 70 | 100 |
| 2. | 18MA151 | Engineering Mathematics – I<br>(Common to all Branches) | BSC | 3 | 1 | 0 | 4 | 30 | 70 | 100 |
| 3. | 18CH051 | Engineering Chemistry<br>(Common to all Branches) | BSC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4. | 18CS041 | Programming for Problem Solving<br>(Common to AU,CE,EC, EE & ME) | ESC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| **PRACTICAL** | | | | | | | | | | |
| 5. | 18CH028 | Chemistry Laboratory<br>(Common to all Branches) | BSC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| 6. | 18CS027 | Programming for Problem Solving Laboratory<br>(Common to AU,CE,EC, EE & ME) | ESC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| 7. | 18AU027 | Engineering Graphics Laboratory<br>(Common to CE,CS,EC, EE & IT) | ESC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| **MANDATORY COURSE** | | | | | | | | | | |
| 8. | 18MC051 | Constitution of India<br>(Common to all Branches) | MC | 3 | 0 | 0 | 0 | 50 | 50 | 100 |
| | | Total | | 14 | 1 | 10 | 16 | | 800 | |

**\*Induction program will be conducted for three weeks as per AICTE guidelines**

### SEMESTER - II

| Sl.<br>No. | Course<br>Code | Course Name | Category | L | T | P | C | CA | ES | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | | | | |
| 1. | 18EN251 | Technical English – II<br>(Common to All Branches) | HSC | 2 | 0 | 1 | 3 | 30 | 70 | 100 |
| 2. | 18MA241 | Engineering Mathematics – II<br>(Common to AU,CE & ME) | BSC | 3 | 1 | 0 | 4 | 30 | 70 | 100 |
| 3. | 18PH233 | Applied physics for Civil Engineering | BSC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4. | 18CE214 | Engineering Mechanics | ESC | 3 | 1 | 0 | 4 | 30 | 70 | 100 |
| 5. | 18EE041 | Basics of Electrical and Electronics Engineering<br>(Common to AU,CE,CS,IT& ME) | ESC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| **PRACTICAL** | | | | | | | | | | |
| 6. | 18PH028 | Physics Laboratory<br>(Common to all Branches) | BSC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| 7. | 18GE027 | Workshop Practices Laboratory<br>(Common to AU,CE &ME) | ESC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| **MANDATORY COURSE** | | | | | | | | | | |
| 8. | 18MC052 | Environmental Science and Engineering<br>(Common to all Branches) | MC | 3 | 0 | 0 | 0 | 50 | 50 | 100 |
| | | Total | | 17 | 2 | 7 | 19 | | 800 | |

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|---|---|---|

| Department | Civil Engineering |
|---|---|
| Programme | B.E. – Civil Engineering |

### SEMESTER - III

| Sl. No. | Course Code | Course Name | Category | Hours / Week | | | Credit | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | CA | ES | Total |
| **THEORY** | | | | | | | | | | |
| 1. | 18MA332 | Engineering Mathematics -III | BSC | 3 | 1 | 0 | 4 | 30 | 70 | 100 |
| 2. | 18CE312 | Engineering Geology | ESC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3. | 18CE313 | Fluid Mechanics | PCC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4. | 18CE314 | Mechanics of Solids | ESC | 3 | 1 | 0 | 4 | 30 | 70 | 100 |
| 5. | 18CE315 | Surveying | PCC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6. | 18CE316 | Construction Materials | ESC | 2 | 0 | 0 | 2 | 30 | 70 | 100 |
| **PRACTICAL** | | | | | | | | | | |
| 7. | 18CE321 | Computer aided Building Drawing | ESC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| 8. | 18CE322 | Survey Practical | PCC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| 9. | 18CE323 | Strength of Materials Laboratory | PCC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| 10. | 18HR351 | Career Development Skills- I (Common to all Branches) | EEC | 0 | 2 | 0 | 0 | 100 | 00 | 100 |
| | | TOTAL | | 17 | 4 | 9 | 22 | | 1000 | |

### SEMESTER - IV

| Sl. No. | Course Code | Course Name | Category | Hours / Week | | | Credit | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | CA | ES | Total |
| **THEORY** | | | | | | | | | | |
| 1. | 18MA432 | Numerical Methods | BSC | 3 | 1 | 0 | 4 | 30 | 70 | 100 |
| 2. | 18CE412 | Soil Mechanics | PCC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3. | 18CE413 | Strength of Materials | PCC | 3 | 1 | 0 | 4 | 30 | 70 | 100 |
| 4. | 18CE414 | Applied Hydraulic and Hydraulic Machinery | PCC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5. | 18CE415 | Construction Techniques and Practices | PCC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6. | 18CE416 | Highway Engineering | PCC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| **PRACTICAL** | | | | | | | | | | |
| 7. | 18CE421 | Fluid Mechanics and Machinery Laboratory | PCC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| 8. | 18CE422 | Soil Mechanics Laboratory | PCC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| 9. | 18CE423 | Highway Engineering Laboratory | PCC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| 10. | 18HR422 | Career Development Skills- II | EEC | 0 | 2 | 0 | 0 | 50 | 50 | 100 |
| | | Total | | 18 | 4 | 9 | 23 | | 1000 | |

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|---|---|---|

| Department | Civil Engineering |
|---|---|
| Programme | B.E. – Civil Engineering |

### SEMESTER V

| SI. No. | Course Code | Course Name | Category | Hours / Week | | | Credit | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | CA | ES | Total |
| **THEORY** | | | | | | | | | | |
| 1. | 18CE511 | Railways, Airport and Harbour Engineering | PCC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2. | 18CE512 | Foundation Engineering | PCC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3. | 18CE513 | Concrete Technology | PCC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4. | 18CE514 | Analysis of Indeterminate Structures | PCC | 3 | 1 | 0 | 4 | 30 | 70 | 100 |
| 5. | 18CE515 | Design of Reinforced concrete | PCC | 3 | 1 | 0 | 4 | 30 | 70 | 100 |
| 6. | 18CE516 | Water supply Engineering | PCC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| **PRACTICAL** | | | | | | | | | | |
| 7. | 18CE521 | Environmental Engineering Laboratory | PCC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| 8. | 18CE522 | Concrete Laboratory | PCC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| 9. | 18HR523 | Career Development Skills- III | EEC | 0 | | 0 | 0 | 50 | 50 | 100 |
| | | TOTAL | | 18 | 4 | 6 | 22 | | 900 | |

### SEMESTER –VI

| SI. No. | Course Code | Course Name | Category | Hours / Week | | | Credit | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | CA | ES | Total |
| **THEORY** | | | | | | | | | | |
| 1. | 18CE611 | Irrigation Engineering | PCC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2. | 18CE612 | Advanced Analysis of Structures | PCC | 3 | 1 | 0 | 4 | 30 | 70 | 100 |
| 3. | 18CE613 | Design of Steel Structures | PCC | 3 | 1 | 0 | 4 | 30 | 70 | 100 |
| 4. | 18CE614 | Waste water Engineering | PCC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5. | | Professional Elective – I | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6. | | Open Elective – I | OEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| **PRACTICAL** | | | | | | | | | | |
| 7. | 18CE621 | Irrigation and Environmental Engineering Drawing | ESC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| 8. | 18CE622 | Survey Camp (2 weeks during V Sem vacation) | PWC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| 9. | 18HR624 | Career Development Skills- IV | EEC | 0 | 2 | 0 | 0 | 50 | 50 | 100 |
| | | Total | | 18 | 4 | 6 | 22 | | 900 | |

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|---|---|

| Department | Civil Engineering |
|---|---|
| Programme | B.E. – Civil Engineering |

### SEMESTER VII

| Sl. No. | Course Code | Course Name | Category | Hours / Week | | | Credit | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | CA | ES | Total |
| **THEORY** | | | | | | | | | | |
| 1. | 18HS051 | Professional Ethics<br>(Common to all Branches) | HSC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2. | 18CE712 | Quantity Surveying and Estimation | PCC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3. | | Professional Elective – II | PCC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4. | | Professional Elective –III | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5. | | Open Elective – II | OEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| **PRACTICAL** | | | | | | | | | | |
| 6. | 18CE721 | Structural Design and Drawing Laboratory | ESC | 0 | 0 | 3 | 1 | 50 | 50 | 100 |
| 7. | 18CE722 | Design Project | EEC | 0 | 0 | 6 | 3 | 50 | 50 | 100 |
| 8. | 18CE723 | Industrial Training ( 4 weeks during VI Sem vacation) | EEC | 0 | 0 | 0 | 2 | 50 | 50 | 100 |
| **MANDATORY COURSE** | | | | | | | | | | |
| 9. | 18MC053 | Essence of Indian Traditional Knowledge<br>(Common to all Branches) | MC | 3 | 0 | 0 | 0 | 50 | 50 | 100 |
| | | TOTAL | | 18 | 0 | 9 | 21 | | 900 | |

### SEMESTER –VIII

| Sl. No. | Course Code | Course Name | Category | Hours / Week | | | Credit | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | CA | ES | Total |
| **THEORY** | | | | | | | | | | |
| 1. | 18CE811 | Construction Management | PCC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2. | | Professional Elective – IV | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3. | | Professional Elective – V | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| **PRACTICAL** | | | | | | | | | | |
| 4. | 18CE821 | Project Work | EEC | 0 | 0 | 12 | 6 | 50 | 50 | 100 |
| | | Total | | 9 | 0 | 12 | 15 | | 400 | |

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|---|---|---|
| Department | Civil Engineering | |
| Programme | B.E. – Civil Engineering | |
| **List of Electives** | | |

### ELECTIVE – I (SEMESTER – VI)

| Sl.<br>No. | Course<br>Code | Course Name | Specia<br>lization | Categor<br>y | Hours / Week | | | Credit | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | C | CA | ES | Total |
| 1. | 18CE661 | Prefabricated Structures | S1 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2. | 18CE662 | Maintenance and Rehabilitation of Structures | S2 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3. | 18CE663 | Hydrology | S4 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4. | 18CE664 | Remote Sensing and GIS | S5 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5. | 18CE665 | Traffic Engineering and Management | S6 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6. | 18CE666 | Ground Improvement Techniques | S7 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |

### ELECTIVE – II & III (SEMESTER – VII)

| Sl.<br>No. | Course<br>Code | Course Name | Special<br>ization | Category | Hours / Week | | | Credit | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | C | CA | ES | Total |
| 1. | 18CE761 | Pre-stressed Concrete | S1 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2. | 18CE762 | Bridge Engineering | S1 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3. | 18CE763 | Industrial Structures | S1 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4. | 18CE764 | Construction Safety Practices | S2 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5. | 18CE765 | Air Pollution Management | S3 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6. | 18CE766 | Environmental Impact Assessment | S3 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 7. | 18CE767 | Industrial Waste Management | S3 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 8. | 18CE768 | Geo - informatics Applications for Civil Engineering | S5 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 9. | 18CE769 | Geographical Information System | S5 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 10. | 18CE771 | Urban Planning and Development | S6 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 11. | 18CE772 | Basics of Dynamics and Aseismic design | S1 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 12. | 18HS001 | Principles of Management<br>(Common to AU, CE, EEE, ECE,) | S8 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |

### ELECTIVE – IV & V (SEMESTER – VIII)

| Sl.<br>No. | Course<br>Code | Course Name | Specia<br>lizatio<br>n | Category | Hours / Week | | | Credit | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | C | CA | ES | Total |
| 1. | 18CE861 | Disaster Resisting Structures | S1 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2. | 18CE862 | Smart Materials and Smart Structures | S1 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3. | 18CE863 | Earthquake Engineering | S1 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |

| 4. | 18CE864 | Finite Element Method | S1 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5. | 18CE865 | Housing, Planning and Management | S2 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6. | 18CE866 | Architectural Planning Aspects | S2 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 7. | 18CE867 | Municipal Waste and Management | S3 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 8. | 18CE868 | Coastal Zone management | S4 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 9. | 18CE869 | Cartography | S5 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 10. | 18CE871 | Pavement Engineering | S6 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 11. | 18CE872 | Soil Dynamics and Machine Foundations | S7 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 12. | 18HS002 | Total Quality Management (Common to AU, CE, CSE, EEE, ME & IT) | S8 | PEC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |

S1 -Structural Engineering      S5 - Geo informatics & Survey Engineering

S2 - Construction Engineering      S6 - Transport Engineering

S3 - Environmental Engineering      S7 - Soil & Foundation Engineering

S4 - Hydrology & Water Resources      S8- Humanities

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|---|---|
| Department | Civil Engineering |
| Programme | B.E. – Civil Engineering |
| **List of Open Electives** | |

| Sl. No. | Course Code | Course Name | Speciali zation | Hours / Week | | | Credit | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | CA | ES | Total |
| 1. | 18HS094 | Disaster Management | MBA | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2. | 18AU811 | Hybrid & Electric Vehicles | AU | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3. | 18EE099 | Electrical Wiring, Estimating & Costing | EE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4. | 18CS512 | Data Base Management | CS | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5. | 18CS613 | Software Testing | CS | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6. | 18ME773 | Renewable Sources of Energy | ME | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 7. | 18AU862 | Special Purpose Vehicles | AU | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 8. | 18CS871 | M - Commerce | CS | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 9. | 18IT765 | Video Analytics | IT | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 10. | 18EE092 | Electronic Instrumentation | EE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 11. | 18CE313 | Fluid Mechanics | CE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 12. | 18CE413 | Strength of Materials | CE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 13. | 18CE664 | Remote Sensing and GIS | CE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 14. | 18CE766 | Environmental Impact assessment | CE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 15. | 18CE862 | Smart Materials and Smart Structures | CE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 16. | 18CE865 | Housing Planning and Management | CE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 17. | 18CE866 | Architecture Planning Aspects | CE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 18. | 18CE867 | Municipal Waste and Management | CE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 19. | 18CE091 | Basic Civil and Mechanical Engineering | CE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 20. | 18CE096 | Solid Waste Management | CE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |

**LIST OF VALUE ADDED COURSES**

| SI. No. | Course Name | Numbers of Hours | Offered by Internal / External |
|---|---|---|---|
| 1. | Contract and Tender Procedures | 15 | Internal/External |
| 2. | Modern Construction Practices | 15 | Internal/External |
| 3. | E-Tabs Applications | 15 | Internal/External |
| 4. | CPM & PERT | 15 | Internal/External |
| 5. | Soil Interaction | 15 | Internal/External |
| 6. | Materials Management | 15 | Internal/External |
| 7. | Water Harvesting &Management | 15 | Internal/External |
| 8. | Energy Engineering | 15 | Internal/External |
| 9. | Solid waste management | 15 | Internal/External |
| 10 | Sustainable Engineering practices | 15 | Internal/External |
| 11. | Intellectual Property Rights | 15 | Internal/External |
| 12. | Engineering Economics & Cost analysis | 15 | Internal/External |
| 13. | Value Engineering | 15 | Internal/External |
| 14. | Optimization techniques | 15 | Internal/External |
| 15. | Finite element method | 15 | Internal/External |

**COURSE COMPONENT SUMMARY**

| S.No | Subject Area | Credits per semester | | | | | | | | Credits Total | % of Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | VII | VIII | | |
| 1 | HSC | 3 | 3 | | | | | 3 | | 9 | 5.62 |
| 2 | BSC | 8 | 8 | 4 | 4 | | | | | 24 | 15.00 |
| 3 | ESC | 5 | 8 | 10 | | | 1 | 1 | | 25 | 15.62 |
| 4 | PCC | | | 8 | 19 | 22 | 14 | 3 | 3 | 69 | 43.12 |
| 5 | PEC | | | | | | 3 | 6 | 6 | 15 | 9.37 |
| 6 | OEC | | | | | | 3 | 3 | | 06 | 3.75 |
| 7 | EEC | | | | | | 1 | 5 | 6 | 12 | 7.50 |
| 8 | MC | 0 | 0 | | | | | 0 | | 0 | 0 |
| | Total | 16 | 19 | 22 | 23 | 21 | 22 | 21 | 15 | 160 | 100 |

**K.S.R. COLLEGE OF ENGINEERING (Autonomous)**                    **R 2018**

<u>SEMESTER - I</u>

| | **TECHNICAL ENGLISH – I** | L | T | P | C |
|---|---|---|---|---|---|
| **18EN151** | (common to all branches) | 2 | 0 | 1 | 3 |

*Prerequisite: No prerequisites are needed for enrolling into the course*

*Objectives:*

- *To develop basic conversation skills.*
- *To build vocabulary skills with the right choice of words.*
- *To improve students' understanding of grammar in context progressively.*

**UNIT - I**                                                                                                   **[ 9 ]**

Synonyms & Antonyms – Tenses (Simple Present, Present Continuous, Present Perfect, Simple Past, and Simple Future) - Use of Modal Auxiliaries – Infinitive and Gerund –- Intensive Reading – Predicting Content – Interpretation - Active Listening - Listening for the main idea - Need based Correspondence (request for joining hostel, bonafide certificate)

**UNIT - II**                                                                                                 **[ 9 ]**

British & American Terminology - Impersonal passive – Standard Abbreviations and Acronyms - Predicting Content - Drawing inferences - Listening for specific details - Listening to News – Job Application and Resume – Writing Instructions

**UNIT - III**                                                                                               **[ 9 ]**

Preposition of Time, Place and Movement – Concord (Subject & Verb Agreement) – Passive Voice –Consonant Sounds – Pronunciation guidelines related to Vowels and Consonant – Skimming & Scanning - Inference – Context Based Meaning - Welcome Speech – Vote of Thanks.

**UNIT - IV**                                                                                               **[ 9 ]**

Newspaper Reading – Vocabulary Building – Phrasal Verbs (Put, Give, Look, Take, Get, Call) – Note making – Rearranging the jumbled sentences - MoC – Anchoring – Role play in academic context – E Mail Etiquette – Introducing others.

**UNIT - V**                                                                                                 **[ 9 ]**

Listening to Dialogues – Listening to Telephonic Conversation - Recommendation Writing - Letter of Invitation (inviting, accepting and declining) – Paragraph writing - Letter to the Editor of a News paper – Drills using Minimal pairs – Presentation Skills.

**Total = 45 Periods**

*Course Outcomes : On Completion of this course, the student will be able to*

- *Comprehend and apply Grammar in context for professional communication.*
- *Infer the gist and specific information.*
- *Ability to speak, express and interact in the society and place of study.*
- *Critically interpret by reading a text and comprehend a given text.*
- *Correspond and communicate for jobs.*

**Text Books :**

1    Dr.P.Rathna, English Work Book – I, VRB Publishers Pvt. Ltd., Chennai,2018
2    S.Sumant, Technical English – I, Vijay Nicole, Chennai, 2018

**Reference Books :**

1    Meenakshi Raman. Technical Communication, Oxford University Press, New Delhi, 2017
2    Seely, The Oxford Guide to Writing and Speaking, Oxford University Press, New Delhi, 2016
3    M AshraRizvi, Effective Technical Communication, Tata Mc GRAW HILL, New Delhi (2005)
4    P.Kiranmani Dutt, A course in Communication Skills, Cambridge University Press, New Delhi, 2014

**SEMESTER - I**

| 18MA151 | ENGINEERING MATHEMATICS – I | L | T | P | C |
|---------|-----------------------------|---|---|---|---|
| | (COMMON TO ALL BRANCHES) | 3 | 1 | 0 | 4 |

**Prerequisite:** No prerequisites are needed for enrolling into the course.

**Objectives**

- *To study the concepts of Matrices and its Applications.*
- *To study the concepts and its applications of Ordinary Differential Equations and solving differential calculus problems.*
- *To study the concepts of functions of several variables and basics of Vector Calculus.*

### UNIT - I        LINEAR ALGEBRA        [12]

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors (Excluding proof) – Cayley Hamilton theorem (excluding proof) - Quadratic forms – Reduction of quadratic form to canonical form by orthogonal transformation.

### UNIT - II        ORDINARY DIFFERENTIAL EQUATIONS        [12]

Linear differential equations of second and higher order with constant coefficients – Differential equations with variable coefficients – Cauchy's and Legendre's linear equations – Method of variation of parameters.

### UNIT - III        DIFFERENTIAL CALCULUS        [12]

Curvature - Radius of curvature (Cartesian co-ordinates only) – Centre of curvature and Circle of curvature – Involutes and Evolutes.

### UNIT - IV        FUNCTIONS OF SEVERAL VARIABLES        [12]

Partial derivatives – Total derivatives – Euler's theorem for homogenous functions – Taylor's series expansion - Maxima and Minima for functions of two variables – Method of Lagrangian multipliers.

### UNIT - V        VECTOR CALCULUS        [12]

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Green's theorem in plane, Gauss divergence theorem and Stoke's theorem – Problems in Cube, Cuboid and Rectangular paralleopiped only.

**Total (L: 45  T:15) = 60 Periods**

**Course Outcomes:  On Completion of this course, the student will be able to**

- *Interpret the basics of Matrix applications in the field of engineering.*
- *Acquire knowledge in solving ordinary differential equations.*
- *Explain and apply the concepts of differential calculus problems.*
- *Skills in Developing and solving the functions of several variables.*
- *Acquire the basics of vector calculus and its applications.*

**Text Books :**

1. Ravish R Singh and Mukul Bhatt, Engineering Mathematics – I, McGraw Hill Publications, 3rd Edition, New Delhi 2016.
2. Grewal B.S, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company, 43rd Edition, New Delhi, 2015.

**References :**

1. Bali N. P and Manish Goyal, Text book on Engineering Mathematics, Laxmi Publications (p) Ltd., 7th Edition, 2016.
2. H.K. Dass, Advance Engineering Mathematics, S. Chand and company, 11th Edition, 2015.
3. http://www.sosmath.com/matrix/matrix.html

**K.S.R. COLLEGE OF ENGINEERING (Autonomous)**　　　　　　**R 2018**
<u>SEMESTER – I</u>

| **18CH051** | **ENGINEERING CHEMISTRY**<br>**(Common to All Branches)** | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

*Prerequisite: NIL.*

*Objectives:*

- *To impart knowledge about the manufacture, properties and uses of advanced engineering materials.*
- *To acquaint the students with the basic concepts of corrosion mechanism and its control.*
- *To understand the concept of thermodynamics.*
- *To gain knowledge about atomic structure and chemical bonding.*
- *To make the students conversant with various spectroscopic techniques.*

**UNIT - I　　　　ADVANCED ENGINEERING MATERIALS　　　　　　　　　[ 9 ]**

Abrasives – Moh's scale of hardness – types – natural [Diamond] – synthetic [SiC]; Refractories – characteristics – classifications [Acidic, basic and neutral refractories] – properties – refractoriness – RUL – porosity – thermal spalling; Lubricants – definition – function – characteristics – properties – viscosity index, flash and fire points, cloud and pour points, oiliness; Solid lubricants – graphite and $MoS_2$; Nano materials – CNT– synthesis [CVD, laser evaporation, pyrolysis] – applications – medicine, electronics, biomaterials and environment.

**UNIT - II　　　　ELECTROCHEMISTRY AND CORROSION　　　　　　　　[ 9 ]**

Introduction – electrode potential – Nernst equation –  EMF series and its significance – types of cells (Electrolytic & electrochemical); Corrosion – causes, consequences – classification – chemical corrosion – electro chemical corrosion – mechanism; Galvanic & differential aeration corrosion – factors influencing corrosion – corrosion control – corrosion inhibitors.

**UNIT - III　　　　CHEMICAL THERMODYNAMICS　　　　　　　　　　[ 9 ]**

Terminology of thermodynamics – second law; Entropy – entropy change for an ideal gas – reversible and irreversible processes – entropy of phase transition – Clausius inequality; Free energy and work function – Helmholtz and Gibb's free energy functions (Problems) – criteria of spontaneity; Gibb's – Helmholtz equation (Problems) – Clausius-Clapeyron equation; Maxwell's relations – Van't Hoff isotherm and isochore (problems).

**UNIT - IV　　　　ATOMIC STRUCTURE AND CHEMICAL BONDING　　　　[ 9 ]**

Effective nuclear charge – orbitals – variations of s, p, d and f orbital – electronic configurations – ionization energy – electron affinity and electro negativity; Types of bonding – ionic, covalent and coordination bonding – hydrogen bonding and its types; Crystal field theory – the energy level diagram for transition metal complexes ($[Fe(CN)_6]^{3-}$, $[Ni(CN)_4]^{2-}$ and $[CoCl_4]^{2-}$ only); Role of transition metal ions in biological system; Band theory of solids.

**UNIT - V　　　　PHOTOCHEMISTRY AND SPECTROSCOPIC TECHNIQUES　　[ 9 ]**

Laws of photochemistry – Grotthuss Draper law – Stark-Einstein law – Beer-Lambert law – phosphorescence – fluorescence and it's applications in medicine – chemiluminescence; Colorimetry – principle – instrumentation (block diagram only) –  estimation of iron by colorimetry; principles of spectroscopy – selection rules – vibrational and rotational spectroscopy – applications; Flame photometry – principle – instrumentation (block diagram only) – estimation of sodium; Atomic absorption spectroscopy – principle – instrumentation (block diagram only) – estimation of nickel.

**Total  = 45 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*

- *Know the manufacture, properties and uses of advanced engineering materials.*
- *Perceive knowledge on the concept of corrosion and its control.*
- *Gain knowledge about thermodynamics.*
- *Rationalize periodic properties such as ionization energy, electron affinity and electro negativity.*
- *Recognize the usage of various spectroscopic techniques.*

**Text Book :**

1　P.C. Jain and Monica Jain, Engineering Chemistry, DhanpatRai Pub. Co., New Delhi, 2015.

2　Dr. A. Ravikrishnan, Engineering Chemistry, Srikrishna Hi-tech Publishing Company Pvt. Ltd., Chennai, 2016.

**Reference Books :**

1　S S. Dara and S. S. Umare, A Text book of Engineering Chemistry, S.Chand&Co.Ltd., New Delhi, 2015.

2　S. Vairam, P. Kalyani and Suba Ramesh, Engineering Chemistry, Wiley India Pvt. Ltd.,  New Delhi, 2013.

3　https://www.vidyarthiplus.com/vp/attachment.php?aid=12082

**K.S.R. COLLEGE OF ENGINEERING (Autonomous)**          **R 2018**

<u>**SEMESTER – I**</u>

| 18CS041 | **PROGRAMMING FOR PROBLEM SOLVING** (Common to AU,CE,EC, EE & ME) | L 3 | T 0 | P 0 | C 3 |
|---|---|---|---|---|---|

*Prerequisite:* No prerequisites are needed for enrolling into the course.

*Objectives:*
- *To learn the organization of a digital computer.*
- *To think logically and write pseudo code or draw flowchart of a problem*
- *To write simple programs using C language.*

**UNIT - I          BASICS OF COMPUTER AND PROBLEM SOLVING          [ 9 ]**

Generation and Classification of Computer – Organization of Digital Computer – Categories of Software – Software Development Life Cycle – Number System and Conversions – Representation of an Algorithm: Pseudo code, Flowchart with examples – Steps in Problem Solving – Problem Solving Strategies.

**UNIT - II          C PROGRAMMING BASICS          [ 9 ]**

Fundamentals – Structure of a C program – Compilation and Linking processes – Constants, Variables – Data Types – Operators – Expressions – Managing Input and Output operations – Decision Making and Branching – Looping statements – Simple Programs.

**UNIT - III          ARRAYS AND STRINGS          [ 9 ]**

Arrays: Introduction, One Dimensional Array, Declaration – Initialization of One Dimensional Array, Two-Dimensional Arrays, Initializing Two Dimensional Arrays – Simple Programs. String: Declaring and Initializing String Variables – String handling Functions and Operations.

**UNIT - IV          FUNCTIONS AND POINTERS          [ 9 ]**

Function: Declaration – Definition – Categories – Pass by Value – Pass by Reference – Recursion – Pointers: Definition – Initialization – Pointers arithmetic – Pointers to Pointers – Pointers and Arrays – Simple Programs.

**UNIT - V          STRUCTURES AND UNIONS          [ 9 ]**

Structures: Declaration – Definition – Structure within a structure – Union – Storage Classes – Preprocessor Directives – Files: Defining and Opening a file – Closing a file – Input/output operations on files – Command line arguments.

**Total  = 45 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*
- *Identify basics of computer.*
- *Write C programs for solving simple scientific and statistical problems.*
- *Implement C programs for arrays and strings.*
- *Write C programs using functions and pointers.*
- *Implement simple C applications using structures and unions.*

**Text Books :**

1   Herbert Schildt, "C - The Complete Reference", Tata McGraw-Hill, 2013.

2   R.G.Dromey, "How to Solve it by Computer", Pearson Education, India, 2008.

**References :**

1   Ashok N.Kamathane, ''Computer Programming'', Pearson Education, 2014

2   Pradip Dey, ManasGhosh, ''Fundamentals of Computing and Programming in C'', Oxford University Press, 1st Edition, 2013.

3   Anita Goel and Ajay Mittal, ''Computer Fundamentals and Programming in C'', Dorling Kindersley India Pvt. Ltd., Pearson Education in South Asia, 2011.

4   Yashavant P. Kanetkar, ''Let Us C'', BPB Publications, 2011.

5   Nptel.ac.in/courses/106104128/

**K.S.R. COLLEGE OF ENGINEERING (Autonomous)**          **R 2018**

<u>**SEMESTER – I**</u>

| 18CH028 | CHEMISTRY LABORATORY | L | T | P | C |
|---------|----------------------|---|---|---|---|
|         | (Common to All Branches) | 0 | 0 | 3 | 1 |

*Prerequisite: Knowledge of Engineering Chemistry*

***Objectives:***

- *To gain the practical knowledge and hands on experiences of understanding the principle of conductometric titration.*
- *Applying theoretical principles to water analysis and corrosion.*

**LIST OF EXPERIMENTS:**

1. Conductometric Titration – Strong Acid Vs. Strong Base.

2. Conductometric Titration – Mixture of Weak and Strong Acids Vs. Strong Base.

3. Conductometric Titration – Precipitation, $BaCl_2$ Vs. $Na_2SO_4$.

4. Estimation of Ferrous ion by Potentiometry – $Fe^{2+}$ Vs $K_2Cr_2O_7$.

5. Estimation of Hydrochloric Acid by pH metry.

6. Estimation of Iron by Spectrophotometry.

7. Estimation of hardness in water by EDTA method.

8. Estimation of chloride in water sample by Argentometry.

9. Estimation of dissolved oxygen (DO) in water by Winkler's method.

10. Determination of rate of corrosion of mild steel by weight loss method.

**Total : 30 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*

- *Apply the principle of conduct metric titration.*
- *Determine the role of pH in quantitative analysis of a solution.*
- *Get conceptual knowledge in estimating the concentration of Iron in solution by electrochemical methods.*
- *Analyze the application of water in various fields.*
- *Identify with the nature of corrosion process.*

**Text Book :**

1    Chemistry Lab Manual, Department of Chemistry, K.S.R. College of Engineering, Tiruchengode, 2018.

**Reference Books :**

1    Vogel's Textbook of Quantitative Chemical Analysis, 2014.

**K.S.R. COLLEGE OF ENGINEERING (Autonomous)**       **R 2018**

<u>**SEMESTER – I**</u>

| | | L | T | P | C |
|---|---|---|---|---|---|
| **18CS027** | **PROGRAMMING FOR PROBLEM SOLVING LABORATORY** <br> (Common to  AU, CE, EC, EE & ME) | 0 | 0 | 3 | 1 |

*Prerequisite:* No prerequisites are  needed for enrolling into the course

*Objective:*

- *To gain the knowledge of PC hardware, Office software and simple applications using C programming*

**List of Experiments:**

1. Study and Identification of PC Motherboard and its interfacing components
2. Prepare a Bio-data using MS Word with appropriate page, text and table formatting options and send the same tomany recipients using mail merge.
3. Prepare a mark sheet with five subjects for five students in MS Excel File using Formulas, Functions and charts.
4. i) Prepare a Power Point presentation for your organization with varying animation effects using timer.
   ii) Prepare a Student Database in MS Access, manipulate the data and generate report.

**Implement the following program using Raptor tool and C**

5. Generate Fibonacci series and compute factorial for a given number using looping statements. (While and do…while).
6. Consider the five subjects Physics, Chemistry, Biology, Mathematics and Computer. Calculate the average and grade according to following:
   > Percentage >= 90%: Grade A
   > Percentage >= 80%: Grade B
   > Percentage >= 70%: Grade C
   > Percentage >= 60%: Grade D
   > Percentage >= 40%: Grade E
   > Percentage < 40%: Grade F Using if … else & switch
7. Declare an array with N elements then delete given element from the array and display.
8. Maintain a record of 'n' employee details using an array of structures with four fields (Employee ID, Name, salary and designation). Assume appropriate data type for each field. Print the employee details.
9. Generate prime factors of an integer using functions.
10. Implement the following using pointer:
i) Arithmetic operations   ii) Swapping of two variables.

**Total : 45 Periods**

*Course Outcomes: On Completion of this course , the student will be able to*

- *Be familiar with creating a table, flow chart, mail merge and apply text manipulation in a word document*
- *Design a spreadsheet for creating the charts and apply formulas and functions.*
- *Create power point presentation with animations and generate a report in MS access.*
- *Apply good programming design methods for program development.*
- *Design and implement C programs for simple applications.*

**K.S.R. COLLEGE OF ENGINEERING (Autonomous)**          **R 2018**

<u>**SEMESTER – I**</u>

| | | L | T | P | C |
|---|---|---|---|---|---|
| **18AU027** | **ENGINEERING GRAPHICS LABORATORY** | | | | |
| | (Common to CE,CS,EC,EE & IT) | 0 | 0 | 3 | 1 |

***Prerequisite:*** *No Prerequisites are needed for enrolling into the course.*

***Objective:***

- *To develop skill for using software to create 2D and 3D Models.*

**List of Experiments:**

1. Study of basic tools, commands and coordinate system (absolute, relative, polar, etc.) used in 2D software.
2. Draw the conic curves and special curves by using AutoCAD.
3. Draw the front view, top view, side view of objects from the given pictorial view.
4. Draw the projections of straight lines.
5. Draw the projections of polygonal surface.
6. Draw the projections of simple solid objects.
7. Draw the sectional view and the true shape of the given section.
8. Draw the development of surfaces like prism, pyramids, cylinders and cone.
9. Draw the isometric projections of simple solids, truncated prism and pyramids.
10. Draw the isometric projections of cylinder and cone.

**LIST OF EQUIPMENT**

| Sl. No. | Name of the Equipment | Qty. |
|---|---|---|
| 1. | Pentium IV computer or better hardware, with suitable graphics facility | 30 Nos. |
| 2. | Licensed software for drafting and modeling | 15 Nos. |
| 3. | Laser Printer or Plotter to print / plot drawings | 2 Nos. |

**Total : 45 Periods**

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

- *Construct various plane curves.*
- *Do orthographic projection of lines and plane surfaces.*
- *Draw projections of solids and development of surfaces.*
- *Prepare isometric sections of simple solids.*
- *Develop the section of solids and surfaces.*

**K.S.R. COLLEGE OF ENGINEERING (Autonomous)**     **R 2018**

**SEMESTER – I**

| 18MC051 | **CONSTITUTION OF INDIA**<br>(Common to all branches) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 0 |

**Prerequisite: Nil**

**Objectives:**
- *To know about the fundamentals of our Indian constitution and their structure.*
- *The student should be able to know the formation of state government and union government.*
- *To know more about the Indian Judiciary System and Election Commission.*

**UNIT - I          INTRODUCTION                                                                [ 9 ]**

Historical Background – Significance of the Constitution - Making of the constitution – Constituent Assembly of India - Role of the constituent Assembly - Salient features of the constitution - Nature of Federal system.

**UNIT - II          FUNDAMENTAL RIGHTS AND DUTIES                                       [ 9 ]**

Preamble – Citizenship – Fundamental Rights – Fundamental Duties and Responsibilities – Directive Principles of State Policy - Procedure for Amendment.

**UNIT - III          UNION GOVERNMENT                                                         [ 9 ]**

Union Government – President – Vice President – Prime Minister – Powers and Duties – Cabinet – Council of Ministers – Parliament -  Functions – Lok Sabha – Rajya Sabha – Role of the Speaker.

**UNIT - IV          STATE GOVERNMENT                                                         [ 9 ]**

State Government – The Governor – Council of Ministers and Chief Minister – Powers and Functions – State legislature – Local Governance.

**UNIT - V          JUDICIAL SYSTEM AND ELECTION COMMISION                          [ 9 ]**

The Indian Judicial System – Supreme Court – High Courts of India – Judicial Review – Election Commission of India – Duties and Responsibilities – State Election Commissions – Roles and functions.

**Total  = 45 Periods**

**Course Outcomes: On Completion of this course, the student will be able to**
- *Explain about the historical background of Indian constitution and features*
- *Know about fundamental rights and responsibilities of the citizen*
- *Learn about the structure and function of union government.*
- *Gain knowledge about the legislature assembly of state government.*
- *Know about Indian judiciary system and working of Election Commission.*

**Text Books :**

1   P.M. Bakshi," The Constitution of India "15th Edition, Universal law Publishing, New Delhi, 2018.
2   D.D.Basu, "Introduction to the constitution india", Lexisnexis Publisher, New Delhi, 2015.

**Reference Books :**

1   Brij Kishore sharma,"Introduction to the constitution india",7th Edition, PHI Learning Pvt. Ltd, New Delhi, 2015.
2   Sharma B. K, "Introduction to the Constitution of India" 6th Edition, PHI Learning Pvt. Ltd, New Delhi, 2011.
3   http://nptel.ac.in/courses/109104074/8
4   https://www.vidyarthiplus.com/vp/thread-28159.html#.Vrmlwrh97IU

**K.S.R. COLLEGE OF ENGINEERING (Autonomous)**     **R 2018**

<u>SEMESTER - II</u>

| | | L | T | P | C |
|---|---|---|---|---|---|
| **18EN251** | **TECHNICAL ENGLISH – II**<br>(common to all branches) | 2 | 0 | 1 | 3 |

*Prerequisite: No prerequisites are needed for enrolling into the course*

*Objective:*

* *To improve Listening, Speaking, Reading and Writing skills.*

**UNIT - I**                                                                                           **[ 9 ]**

Technical Vocabulary – Changing words from one form to another - Articles – Compound Nouns - Critical reading - Need based Correspondence (In plant training & Industrial Visit) - Context based meaning – Introducing Oneself – Writing short Essays.

**UNIT - II**                                                                                          **[ 9 ]**

Numerical Adjectives – Prefixes & Suffixes- If Conditionals – E-mail Writing - Greetings and Introductions – Making Requests – Seeking Information – Inviting People – Likes & Dislikes -. Listening for main ideas -  Report Writing.

**UNIT - III**                                                                                         **[ 9 ]**

Framing Questions – 'Wh' Question – Yes / No Question –Discourse markers - Cause and Effect Expression - Critical reading, Making inference - Transcoding (Interpretation of Charts) - Listening and Note taking – Oral Presentation.

**UNIT - IV**                                                                                        **[ 9 ]**

Expression of Purpose – Editing text for Spelling and Punctuation – Redundancies - Business Correspondence – Calling for Quotations, Seeking Clarification, placing order and Complaint - Extensive Listening – Short Comprehension Passages.

**UNIT - V**                                                                                         **[ 9 ]**

Instructions – Describing – Telephone Etiquette - Listening to fill up forms and gapped texts – Agenda and Minutes of meeting – Check list – Essay Writing – Reading Short texts from Journals and Newspapers.

**Total  = 45 Periods**

***Course Outcomes : On Completion of this course, the student will be able to***

* *Comprehend and apply the enriched vocabulary, by knowing the basic grammatical structure, in academic and professional contexts.*
* *Recognize and use Standard English in diverse situations.*
* *Critically interpret by reading a text and comprehend a given text.*
* *Able to write clearly in professional contest.*
* *Enhance the listening skill for academic purposes.*

**Text Books :**

> 1.Dr.P.Rathna, English Work Book – II, VRB Publishers Pvt. Ltd., Chennai,2016
> 2. S.Sumant, Technical English – I, Vijay Nicole, Chennai, 2018

**Reference Books :**

1    Dr.S.Sumant, Technical English I, Tata McGraw Hill, Chennai (2016).

2    Dept. of Humanities and social sciences, Anna University, Chennai, English for Engineers and Technologists, Orient Longman, 2014

3    Hory Sankar Mukerjee, Business Communication, Oxford University Press, New Delhi (2013).

4    Department of English, English for Technologists and Engineers, Orient Black Swan, Chennai (2016).

**K.S.R. COLLEGE OF ENGINEERING (Autonomous)**          **R 2018**

**SEMESTER - II**

| 18MA241 | ENGINEERING MATHEMATICS – II | L | T | P | C |
|---------|------------------------------|---|---|---|---|
|         | (Common to B.E. AU, CE & ME) | 3 | 1 | 0 | 4 |

*Prerequisite:*No prerequisites are needed for enrolling into the course.
*Objective(s):*
- *To understand the concepts of analytic functions, conformal mapping and bilinear transformations.*
- *To acquire knowledge in complex integration and Fourier series.*
- *To acquire knowledge in partial differential equations and its applications, Laplace transform And inverse Laplace transforms techniques.*

**UNIT - I          ANALYTIC FUNCTIONS          [12]**

Functions of a complex variable – Analytic functions – Necessary and sufficient conditions: Cauchy – Riemann Equation (excluding proof) – Harmonic functions – Construction of analytic functions (Milne Thomson method) – Conformal mapping : $w = z+c$, $cz$, $1/z$ and bilinear transformation.

**UNIT - II          COMPLEX INTEGRATION          [12]**

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Laurent's series expansion – Singular points – Residues – Cauchy's residue theorem – Evaluation of real and definite integrals on unit circle and semi – circular contour (excluding poles on boundaries).

**UNIT - III          FOURIER SERIES          [12]**

Dirichlet's conditions – General Fourier series - Odd and Even functions – Half range sine and cosine series – Harmonic analysis.

**UNIT - IV          PARTIAL DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS          [12]**

Formation of partial differential equations – Lagrange's linear equation - Solutions of one dimensional wave equation – Problems on vibrating string with zero and non - zero initial velocity – One dimensional heat equation – Problems of steady state condition with zero and non- zero boundary values.

**UNIT - V          LAPLACE TRANSFORMATION          [12]**

Laplace transforms – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives – Initial and final value theorems (excluding proof). Transform of periodic functions. Inverse Laplace transforms (partial fraction method only) – Solution of linear ordinary differential equations of second order with constant coefficients.

**Total (L: 45  T:15  ) = 60 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*
- *Apply the concepts of analytic functions, conformal mapping and bilinear transformations.*
- *Know the concepts of Complex Integration.*
- *Identify the basics of Fourier series and its applications in the field of engineering.*
- *Analyze the concepts of partial differential equations and its applications.*
- *Gain the fundamentals of Laplace transform Inverse Laplace transform and its applications.*

**Text Books :**
1. Ravish R Singh and Mukul Bhatt, "Engineering Mathematics II", McGraw Hill Publications, New Delhi, (2016), 3rd Edition.
2. Grewal B.S,"Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 43rd edition, 2015.

**References :**
1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 7th Edition.(2016).
2. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", Laxmi Pub.(p) Ltd.,7th edition, (2016).
3. http://tutorial.math.lamar.edu/Classes/DE/DE.aspx

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<u>**SEMESTER - II**</u>

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

**18PH233**          **APPLIED PHYSICS FOR CIVIL ENGINEERING**

*Prerequisite:* *Basic knowledge on physics*

*Objectives:*
- *Explore the fundamentals of Lasers, Optical fiber and their applications.*
- *The student should be able to know the basics of Magnetic and Dielectric materials.*
- *Understand the basic concepts of Elasticity and Thermodynamic systems.*

**UNIT - I          LASERS AND APPLICATIONS          [ 9 ]**

Introduction – properties of laser - Principle of spontaneous emission and stimulated emission - Population inversion, pumping - Einstein's A and B coefficients (derivation) - Types of lasers – Nd-YAG, $CO_2$ and Semiconductor laser – (Homo junction & Hetero junction) -Medical and Industrial applications - Holography (construction & reconstruction).

**UNIT - II          FIBER OPTICS AND APPLICATIONS          [ 9 ]**

Principle and propagation of light in optical fibers – Numerical aperture and Acceptance angle (derivation) – Types of optical fibers (material, refractive index & mode) – Double crucible technique of fiber drawing – Losses in optical fiber – Attenuation, Dispersion, Bending – Fiber optical communication system (Block diagram) – Fiber optic sensors – temperature & displacement – Endoscope.

**UNIT - III          MAGNETIC AND DIELECTRIC MATERIALS          [ 9 ]**

Origin of magnetic moment – Bohr magneton – Types of magnetic materials  - Dia, Para, Ferro and Anti ferromagnetic materials -  Domain theory – Hysteresis – soft and hard magnetic materials – applications (Qualitative). Dielectrics - Dielectric constant – Polarization in dielectrics – Electronic, Ionic, Orientational and Space charge polarizations (Derivation for polarizability) – Internal or local field- Clausius – Mosotti equation.

**UNIT - IV          ELASTICITY AND HYDRODYNAMICS          [ 9 ]**

Elasticity-Stress – Strain – Hooke's Law – Types of moduli of elasticity – Torsional pendulum – Determination of rigidity modulus of a wire – Bending of beams – Expression for bending moment – Measurement of Young's modulus by uniform and non-uniform bending – Viscosity – Stream line flow – Turbulent flow - Poiseulle's equation for the flow of liquid through a tube.

**UNIT - V          THERMAL PHYSICS          [ 9 ]**

Modes of heat transfer – Thermal expansion of solids and liquids -  thermal conduction, convection and radiation – Heat conduction in solids – Thermal conductivity –Lee's disc method – theory and experiment – Conduction through compound media (series and parallel) – Thermal insulation – Applications – refrigerators and solar water heaters.

**Total  = 45 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*
- *Explain about the different types of lasers and their usages in various fields.*
- *Apply the basics of fiber technology in the fiber optical communications systems.*
- *Categorize the different types and conceived the origin of magnetic and dielectric materials.*
- *Comprehend the knowledge about the basics of elasticity and hydrodynamics.*
- *Utilize the conceived concepts and laws of thermodynamical systems and Carnot theorem.*

**Text Book :**

1   Dr.M.Arumugam, "Engineering Physics", Anuradha Publications, Kumbakonam, 2017.

2   Dr.G. Senthilkumar, "Engineering Physics - II", VRB Publishers Pvt. Ltd, Chennai, 2016.

**Reference Books :**

1   Dr. P. Mani, "Engineering Physics – II", Dhanam Publications, Chennai, 2015.

2   Rajendran V, "Engineering Physics", Tata McGraw Hill, New Delhi, 2011.

3   www.vidyarthiplus.com/vp/attachment.php?aid=14842

**K.S.R. COLLEGE OF ENGINEERING (Autonomous)**          **R 2018**
<u>**SEMESTER - II**</u>

| | | L | T | P | C |
|---|---|---|---|---|---|
| **18CE214** | **ENGINEERING MECHANICS** | 3 | 1 | 0 | 4 |

**Objectives:**
- *To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.*
- *To know about the system of forces and their conditions for the equilibrium of particles and rigid bodies.*
- *To understand and apply Newton's law of motion to the dynamics of particles*

**UNIT - I     BASICS & STATICS OF PARTICLES**          **[ 9+3 ]**

Introduction – Laws of Mechanics – Lame's theorem, Parallelogram and triangular Law of forces – Coplanar Concurrent Forces – Resolution and Composition of forces – Equilibrium of a particle in 2D & 3D – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

**UNIT - II     EQUILIBRIUM OF RIGID BODIES**          **[ 9+3 ]**

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Equilibrium of Rigid bodies in two dimensions and three dimensions .

**UNIT - III     PROPERTIES OF SURFACES AND SOLIDS**          **[ 9+3 ]**

Centroid - parallel axis theorem and perpendicular axis theorem - First moment of area —Second moment of area – moment and Product of inertia of plane areas -Polar moment of inertia –Principal axes –Mass moment of inertia.

**UNIT - IV     DYNAMICS OF PARTICLES**          **[ 9+3 ]**

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

**UNIT - V     FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS**          **[ 9+3 ]**

Static and Dynamic Friction – Types of friction- Laws of friction – Angle of repose –Translation and Rotation of Rigid Bodies — General Plane motion of simple rigid bodies.

**Total (L: 45 T: 15  ) = 60 Periods**

***Course Outcomes: On Completion of this course, the student will be able to***
- *Know the basic concepts and system of forces in static particles.*
- *Evaluates the reaction forces in elemental structures.*
- *Limit the properties of section those are needed for the design of structural elements.*
- *Identification about the differential principles applied to solve engineering problems dealing with force, displacement, velocity and acceleration.*
- *Resolve the rigid body subjected to dynamic forces.*

**Text Books :**

1    S.S. Bhavikatti, "Engineering Mechanics", New Age International Publishers, New Delhi, 2016.

2    S.C. Natesan, "Engineering Mechanics Statics and Dynamics", Umesh Publications, Naisarak, Delhi – 110006, 2005.

**Reference Books :**

1    Rajasekaran, S, Sankarasubramanian, G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., 2005.

2    Ashok Gupta, "Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)", Pearson Education Asia Pvt., Ltd., 2002.

3    Palanichamy, M.S., Nagan, S., "Engineering Mechanics – Statics and Dynamics", Tata McGraw-Hill, 2001.

4    Hibbeller, R.C., "Engineering Mechanics", Vol.1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000.

5    http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/engg_mechanics/ui/TableofContents.html

**K.S.R. COLLEGE OF ENGINEERING (Autonomous)**                    **R 2018**

**SEMESTER - II**

| 18EE041 | **BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING**<br>(Common to AU, CE, CS, IT & ME) | L<br>3 | T<br>0 | P<br>0 | C<br>3 |
|---|---|---|---|---|---|

*Prerequisite: Engineering Mathematics, Engineering Physics*

*Objectives:*

- To study the basic concepts of electric circuits and various measuring instruments.
- To familiarize the constructional details and operation of the electrical machines.
- To study the special electrical machines.
- To study the characteristics of semiconductor devices and its applications.

**UNIT - I          ELECTRICAL CIRCUITS                                             [ 9 ]**

Structure of Electrical Power System– Ohm's Law – Kirchhoff's Laws – Circuit Analysis – Introduction to AC Circuits: R, RL & RLC series circuits (Quantitative Approach Only), Average and RMS Value – Power factor for single phase Circuits – Three Phase Star and Delta Connections – Electrical Safety.

**UNIT - II          DC MOTORS AND TRANSFORMERS                            [ 9 ]**

Faraday's Law – Lenz's Law-Fleming's left hand and right hand rule, DC Motors: Construction –Operation – Series and Shunt Motor – Characteristics - Applications. Single Phase Transformer: Construction – Operation – EMF Equation – Types - Applications.

**UNIT - III          AC MOTORS & SPECIAL MACHINES                         [ 9 ]**

Single Phase Induction Motor: Construction – Operation – Split Phase Induction Motor and Capacitor Start Induction Run Motor – Applications, Three Phase Induction Motor:  Construction – Operation – Types – Applications. Special Machines: Stepper Motor.

**UNIT - IV          MEASURING INSTRUMENTS                                    [ 9 ]**

Basic Methods of Measurements: Direct and Indirect , Functional elements of an instrument – Errors in measurements – Analog and Digital Instruments – Basic Principle of Indicating Instruments – Moving Coil and Moving Iron Ammeter and Voltmeter. Dynamometer type Wattmeter – Induction type Energy Meter – Cathode Ray Oscilloscope.

**UNIT - V          ANALOG AND DIGITAL ELECTRONICS                       [ 9 ]**

Semiconductor devices: PN Junction Diode, Zener diode: classification, operation and Characteristics- Bipolar Junction Transistor – CE Configurations and its Characteristics. Review of number systems – digital logic gates – Introduction to Micro processors

**Total  = 45 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*

- *Solve the electric circuits by applying basic circuital laws using various combinations of circuit elements.*
- *Explain the construction, operating principle and application of DC motor, transformers.*
- *Enlighten the construction, operating principle and application of AC motors.*
- *Illustrate the function of various measuring instruments.*
- *Discuss the characteristics of Diodes, Zener diode, BJT using CE configurations*

**Text Books :**

1  Smarajit Ghosh, Fundamentals of Electrical and Electronics Engineering, PHI Learning Private Limited, Second Edition, 2007.

2  V.Jegathesan, K.VinothKumar and R.Saravanakumar, Basic Electrical and Electronics Engineering, Wiley India, First Edition, 2012.

**Reference Books :**

1  Muthusubramanian,R, Salivahanan S and Muraleedharan K .A, Basic Electrical, Electronics and Computer Engineering,Tata McGraw Hill, Second Edition, 2006.

2  Nagsarkar T K and Sukhija M S,Basics of Electrical Engineering, Oxford University  press , Ninth Edition, 2005.

3  Mehta, V.K and Rohit Mehta, Principle of Electrical Engineering, S Chand & Company, Second Edition 2008.

4  Mahmood Nahvi and Joseph A. Edminister, Electric Circuits, Schaum' Outline Series, McGraw Hill, Fifth Edition 2002.

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<u>SEMESTER – II</u>

| | | L | T | P | C |
|---|---|---|---|---|---|
| **18PH028** | **PHYSICS  LABORATORY** (Common to all branches) | 0 | 0 | 3 | 1 |

*Prerequisite:* Knowledge in Engineering Physics

*Objectives:*

- *To gain the practical knowledge and hands on experiences of understanding the physics concepts applied in optics, sound and thermal physics.*
- *To gain practical knowledge by applying theoretical principles and performing the following experiments.*

**List of Experiments:**

1. Determination of wavelength of Laser using grating and the Size of the Particles.

2. Determination of thickness of the given material by Air – wedge method.

3. Determination of velocity of Ultrasonic waves and compressibility using Ultrasonic interferometer.

4. Spectrometer grating - Determination of wavelength of mercury spectrum.

5. Determination of thermal conductivity of a bad conductor by Lee's disc method.
6. Determination of Young's modulus of the material of a uniform bar by Non – Uniform bending method.

7. Determination of Band gap energy of a semiconductor.

8. Determination of Viscosity of a given liquid by Poiseuille's method.

9. Torsional pendulum - Determination of rigidity modulus of a given wire.

10. V-I Characteristics of Solar Cell.

**Total : 30 Periods**

*Course Outcomes: On Completion of this course , the student will be able to*

- *Comprehend the different physical parameters of optics.*
- *Perceive the production of ultrasonic waves through inverse piezoelectric effect and to determine the velocity of sound waves in the given liquid.*
- *Gain Knowledge about thermal conductivity thereby to calculate the thermal conductivity of various bad conductors like cardboard, mica, etc.*
- *Confer the experimental counterparts of materials properties such as modulus, solar cell, and energy gap.*
- *Imbibe the concept of capillary action in fluid dynamics and to compare the coefficient of viscosity of the given liquid.*

**Text Book :**

1  Physics Lab manual, Department of Physics, K.S.R College of Engineering.

**Reference Book :**

1  Dr.M.Arumugam, "Physics Lab manual", Anuradha Publications, Kumbakonam, (2017).

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<u>**SEMESTER – II**</u>

| **18GE027** | **WORKSHOP PRACTICES LABORATORY** | L | T | P | C |
|---|---|---|---|---|---|
| | (Common to AU,CE & ME) | 0 | 0 | 3 | 1 |

*Prerequisite:* *No Prerequisites are needed for enrolling into the course.*

**GROUP A (CIVIL & MECHANICAL)**

*Objective*:

- *To provide exposure to the students with hands on experience in various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.*

**LIST OF EXPERIMENTS**

1. Make Lap joint / Butt joint / T joint from the given wooden pieces using carpentry tools.
2. Make a Butt joint / Lap joint / Tee joints using arc / gas welding equipment.
3. Perform simple Facing and Turning operation using Centre Lathe.
4. Make holes as per the given dimensions using drilling machine.
5. Prepare a mould using solid/split patterns in Foundry.
6. Study of fitting, smithy, Plastic Moulding, and Glass cutting.

**LIST OF EQUIPMENT**

| | | | |
|---|---|---|---|
| 1. | Fitting tools and its accessories | - | 15 Sets |
| 2. | Carpentry tools and its accessories | - | 15 Sets |
| 3. | Smithy tools and Open hearth furnace setup | - | 2 Sets |
| 4. | Foundry tools and its accessories | - | 5 Sets |
| 5. | Arc Welding equipments and its accessories | - | 5 Sets |
| 6. | Oxy Acetylene welding setup and its accessories | - | 1 Set |
| 7. | Centre Lathe with its accessories | - | 2 Nos. |
| 8. | Pillar type drilling machine | - | 1 No. |

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

- *Fabricate components with their own hands.*
- *Practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.*
- *Assembling different components, they will be able to produce small devices of their interest.*

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<u>**SEMESTER –II**</u>

| **18GE027** | **GROUP B (ELECTRICAL & ELECTRONICS)**<br>(Common to AU, CE, & ME) | L<br>0 | T<br>0 | P<br>3 | C<br>1 |
|---|---|---|---|---|---|

***Prerequisite:*** No prerequisites are needed for enrolling into the course

***Objectives:***

- *To study different types of wiring used in house.*
- *To learn components in electronics and different logic gates and its truth tables.*

**List of Experiments:**
**ELECTRICAL ENGINEERING**

1. Fluorescent lamp wiring & Stair-case wiring.

2. Calibration of Single phase Energy meter

**ELECTRONICS ENGINEERING**

1. Study of Electronic components and Soldering practice.

2. Study of logic gates AND, OR, EX-OR, NOT, Half and Full Adder.

3.  Study of CRO

**Total : 45 Periods**

***Course Outcomes: On Completion of this course , the student will be able to***

- *Construct different types of wiring used in house.*
- * Calibrate single phase Energy meter.*
- *Organize different electronic components and logic gates*

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**SEMESTER – II**

| 18MC052 | ENVIRONMENTAL SCIENCE AND ENGINEERING<br>(Mandatory, non - credit course) (Common to All Branches) | L<br>3 | T<br>0 | P<br>0 | C<br>0 |

*Prerequisite: Nil*
*Objectives:*
- *To impart knowledge on the principle of environmental science and engineering.*
- *To embellish the students to understand the usages of natural resources, ecosystem and biodiversity.*
- *To create awareness on pollution, value education and social issues.*

**UNIT - I      INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES      [ 9 ]**

Environment – definition – scope and importance – need for public awareness; Forest resources – use – over exploitation – deforestation; Water resources – over–utilization of surface and ground water; Mineral resources – environmental effects of extracting and using mineral resources; Food resources – overgrazing – effects of modern agriculture – fertilizer–pesticide problems – water logging – salinity; Role of an individual in conservation of natural resources. **Activity:** Slogan making event on conserving natural resources or plantation of trees.

**UNIT - II      ECOSYSTEM AND BIODIVERSITY      [ 9 ]**

Concept of an ecosystem – structure and function of an ecosystem – producers – consumers and decomposers – Food chain – food web – energy flow in the ecosystem – ecological pyramids – Ecological succession;  Forest ecosystem and Aquatic ecosystems (Estuary and marine ecosystem); Biodiversity – introduction – definition – Values of biodiversity; Hot-spots of biodiversity; Endangered and Endemic Species of India. **Activity:** Arrange a trip to visit different varieties of plants.

**UNIT - III      ENVIRONMENTAL POLLUTION      [ 9 ]**

Pollution – introduction and different types of pollution; Causes – effects and control measures of air pollution and water pollution – water quality parameters – hardness – definition – types; Alkalinity – definition – types; BOD and COD (definition and significance);  Noise pollution –  solid waste management – hazardous waste – medical and e-wastes; Role of an individual in prevention of pollution. **Activity:** Drive for segregation of waste or cleanliness drive.

**UNIT - IV      SOCIAL ISSUES AND ENVIRONMENT      [ 9 ]**

Water conservation – rain water harvesting and watershed management; Environmental ethics – Issues and possible solutions; Climate change – global warming and its effects on flora and fauna – acid rain – ozone layer depletion; Disaster Management – earth quake – cyclone – tsunami – disaster preparedness – response and recovery from disaster. **Activity:** Poster making event on water management or Climate change.

**UNIT - V      SUSTAINABILITY AND GREEN CHEMISTRY      [ 9 ]**

Sustainable development – from unsustainable to sustainable development – Environmental Impact Assessment (EIA); Human rights; Value education; HIV/AIDS; Role of information technology in environment and human health; 12 Principles of Green Chemistry. **Activity:** Group discussion on Sustainability or Lecture from an expert on Green chemistry.

**Total  = 45 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*
- *Play an important role in conservation of resources for future generation*
- *Paraphrase the importance of ecosystem and biodiversity*
- *Analyze the impact of pollution and hazardous waste in a global and societal context.*
- *Identify the contemporary issues that result in environmental degradation that would attempt to provide solutions to overcome the problems*
- *Realize the concept of Sustainability and Green Chemistry.*

**Text Books :**

1  AnubhaKaushik and C. P. Kaushik, Environmental Science and Engineering, New Age International Publishers, Chennai, 2014.
2  Dr. T. ArunLuiz, Environmental Science and Engineering, S.Chand & Co.Pvt.Ltd., New Delhi, 2016.

**Reference Books :**

1  G. Tyler Miller and Scott E. Spoolman, Environmental Science, Cengage Learning India Pvt .Ltd., New Delhi, 2014.
2  Dr. A. Ravikrishnan, Environmental Science and Engineering, Srikrishna Hi-tech Publishing Company Pvt. Ltd., Chennai, 2014.
3  https://www.vidyarthiplus.com/vp/attachment.php?aid=41992

**K.S.R. COLLEGE OF ENGINEERING (Autonomous)**　　　　**R 2018**

**SEMESTER - III**

| **18MA332** | **ENGINEERING MATHEMATICS III** **(B.E. CIVIL ENGINEERING)** | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 |

*Prerequisite:* No prerequisites are needed for enrolling into the course.

 *Objective(s):*

- *To study the concepts of Theory of Equations, Three Dimensional Geometry, Z–Transform and Fourier Transform.*

**UNIT - I**　　　　**THEORY OF EQUATIONS**　　　　**[12]**

Solution to Reciprocal equations – Formation of equations whose roots are diminished by h – Increased by h – Finding the root of an equation by Horner's method – Numerical iterative solution to algebraic equations by Newton-Raphson method.

**UNIT - II**　　　　**THREE DIMENSIONAL GEOMETRY (STRAIGHT LINES)**　　　　**[12]**

Direction Cosines and Direction ratios of a line – Angle between two lines – Condition for parallelism and perpendicularity of two lines - Coplanar lines in symmetrical form – Shortest distance between two skew lines in symmetrical form only.

**UNIT - III**　　　　**THREE DIMENSIONAL GEOMETRY (PLANE AND SPHERE)**　　　　**[12]**

Equation of a Plane – Angle between two planes – Plane and straight line – Finding foot and image of a line in the plane – Equation of a Sphere – Plane section of a sphere – Tangent plane.

**UNIT - IV**　　　　**Z TRANSFORMS AND DIFFERENCE EQUATIONS**　　　　**[12]**

Z-Transforms - Elementary properties - Inverse Z-Transforms by using Partial Fraction method and Convolution theorem (without proof) - Solutions of difference equations by using Z-Transforms.

**UNIT – V**　　　　**FOURIER TRANSFORMS**　　　　**[12]**

Fourier integral theorem (without proof) - Fourier Transform pair - Sine and cosine transforms - Properties - Transforms of simple functions - Convolution theorem (without proof).

**Total (L: 45  T:15) = 60 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*

- *Find the solution of algebraic equations.*
- *Apply the concepts of straight lines.*
- *Imagine the concepts of plane and spheres in three dimensional visions.*
- *Acquire knowledge in basics of Z–Transforms.*
- *Apply the concepts of Fourier Transform.*

**Text Books :**
1. Ravish R Singh and Mukul Bhatt, "Engineering Mathematics", McGraw Hill Publications, New Delhi, 3rd Edition, (2012).
2. Veerarajan.T "Engineering Mathematics", Tata McGraw Hill Publications, New Delhi, 3rd edition, (2015).
3. P. Kandasamy, K. Thilagavathi "Allied Mathematics" S. Chand & Co. New Delhi.

**References :**
1. Grewal B.S,"Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 43rd edition, (2015).
2. Kreyszig. E. "Advance Engineering Mathematics" John Wiley and Sons, New Delhi, 8th edition, 2016.
3. https://ieeexplore.ieee.org/abstract/document/1161523

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**SEMESTER - III**

| | | L | T | P | C |
|---|---|---|---|---|---|
| **18CE312** | **ENGINEERING GEOLOGY** | 3 | 0 | 0 | 3 |

***Prerequisite:*** *No prerequisites are needed for enrolling into the courses*
***Objective(s):***
- To familiarize students to interior of the earth, plate tectonics, geomorphological processes and groundwater occurrence.
- To provide an insight on different types of minerals, rocks and their geological characteristics
- To facilitate the students to understand various defects associate with geological formations and also geophysical exploration techniques.
- To make students to understand the role of geology in selection of site and construction of dams, tunnels etc.

**UNIT - I　　PHYSICAL GEOLOGY　　　　　　　　　　　　　　　　　　　　　[9 ]**

Geology in Civil Engineering – Interior of the earth – Elementary Knowledge on Continental Drift and Plate Technologies. Earthquakes and Earthquake Belts in India, Earth Processes - Weathering, Work of Rivers, Wind and Sea and their Engineering Importance-Groundwater , Mode of Occurrence – Prospecting – Importance in Civil Engineering.

**UNIT - II　　MINERALOGY　　　　　　　　　　　　　　　　　　　　　　　[9 ]**

Physical Properties of minerals –classification of minerals, Quartz group, Feldspar group, Pyroxene - Hypersthene and Augite, Amphibole – Hornblende, Mica – Muscovite and Biotite, Calcite, Gypsum and Clay minerals, Significance of Minerals in Civil Engineering.

**UNIT - III　　PETROLOGY　　　　　　　　　　　　　　　　　　　　　　　[9 ]**

Classification of Rocks, Igneous, Sedimentary and Metamorphic Rocks, their mode of formation, texture, structures. Engineering Properties of rocks. Description of rocks such as Granite, Dolerite, Basalt, Rhyolite, Gabbro, Sandstone, Limestone, Laterite, Shale, Quartzite, Marble, Slate, Gneiss, Schist, Role of Petrology in Civil Engineering Construction Field.

**UNIT - IV　　STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD　　　　　[9 ]**

Attitude of Beds – Outcrops – Introduction to Geological Maps – Study of Structures – Folds, Faults and Joints – Their Bearing on Engineering Construction. Seismic and Electrical Methods for Civil Engineering Investigations.

**UNIT - V　　GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING　　　[9 ]**

Role of Geology in site investigation, geotechnical classification of rock masses, Geological Conditions Necessary for Construction of Reservoirs and Dams, Tunnels, Road Cuttings, Land Slides – Causes and Preventions. Sea Erosion and Coastal Protection

**Total (L: 45 T: 0  ) = 45 Periods**

***Course Outcomes: On Completion of this course, the student will be able to***

- *Deal with site selection, planning, construction and protection of structures using the knowledge of plate tectonics, geomorphological processes, earthquakes.*
- *Use the knowledge of minerals to understand behavior of soils, rocks and address the foundation problems, durability of construction materials etc.*
- *Plan as well as design and safe construction of subsurface structure, solution to stability of structures founded on shallow foundation, the best performance to concrete etc.*
- *Know magnitude of lateral variation in lithological characteristics in subsurface due to rock defects and also insitu stress variations etc and also their significance in site conditions.*
- *Study about geological maps and reports to select the best possible site for construction and take all necessary steps to ensure stability, durability of structure and also safety during construction.*

**Text Books :**

1　Parbin Singh. "Engineering and General Geology", S.K. Kataria& Sons, Katson Publishing House Ludhiana, 8th Edition, reprint 2011-12

2　Varghese. P.C. **"**Engineering Geology for Civil Engineers", PHI Learning Private Ltd, M-97, Connaught Circus, New Delhi, 2012

**Reference Books :**

1　Krynine. D. P.  and Judd. W. R. " Principles of Engineering Geology and Geotechnics", CBS Publisher,2005
2　Bell. F.G. " Engineering Geology" Elsevier publications, 2007
3　Billings  Marland.P. "Structural Geology", Pearson Education; Third edition  2016
4　Chenna Kesavulu N. "Textbook of Engineering Geology",  Laxmi Publications Pvt Ltd; Third edition, 2018
5　http://nptel.ac.in/courses/105105106/

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**SEMESTER -III**

| | | L | T | P | C |
|---|---|---|---|---|---|
| **18CE313** | **FLUID MECHANICS** | 3 | 0 | 0 | 3 |

*Prerequisite: Nil*
*Objective(s):*
- *To outline the basic properties of the fluid, fluid kinematics, fluid dynamics and*
- *To Infer and appreciate the complexities involved in solving the fluid flow problems.*
- *To learn about boundary layer on a flat plate*

### UNIT - I    FLUID PROPERTIES AND FLUID STATICS                                    [9]

Fluid – Definition, Distinction between Solid and Fluid - Units and Dimensions - Properties of Fluids - Density, Specific Weight, Specific Volume, Specific Gravity, Temperature, Viscosity, Compressibility, Vapour Pressure, Capillarity and Surface Tension - Fluid Statics: Concept of Fluid Static Pressure, Absolute and Gauge Pressure - Pressure Measurements by Manometers and Pressure Gauges- Forces on Planes – Centre of Pressure – Buoyancy and Floatation.

### UNIT - II    FLIUD KINEMATICS AND DYNAMICS                                    [9]

Fluid Kinematics - Flow Visualization - Lines of Flow - Types of Flow - Velocity Field and Acceleration - Continuity Equation (1,2 & 3D forms)- Equation of Streamline - Stream Function - Velocity Potential Function - Circulation - Flow Net. Fluid Dynamics - Equations of Motion - Euler's Equation along a Streamline - Bernoulli's Equation – Application –Venturi Meter, Orifice Meter and Pitot Tube. Linear Momentum Equation and its Application.

### UNIT - III    FLOW THROUGH PIPES                                    [9]

Viscous Flow - Shear Stress, Pressure Gradient Relationship - Laminar Flow between Parallel Plates - Laminar Flow Through Circular Tubes (Hagen Poiseulle's) - Hydraulic and Energy Gradient - Flow Through Pipes - Darcy -Weisbach'sEquation- Pipe Roughness -Friction Factor-Moody's Diagram- Major and Minor Losses of Flow in Pipes - Pipes in Series and in Parallel.

### UNIT - IV    BOUNDARY LAYER                                    [9]

Boundary Layer – Definition- Boundary Layer on a Flat Plate – Thickness and Classification – Displacement, Energy and Momentum Thickness – Boundary Layer Separation and Control – Drag in Flat Plate – Drag and Lift Coefficients.

### UNIT - V    DIMENSIONAL ANALYSIS AND MODEL STUDIES                                    [9]

Fundamental Dimensions - Dimensional Homogeneity - Rayleigh"s Method and Buckingham Pi-Theorem - Dimensionless PARAMETERS - Similitude and Model studies - Distorted Models.

**Total (L: 45 T: 0  ) = 45 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*
- *Acquire a basic knowledge of fluids in static, kinematic and dynamic equilibrium.*
- *Gain the knowledge of the applicability of physical laws in addressing problems in hydraulics.*
- *Acquire knowledge in velocity field and acceleration.*
- *Know about the various losses in pipes.*
- *Study about the model analysis and its prototype.*

**Text Books :**

1    Bansal, R.K., "A Textbook of Fluid Mechanics and Hydraulics Machines", 10[th]edition, Laxmi Publications Pvt.Ltd,New Delhi, 2018.
2    Modi, P.N and Seth, S.M. "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House,New Delhi, 21st, edition, 2017.

**Reference Books :**

1    Rajput,RK "Fluid Mechanics and Hydraulic Machines**",** S Chand & Company, 6[th]edition,2016.
2    White, F.M., "Fluid Mechanics", McGraw Hill Education India Private Limited; 8[th]edition, 2017.
3    Hibbeler. R.C "Fluid Mechanics in SI Units", Pearson Education; First edition, 2017.
4    nptel.ac.in/courses/105101082/

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**SEMESTER - III**

| | | L | T | P | C |
|---|---|---|---|---|---|
| **18CE314** | **MECHANICS OF SOLIDS** | 3 | 1 | 0 | 4 |

*Prerequisite:* Engineering Mechanics
*Objective(s):*
- *To know the concept of stress, strain and deformation of solids and state of stress.*
- *To study the behavior, determine the internal forces and analyse the stresses of various structural elements under action of different types of forces.*
- *To understand the theory of torsion, stresses and deflection of springs.*

**UNIT - I** **STRESS,STRAIN AND DEFORMATION OF SOLIDS** **[12]**

Rigid Bodies and Deformable Solids – Stability, Strength, Stiffness – Tension, Compression and Shear Stresses – Strain, Elasticity, Hooke's Law, Limit of Proportionality, Modulus of Elasticity, Stress-Strain Curve, Lateral Strain – Deformation of Simple and Compound Bars – Temperature Stresses – Shear Modulus, Bulk Modulus, Relationship between Elastic Constants – Volumetric Strain.

**UNIT - II** **COMPLEX STRESSES AND ANALYSIS OF PLANE TRUSSES** **[12]**

Principal Stresses and Principal Planes- Biaxial State of Stress – Stress at a Point – Stress on Inclined Plane – Mohr's Circle of Stresses. Stability and Equilibrium of Plane Frames – Types of Trusses – Analysis of Forces in Truss Members by Method of Joints, Method of Sections and Method of Tension Coefficients.

**UNIT - III** **TRANSVERSE LOADING ON BEAMS** **[12]**

Beams – Types of Supports – Simple and Fixed, Types of Load – Concentrated, Uniformly Distributed, Uniformly Varying Load, Combination of Above Loading – Relationship between Bending Moment and Shear Force – Bending Moment Diagram and Shear Force Diagram for Cantilever, Simply Supported and Over Hanging Beams. Theory of Simple Bending - Section Modulus - Analysis of Stresses - Load Carrying Capacity of beams.

**UNIT - IV** **DEFLECTION OF BEAMS** **[12]**

Slope and Deflection of Beams - Double Integration Method – Macaulay's Method – Moment Area Method and Conjugate Beam Method.

**UNIT - V** **SHEAR STRESSES, TORSION AND SPRINGS** **[12]**

Variation of Shear Stress – Shear Stress Distribution in Rectangular, I Sections, Solid Circular Sections, Hollow Circular Sections, Angle and Channel Sections. Stresses and Deformation in Circular (Solid and Hollow) Shafts – Stepped Shafts. Leaf Springs – Stresses in Helical Springs – Deflection of Springs.

**Total (L: 45 T: 15 ) = 60 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*
- *Apply the fundamental concepts of force-deformation, and stress-strain relationships to the solid and structural mechanics problems.*
- *Analyse the behaviour of the trusses having more members subjected to loading.*
- *Solve the beams to determine axial forces, shear forces and bending moments.*
- *Determine the slope and deflection of beams by using various methods.*
- *Analyse shear stress distribution and the effect of torsion in solid and hollow shaft and also about stresses and deflection in springs.*

**Text Books :**
1 Bansal R.K. "A Textbook of Strength of Materials", Laxmi Publications, New Delhi, 6thEdition, 2018.
2 Rajput R.K., "Strength of Materials", S. Chand Publications, 6thEdition, 2015.

**Reference Books :**
1 Punmia B.C., Ashok Kumar Jain, Arun Kumar Jain, "Mechanics of Material", Laxmi Publications, revised edition, 2017.
2 Srinath L.S, "Advanced Mechanics of Solids", McGraw Hill Education, 2010.
3 Egor P Popov, "Engineering Mechanics of Solids", Pearson Education India; 2nd edition, 2015.
4 Subramanian R., "Strength of Materials", Oxford University Press, 3rd edition, 2016.
5 Timoshenko S.P. Gere, J.M. "Mechanics of Materials, CBS; 2nd edition, 2006

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**SEMESTER - III**

| 18CE315 | SURVEYING | L<br>3 | T<br>0 | P<br>0 | C<br>3 |

***Prerequisite:*** *No prerequisites are needed for enrolling into the courses*
***Objectives:***
- To understand the importance of surveying in the field of civil engineering so as to get introduced to different plane and geodetic surveying applications such as chain, compass, plane table, levelling, triangulation, trigonometric levelling etc.
- To understand the significance of each method in civil engineering and master the skill to carry out the proper surveying method in the field.
- To design numerical solutions for carrying out surveying in civil engineering field and to get introduced to modern advanced surveying techniques involved such as remote sensing, Total station, GPS etc.

### UNIT - I     INTRODUCTION TO PLANE SURVEYING AND LEVELLING     [ 9 ]
Surveying, Classification of Surveys, Linear Measurements with Chain and Tapes, Field Survey by Chains/Tapes, Compass Surveying, True and Magnetic Bearings, Local Attraction, Fore and Back Bearing, Various Types of Compasses and Applications, Detail Plotting, Traverse Using Graphical Approach, Plane Table Accessories, Methods of Plane Table Survey, Contouring, Methods of Levelling, Determination of Height, Booking of Levelling Operation, Types of Levels, Guidelines for Preparation of Contour Maps, Methods of Contouring.

### UNIT - II     THEODOLITE SURVEY AND CURVES     [9]
Theodolites, Measurements of Horizontal and Vertical Angles, Differences in Vernier and Microscopic Theodolites, Methods of Recording Angles, Principle and basic system, Subtensebar, Various Types of Tacheometers, plotting with Tacheometers, Curves, Classification, Elements of Simple Circular, Compound, Reverse, Transition, Vertical Curves, Setting of Curves.

### UNIT - III     GEODETIC &TRIGNOMETRICLEVELLING     [9]
Triangulation, Purpose of Triangulation and Trilateration, Classification, Strength of Figure, Well-Conditioned Triangle, Triangulation Figures, Reconnaissance and Station Selection, Inter Visibility of Stations, Signal and Towers, Base Lining, Computation and Adjustment in Triangulation, Satellite Station.

### UNIT - IV     SURVEY ERRORS AND  ADJUSTMENTS     [9]
Sources of Errors, Errors in Chain, Compass and Theodolite Survey, Laws of Accidental Errors, Principles of Least Squares, Laws of Weights, Determination of Probable Error, Distribution of Error of the Field Measurements, Normal Equations, Determination of the Most Probable values, Method of Correlates, Triangulation Adjustments, Figure Adjustment, Adjustment of Geodetic Triangle, Adjustment of Chain of Triangles, Method of Equal Shift.

### UNIT - V     ADVANCED SURVEYING     [9]
Hydrographic Surveying, Soundings, Method of Locating Sounding, EDM - Principles and Applications, Geodimeter, Tellurometer, Distomat etc., Digital Theodolites, Total Station, GPS. Introduction to Photogrammetry, Comparison of Serial Photographs and Topographic Maps, Definition of Basic Terms, Perspective of Near-Vertical Photograph, Scale and Coordinates from Photographs, Stereoscopy, Parallel Bar Measurements, Determination of Heights, Principle of Radial Line Triangulation, Assumption, Limitations and Errors.

**Total (L: 45 T: 0) = 45 Periods**

***Course Outcomes: On Completion of this course, the student will be able to***
- *Know how to use surveying instruments and how to find the height, distance of each point, and to prepare profile of the ground and contour maps for Civil Engineering projects*
- *Explain the theoretical backgrounds of  theodolite surveying and plan a survey for applications such as road alignment and height of the building*
- *Carry out survey for large areas using the concepts of triangulation and trigonometric levelling*
- *Learn about errors in measurements and their adjustments in a traverse*
- *Acquire introduced to modern advanced surveying techniques involved such as Remote sensing, Total station, GPS, Photogrammetry etc.*

**Text Books :**
1. Punmia B.C., Ashok Kumar Jain, Arun Kumar Jain "Surveying and Levelling",Vol.1, Laxmi Publication,17th edition,2017
2. Punmia B.C., Ashok Kumar Jain, Arun Kumar Jain. "Surveying and Levelling", Vol. 2, Laxmi Publication,16thedition,2017
3. GopiSatheesh , Sathikumar, R. , Madhu, N. "Advanced Surveying: Total Station, GPS, GIS & Remote Sensing", Pearson Education; 2ndedition, 2017

**Reference Books :**
1. Basak, N.N. "Surveying and Levelling", McGraw Hill Education; 2ndedition, 2017
2. Bhavikatti, S.S."Surveying and Levelling", Vol I& II, I K International Publishing House Pvt. Ltd,  2008 & 2009
3. Venugopalarao, P.Vijalakshmi Akella, "Text Book of Surveying", PHI Learning; 1st edition, 2015
4. Duggal. S.K."Surveying", Vol I& II, McGraw Hill Education; 4th edition,  2017
5. http://nptel.ac.in/courses/105104101/
6. http://nptel.ac.in/courses/105107122/

**SEMESTER - III**

| | | L | T | P | C |
|---|---|---|---|---|---|
| **18CE316** | **CONSTRUCTION MATERIALS** | 2 | 0 | 0 | 2 |

*Prerequisite:* No  prerequisites are needed for enrolling into the courses

*Objectives:*
- *To develop knowledge on building materials and their properties*
- *To be familiar with the protection and functional materials*
- *To impart knowledge on new materials and their properties*

### UNIT - I　　　STONES – BRICKS – CONCRETE BLOCKS　　　　　　[ 9 ]

Stone as Building Material – Criteria for Selection – Tests on Stones – Deterioration and Preservation of Stone Work – Bricks – Classification – Manufacturing of Clay and Fly Ash Bricks – Tests on Bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for Special Use – Refractory Bricks – Cement, Concrete Blocks – Lightweight Concrete Blocks.

### UNIT - II　　　LIME – CEMENT – AGGREGATES – MORTAR　　　　　　[ 9 ]

Lime: Characteristics, Classification, Manufacturing Process – Cement: Ingredients, Types and Grades, Properties,  Manufacturing process, Testing of Cement– Industrial By-products: Fly ash – Aggregates: Natural Stone Aggregates,  Classification  Characteristics  of Aggregates, Testing of Aggregates - Cement Mortar: Functions, Uses of Mortar, Types of Mortar,  Ingredients of Mortar, Tests

### UNIT - III　　　CONCRETE　　　　　　[ 9 ]

Introduction – Characteristics of Good Concrete – Advantages and Disadvantages of Concrete – Application – Classification – Plain Cement Concrete – Ingredients – Bulking of Sand -  Water Cement Ratio – Grading of Aggregates – Methods of Proportioning  – Mixes Used in Concrete Works – Workability -  Preparation of Plain Cement Concrete – Properties – Water  Proof Concrete – Concepts  of Precast,Reinforced&Prestressed Concrete

### UNIT - IV　　　TIMBER AND OTHER MATERIALS　　　　　　[ 9 ]

Timber – Market Forms – Industrial Timber– Plywood – Veneer – Thermacole – Panels of Laminates – Steel – Aluminum and Other Metallic Materials – Composition – Aluminium composite panel – Uses – Market forms – Mechanical treatment – Paints – Varnishes – Distempers.

### UNIT - V　　　MODERN MATERIALS　　　　　　[ 9 ]

Glass – Ceramics – Sealants for Joints – Fibre Glass Reinforced Plastic – Clay Products – Refractories – Composite Materials – Types – Applications of Laminar Composites – Fibre Textiles – Geomembranes and Geotextiles for Earth Reinforcement.

**Total (L: 45 T:0  ) = 45 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*
- *Identify suitable construction materials for building construction*
- *Provide knowledge on  lime, cement, aggregates and mortar*
- *Gain knowledge on basic properties of concrete*
- *Familiar with timber and other materials used in construction*
- *Select and justify appropriate advanced and modern building materials for various construction applications.*

**Text Books :**

1　　Varghese.P.C, "Building Materials", Prentice Hall India Learning Private Limited; 2nd edition, 2015
2　　Rajput. R.K., "Engineering Materials", S Chand & Company; 3rd edition, 2006

**Reference Books :**

1　　Jagadish.K.S, Venktarama Reddy, B.V. Nanjunda Rao, K.S. "Alternative Building Materials Technology", New Age International Private Limited; 2ndedition, 2017
2　　Gambhir. M.L., &Neha Jamwal., "Building Materials, Products, Properties and Systems", McGraw Hill Education; 1st edition, 2017
3　　Duggal. S.K. "Building Materials" NEW AGE; 4thedition, 2012
4　　Bhavikatti S.S., "Building Materials" Vikas Publishing House; 1st edition,  2012
5　　http://nptel.ac.in/courses/105102088/

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<u>**SEMESTER - III**</u>

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

**18CE321**                    **COMPUTER AIDED BUILDING DRAWING**

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

*Prerequisite: Nil*
*Objectives:*
- *To understand the principles of planning and bye-laws*
- *To enable the students to create plan, section and elevation of various buildings using drafting software.*
- *To understand the different views of the various components of a building*

1. Classification of buildings - Principles of Planning - Dimensions of Buildings - Building Bye-Laws for Floor Area Ratio, Open Spaces - Orientation of Buildings - Lighting and Ventilation
2. Planning and Preparing Sketches and Detailed Drawings of Residential Buildings (Flat and Sloping Roof), Schools, Hostels, Hospitals Including Details of Doors and Windows
3. Detailed Drawings of RCC Framed Structures
4. Detailed Drawings of Single Storey Factory Buildings with Trusses.
5. Perspective View of One and Two Storey Buildings

**Total : 45 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*
- *Apply the principles of planning and bye-laws used in building planning*
- *Prepare comprehensive planning and draw layout, plan, elevation & sectional elevation of different types of building*
- *Draw plan, elevation and section of RCC framed structures*
- *Draw plan, elevation and section of  factory buildings*
- *Recollect fundamental understanding of 2D and 3D views of buildings*

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<u>**SEMESTER - III**</u>

| | | L | T | P | C |
|---|---|---|---|---|---|
| **18CE322** | **SURVEY PRACTICAL** | 0 | 0 | 3 | 1 |

*Prerequisite :* No  prerequisites are needed for enrolling into the courses
*Objectives:*
- *To introduce the principles of surveying, instruments and its accessories.*
- *To measure the land area, to prepare map and to find out the elevation of a point for constructional purpose.*
- *To possess knowledge about Survey field techniques*

*List of Experiments:*

**CHAIN SURVEYING & COMPASS SURVEYING & PLANE TABLE SURVEYING**

1. Study of Chain, Compass, Plane Table Surveying and its Accessories

**LEVELLING AND ITS APPLICATIONS**

2. Study of Levels and Leveling Staff

3. Fly Leveling and Check Leveling using Dumpy Level

**THEODOLITE SURVEYING AND ITS APPLICATIONS**

4. Study of Theodolite and its Accessories

5. Measurement of Horizontal and Vertical Angle

6. Theodolite Traversing

7. Tachometric Constants

8. Heights and Distances using Stadia Tachometric Principles

9. Heights and Distances using Tangential Tachometric Principles

10. Heights and Distances using Triangulation – Single and Double plane Method

11. Setting out Simple Curve & Transition Curve

12. Field Work using Total Station

**Total : 45  Periods**

*Course Outcomes: On Completion of this course, the student will be able to*
- *Acquire practical knowledge on handling survey instruments like Theodolite, Tacheometery and Total station.*
- *Measure the elevation of points using levelling instrument*
- *Measure the height and distance by theodolite.*
- *Carryout Triangulation surveying including general field marking for various engineering projects and curves setting.*
- *Practice the use of Total Station for field work*

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**SEMESTER - III**

| 18CE323 | **STRENGTH OF MATERIALS LABORATORY** | L | T | P | C |
|---------|--------------------------------------|---|---|---|---|
|         |                                      | 0 | 0 | 3 | 1 |

*Prerequisite: No  prerequisites are needed for enrolling into the courses*

*Objectives:*

- *To conduct test on different materials under the action of various forces and to determine the characteristics experimentally*
- *To understand the procedure of doing different tests like hardness, compression, torsion, tension and impact etc. in various materials*
- *To impart knowledge about the testing properties of brick and cement*

*List of Experiments:*

1. Axial Compression Test to Obtain the Stress – Strain Curve
2. Axial Tension Test to Obtain the Stress – Strain Curve and the Strength
3. Torsion Test to Obtain the Torque vs. Angle of Twist and the Stiffness
4. Flexural test to obtain the Load Deflection Curve and the Stiffness
5. Compression and tension spring test to obtain the  Load Deflection Curve and the Stiffness
6. Rockwell and Brinell hardness tests to obtain the hardness number
7. Shear test obtain the maximum shear strength
8. Charpy and Izod impact test to obtain the impact resistance
9. Tests on Brick
     - i)      Compressive strength
     - ii)     Efflorescence
     - iii)    Water absorption
10. Tests on Cement
     - i)      Standard consistency
     - ii)     Setting time
     - iii)    Soundness
     - iv)     Compressive strength

**Total : 45  Periods**

*Course Outcomes: On Completion of this course, the student will be able to*
- *Describe the behaviour of materials upon normal external loads.*
- *Apply the linear laws of elasticity as related to stress and strain.*
- *Measure the deflection of different sections*
- *Predict the behaviour of the material under impact conditions.*
- *Recognize the mechanical behaviour and properties of materials*

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**SEMESTER - III**

| **18HR351** | **CAREER DEVELOPMENT SKILLS - I** | L | T | P | C |
|---|---|---|---|---|---|
| | (Common to all Branches) | 0 | 2 | 0 | 0 |

**Prerequisite:** No prerequisites are needed for enrolling into the course

**Objectives:**

- *To help individuals cope with continued changes in the world of work*
- *To help individuals understand their unique abilities, interests, and aptitudes..*

**UNIT - I**        **EFFECTIVE ENGLISH – SPOKEN ENGLISH**        **[6]**

Basic Rules of Grammar – Parts of Speech – Tenses – Verbs – Sentences construction - Vocabulary – idioms & phrases – Synonyms – Antonyms – Dialogues and conversation – Exercise(Speaking)

**UNIT - II**        **ESSENTIAL COMMUNICATION**        **[6]**

Verbal communication – Effective communication – Active Listening – Paraphrasing – Feedback, Non Verbal Communication – Body language of self and Others, Important of feelings in communication – Dealing with feelings in communication practice - Exercise

**UNIT - III**        **WRITTEN COMMUNICATION – PART 1**        **[6]**

Usage of noun, pronoun, adjective (Comparative Forms), Verb, Adjectives, Adverb, Tenses, Articles and Preposition – Change of Voice – Change of Speech – One word Substitution – Using the same word as different parts of speech – Odd Man Out – Spelling & Punctuation (Editing)

**UNIT - IV**        **WRITTEN COMMUNICATION – PART – 2**        **[6]**

Analogies – Sentences Formation – Sentence Completion – Sentence Correction – idioms & Phrases – Jumbled Sentences, Letter Drafting (Formal Letters) – Reading Comprehension (Level 1) – Contextual Usage – Foreign Languages Words used in English – Exercise

**UNIT - V**        **ORAL COMMUNICATION – PART – 1**        **[6]**

Self introduction – Situational Dialogues / Role Play (Telephonic Skills) – Oral Presentations – Prepared –' Just A Minute' Sessions (JAM) – Presentation Skills – Exercise

**Total = 30 Periods**

***Course Outcomes : On Completion of this course, the student will be able to***

- *Have competent knowledge on grammar with an understanding of its basic rules*
- *Communicate effectively and enhance interpersonal skills with renewed self – confidence*
- *Construct sentence in English and make correction*
- *Perform oral communication in any formal situation*
- *Develop their SLRW skills.*

**Reference Books :**

1    Anne Laws, Writing Skills, Orient Black Swan., Hyderabad, 2011.

2    Raj N Bakshmi, English Grammar Practice, Orient Black Swan., Hyderabad, 2009.

3    Sarah Freeman, Written Communication in English, Orient Black Swan., Hyderabad , 2015.

4    Thakur K B Sinha, Enrich Your English, Vijay Nicole., Chennai, 2005

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**SEMESTER - IV**

| **18MA432** | **NUMERICAL METHODS**<br>**B.E (CIVIL ENGINEERING)** | L<br>3 | T<br>1 | P<br>0 | C<br>4 |
|---|---|---|---|---|---|

*Prerequisite:* No prerequisites are needed for enrolling into the course.

*Objective(s):*
- *To study the concepts and applications in solving polynomial and transcendental equations, simultaneous linear equations numerically.*
- *To acquire knowledge in Interpolation techniques, numerical differentiation and integration.*
- *To understand the concepts of numerical solutions to ordinary differential equations and numerical solutions to boundary values problems.*

### UNIT - I        SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS        [12]

Solutions to polynomials and transcendental equations - Newton's method, Regula-falsi method - Solutions to simultaneous linear equations - Gauss Elimination method -Gauss-Seidel method - Eigen value of a matrix by Power method.

### UNIT - II        INTERPOLATION AND APPROXIMATION        [12]

Newton's forward and backward difference interpolation techniques (equal intervals) - Lagrange's interpolation - Inverse Lagrange's interpolation and Divided difference method (for unequal intervals).

### UNIT - III        NUMERICAL DIFFERENTIATION AND INTEGRATION        [12]

Numerical differentiation using Newton's forward and backward interpolation methods - Numerical integration by trapezoidal and Simpson's $1/3^{rd}$ and $3/8^{th}$ rules - Double integrals using trapezoidal rule and Simpson's rule.

### UNIT - IV        INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS        [12]

Solving first order Ordinary Differential Equations by Taylor series-Euler's and Modified Euler's Method - Fourth order Runge-Kutta Method - Milne's predictor and corrector method.

### UNIT - V        BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS        [12]

Solution of one dimensional heat equation by Bender - Schmidt and Crank - Nicolson method - Solution of One dimensional wave equation -Solution of two dimensional Poisson equations.

**Total (L: 45  T:15) = 60 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*
- *Solve polynomial, transcendental equations and simultaneous linear equations numerically.*
- *Apply the Interpolation techniques.*
- *Develop their skills in numerical differentiation and integration.*
- *Solve ordinary differential equations numerically.*
- *Apply the concepts of numerical solutions to boundary value problems.*

**Text Books :**
1. Dr. B. S.Grewal, "Numerical Methods in Engineering and Science", Khanna Publishers, New Delhi, (2015), $12^{th}$ edition.
2. Dr. M.K. Venkataraman, "Numerical Methods in Science and Engineering", National Publishing Company, (2015), $4^{th}$ edition.

**References :**
1. Sukhendu Dey and Shishir Gupta "Numerical Methods", Tata McGraw Hill Publishing Company, $5^{th}$ edition, (2016).
2. V. Gerald 'Applied Numerical Analysis' Pearson Education, 6th edition (2015).
3. https://www.youtube.com/watch?v=AT7Olelic8U&https://www.youtube.com/watch?v=QTQ8bO1F-Dg

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**SEMESTER - IV**

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

**18CE412**                                        **SOIL MECHANICS**

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

***Prerequisite:*** *No prerequisites are needed for enrolling into the course*
***Objectives:***
- *To attain adequate knowledge in assessing both physical and engineering behaviour of soil.*
- *To impart knowledge on stress distribution, settlement and shear strength of the soil.*
- *To learn the mechanism of stress transfer in two-phase systems and stability analysis of slopes.*

### UNIT - I          SOIL CLASSIFICATION AND COMPACTION                                        [9]

Nature of Soil - Problems with Soil - Phase Relation - Sieve Analysis - Sedimentation Analysis – Atterberg Limits- Classification for Engineering Purposes - BIS Classification System – Soil Compaction - Factors Affecting Compaction – Laboratory Compaction Methods.

### UNIT - II          SOIL WATER AND PERMEABILITY                                        [9]
Soil Water – Various Forms – Influence of Clay Minerals – Capillary Rise – Suction - Effective Stress Concepts in Soil – Total, Neutral and Effective Stress Distribution in Soil - Permeability – Darcy's Law- Permeability Measurement in the Laboratory – Quick Sand Condition - Seepage –Introduction to Flow Nets –Properties and Uses - Application to Simple Problems.

### UNIT - III          STRESS DISTRIBUTION, COMPRESSIBILITY AND SETTLEMENT                                        [9]
Stress Distribution - Soil Media – Boussinesq Theory - Use of Newmark's Influence Chart –Components of Settlement — Immediate and Consolidation Settlement – Terzaghi's One Dimensional Consolidation Theory – Computation of Rate of Settlement. - √t and log t Methods– e-log p Relationship - Factors Influencing Compression Behaviour of soils.

### UNIT - IV          SHEAR STRENGTH                                        [9]
Shear strength of Cohesive and Cohesionless Soils - Mohr - Coulomb Failure Theory – Saturated Soil - Strength Parameters - Measurement of Shear Strength, Direct Shear, Triaxial Compression, UCC and Vane Shear Tests –Types of Shear Tests Based on Drainage and their Applicability - Drained and Undrained Behaviour of Clay and Sand.

### UNIT - V          SLOPE STABILITY                                        [9]
Slope Failure Mechanisms - Modes - Infinite Slopes - Finite Slopes – Total and Effective Stress Analysis - Stability Analysis for Purely Cohesive and C-ø Soil - Method of Slices – Modified Bishop's Method - Friction Circle Method - Stability Number – Problems – Slope Protection Measures.

**Total (L: 45 T: 0  ) = 45 Periods**

***Course Outcomes: On Completion of this course, the student will be able to***
- *Describe the origin, phase relation physical properties and classification of soil.*
- *Introduce the concept of soil pressure distribution and flow of water in soil*
- *Outline the concepts of stress distribution in soil and Terzaghi's one dimensional consolidation theory.*
- *Analysis of shear strength behaviour of soil by direct shear, triaxial, UCC and Vane shear test.*
- *Explain the concept of slope stability and slope failures of cohesive and C-ø soil.*

**Text Books :**
1   Punmia B.C., Ashok Kumar Jain, Arun Kumar Jain, "Soil Mechanics and Foundations", Laxmi Publications; 16th edition, 2017.
2   GopalRanjan and Rao A.S.R, "Basic and applied Soil Mechanics", New Age Internationals, 2017.

**Reference Books :**

1   Arora K.R, "Soil Mechanics and Foundation Engineering", Standard Publishers Distributors, 2009.
2   Muni Budhu, "Soil Mechanics and Foundations", John Willey & Sons, Inc, 2016.
3   Coduto, D.P,Man-chu Ronald Yeung,William A. Kitch, "Geotechnical Engineering Principles and Practices", Pearson, 2nd edition, 2010.
4   Venkatramaiah C. "Geotechnical Engineering", New Age International, 6thedition, 2018.
5   http://nptel.ac.in/courses/105103097/

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**SEMESTER - IV**

| 18CE413 | STRENGTH OF MATERIALS | L | T | P | C |
|---------|----------------------|---|---|---|---|
|         |                      | 3 | 1 | 0 | 4 |

***Prerequisite:*** *Mechanics of Solids*

**Objectives:**

- *To calculate stresses and deformations of objects under external loadings.*
- *To build the necessary theoretical background for further structural analysis and design courses.*
- *To apply the knowledge of strength of materials on engineering applications and design problems.*

**UNIT - I         ENERGY PRINCIPLES**                                                      **[ 12]**

Strain Energy and Strain Energy Density – Strain Energy in Traction, Shear in Flexure and Torsion –Castigliano's Theorems – Principle of Virtual Work Application of Energy Theorems for Computing Deflections in Beams and Trusses – Maxwell's Reciprocal Theorems.

**UNIT - II        INDETERMINATE BEAMS**                                                    **[12]**

Propped Cantilever and Fixed Beams-Fixed End Moments and Reactions Due to Lateral Loads Theorem of Three Moments – Analysis of Continuous Beams (limited to two unknowns.)

**UNIT - III       COLUMNS**                                                                **[12]**

Eccentrically Loaded Short Columns – Middle Third Rule – Core Section – Columns of Unsymmetrical Sections – Euler's Theory of Long Columns – Critical Loads for Prismatic Columns with Different End Conditions; Rankine-Gordon Formula for Eccentrically Loaded Columns .

**UNIT - IV        THIN  AND THICK CYLINDERS, THEORIES OF FAILURES**                         **[12 ]**

Thin Cylinders and Shells under Internal Pressure –Deformation of Thin Cylinders and Shells. Thick Cylinders – Compound Cylinders. - Theories of Failure – Principal Stress, Dilatation, Principal Strain, Shear Stress, Strain Energy, Distortion Energy andMohr's Theories – Application in Analysis of Stress (limited to Two Dimensional).

**UNIT - V         ADVANCED TOPICS IN BENDING OF BEAMS**                                     **[12]**

Unsymmetrical Bending of Beams of Symmetrical and Unsymmetrical Sections – Shear Flow -Shear Centre - Curved Beams – Winkler Bach Formula – Stress Concentration.

**Total (L: 45 T:15  ) = 60 Periods**

***Course Outcomes: On Completion of this course, the student will be able to***

- *Gain knowledge about the energy principles and computing deflections of beam under the principle of virtual work method.*
- *Know the analysis of propped cantilever, fixed beam and continuous beam and to learn draw SFD & BMD.*
- *Study the stresses developed due to eccentricity in short column and long column and apply the concept of Euler's theory and Rankine's theory  for analysing  long column.*
- *Find different stresses developed in thick and thin cylinders and understand the concept of theory of failures.*
- *Analysis of unsymmetrical bending of beams, Shear flow and* Curved beams.

**Text Books :**

1   Rajput R.K,**"**A Textbook of Strength of Materials"**,** Laxmi Publications,6thedition,2018.
2   Punmia B.C., Ashok Kumar Jain, Arun Kumar Jain, "Mechanics of Material", Laxmi Publications, revised edition, 2017.

**Reference Books :**

1   Nash, William A. "Theory and Problems of Strength of Materials, Schaum's Outline Series", Tata McGraw-Hill Publishing Co., New Delhi, 2007.
2   Srinath L.S, "Advanced Mechanics of Solids",  McGraw Hill Education, 3rd edition, 2017.
3   Egor P Popov, "Engineering Mechanics of Solids", Pearson Education India, 2nd edition, 2015.
4   Kazimi S.M.A, "Solid Mechanics", McGraw Hill Education, 2nd Revised edition, 2017.

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**SEMESTER - IV**

| 18CE414 | APPLIED HYDRAULIC AND HYDRAULIC MACHINERY | L | T | P | C |
|---------|-------------------------------------------|---|---|---|---|
|         |                                           | 3 | 0 | 0 | 3 |

*Prerequisite: Fluid Mechanics*

*Objectives:*
- *To learn the fundamentals on flow in open channels*
- *To understand the basic concepts of impact of jets*
- *To impart the knowledge on pumps and turbines*

### UNIT - I        OPEN CHANNEL FLOW                                    [6]

Open channel flow – Types and regimes of flow – Velocity distribution in open channel – Wide open channel – Specific energy – Critical flow and its computation – channel transition.

### UNIT - II       UNIFORM FLOW  &NON UNIFORM FLOW                     [12]

Uniform flow – Manning's and Chezy's formula – Determination of roughness coefficients – Most economical sections – Non-erodible channels. Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Hydraulic jump – Types – Energy dissipation –Surges.

### UNIT - III      IMPACT OF JETS                                      [9]

Force exerted by the jet on a stationary vertical plate(Inclined flat plate, curved plate) - Force exerted by the jet on a moving plate - Force exerted by the jet of water on unsymmetrical moving curve plate at its tip – series of vanes, radial curved vanes

### UNIT - IV       PUMPS                                               [9]

Centrifugal Pump - Minimum Speed to Start the Pump – Multistage Pumps – Jet and Submersible Pumps - Positive Displacement Pumps - Reciprocating Pump - Negative Slip - Flow Separation Conditions - Air Vessels -Indicator Diagram and its Variation

### UNIT - V        TURBINES                                            [9]

Turbines - Application of Momentum Principle – Turbines - Classification - Draft Tube and Cavitation- Radial Flow Turbines - Axial Flow Turbines – Impulse and Reaction

**Total (L: 45 T: 0 ) =45Periods**

*Course Outcomes: On Completion of this course, the student will be able to*
- *Classify the types of flows in open channel and design a most economical section*
- *Study about non uniform flows in open channel and also to learn about the characteristics of hydraulic jump*
- *Provide insights on impact of jets*
- *Impart knowledge about classification of pumps and its characteristic study.*
- *Apply the momentum principle and learn the design aspects of turbines*

**Text Books :**

1    Subramanya K, "Flow in Open channels", McGraw Hill Education; 4th edition, 2015.

2    Bansal, R.K., "A Textbook of Fluid Mechanics and Hydraulics Machines", 10th edition, Laxmi Publications Pvt. Ltd, New Delhi, 2018.

**Reference Books :**

1    Rajput, R.K "Fluid Mechanics and Hydraulic Machines", S Chand & Company, 6th edition, 2016.

2    Modi, P.N and Seth, S.M. "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House, New Delhi, 21st edition, 2017.

3    Rattan S. S"Fluid Mechanics and Hydraulic  Machines", Khanna Book Publishing, 1st edition, 2014.

4    http://nptel.ac.in/courses/105107059/

5    http://nptel.ac.in/courses/105103021/

**K.S.R. COLLEGE OF ENGINEERING (Autonomous)**                                  **R 2018**
**SEMESTER - IV**

| 18CE415 | CONSTRUCTION TECHNIQUES AND PRACTICES | L | T | P | C |
|---------|----------------------------------------|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

*Prerequisite:* Nil

*Objective(s):*

- *To aware of the various construction techniques, practices and the equipment needed for different types of construction activities.*
- *To understand about the various construction procedures for sub to super structure.*
- *To know about the equipment needed for construction of various types of structures from foundation to super structure.*

**UNIT - I          PLANNING FOR CONSTRUCTION  & SUPPORTING STRUCTURES          [9]**

Various Stages in the Construction of the Project – Construction Coordination - Job Planning - Technical Planning – Scheduling - Site Clearance - Marking – Setting out foundations , Earthwork job Layout – Temporary Sheds – Setting Out Works – Centering & Shuttering - Slip Forms - Scaffolding – Shoring – De-shuttering Forms.

**UNIT - II          CONSTRUCTION PRACTICES          [9]**

Masonry – Stone Masonry – Bond in Masonry - Concrete Hollow Block Masonry – Flooring – Damp Proof Courses – Construction Joints – Movement and Expansion Joints– Pre Cast Pavements – Building Foundations – Basements – Fabrication and Erection of Steel Trusses – Frames – Braced Domes – Laying Brick - Arrangement of bonds in brick masonry— Weather and Water Proof – Roof Finishes –Acoustic and Fire Protection.

**UNIT - III          SUB STRUCTURE CONSTRUCTION          [9]**

Techniques of Box Jacking – Pipe Jacking -Under Water Construction of Diaphragm Walls And Basement – Tunnelling Techniques – Piling Techniques - Well and Caisson - Sinking Cofferdam – Cable Anchoring and Grouting-Driving Diaphragm Walls, Sheet Piles - Shoring for Deep Cutting – Well Points -Dewatering And Stand by Plant Equipment for Underground Open Excavation.

**UNIT - IV          SUPER STRUCTURE CONSTRUCTION          [9]**

Launching Girders, Bridge Decks, Off Shore Platforms – Special Forms for Shells - Techniques for Heavy Decks – In-Situ Pre-Stressing In High Rise Structures, Material Handling - Erecting Light Weight Components On Tall Structures - Support Structure for Heavy Equipment And Conveyors –Erection of Articulated Structures, Braced Domes and Space Decks.

**UNIT - V          CONSTRUCTION EQUIPMENT          [9]**

Selection of Equipment for Earth Work - Earth Moving Operations - Types of Earthwork Equipment -Tractors, Motor Graders, Scrapers, Front End Waders, Earth Movers – Equipment for Foundation and Pile Driving. Equipment for Compaction, Batching And Mixing and Concreting - Equipment for Material Handling and Erection of Structures - Equipment for Dredging, Trenching, Tunneling.

**Total (L: 45 T: 0  ) = 45 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*

1. Gain knowledge on various supporting structures and prerequisite activities needed for construction of a project.
2. Gain knowledge about different types of masonry, foundation, roofing and protection measures involved in construction practices.
3. Illustrate various techniques used for sub structure construction (Jacking, Tunneling, and Cofferdam).
4. Illustrate various techniques used for super structure construction (Launching girders, offshore platform and in situ pre-stressing technique).
5. Give knowledge about earth work equipments used in construction practices (pile driving, compaction, material handling and tunneling equipment).

**Text Books :**

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", McGraw Hill Education, 7th edition, 2010.
2. Purushothama Raj P. "Construction Techniques, Equipments and Practices", 5th edition Sri Krishna Hitech Publishing Company Pvt. Ltd.-2015.

**Reference Books :**

1. Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi, 2016.
2. "Specifications of Handbook on Repair and Rehabilitation of RCC Buildings", Central Public Works Department, 2011.
3. Peurifoy, Robert.L, Schexnayder Clifford J. Schmitt Robert, AviadShapira "Construction Planning, Equipment and Methods", 9th edition, McGraw-Hill Education, 9th edition, 2018.
4. https://nptel.ac.in/courses/114106035/15.

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**SEMESTER - IV**

| | | L | T | P | C |
|---|---|---|---|---|---|
| **18CE416** | **HIGHWAY ENGINEERING** | 3 | 0 | 0 | 3 |

*Prerequisite: No  prerequisites are needed for enrolling into the courses*

*Objectives:*
- *To impart knowledge on highway planning and its geometric design*
- *To learn the desirable properties of highway  materials and maintenance*
- *To make familiar with design  and evaluation of pavements*

### UNIT - I        HIGHWAY PLANNING AND ALIGNMENT        [9]

History of Road Construction, Highway Development in India – Jayakar Committee Recommendations and Realizations, Twenty-year Road Development Plans, Concepts of On-going Highway DevelopmentProgrammes at National Level, Institutions for Highway Development at National Level - Indian Road Congress, Highway Research Board, National Highway Authority of India, Ministry of Road Transport and Highways (MoRTH) and Central Road Research Institute. Requirements of Ideal Alignment, Factors Controlling Highway Alignment, Engineering Surveys for Alignment - Classification and Cross Section of Urban and Rural Roads (IRC) - Principles of Highway Financing.

### UNIT - II        GEOMETRIC DESIGN OF HIGHWAYS        [9]

Highway Cross Sectional Elements – Right of Way, Carriage Way, Camber, Kerbs, Shoulders and Footpaths [IRC Standards], Design of Horizontal Alignment – Horizontal Curves Super Elevation, Widening of Pavements on Horizontal Curves and Transition Curves, Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves-Sight Distances – Factors Affecting Sight Distances, PIEV Theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD] -Geometric Design of Hill Roads [IRC Standards Only].

### UNIT - III        HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE        [9]

Desirable Properties and Testing of Highway Materials: Soil – California Bearing Ratio Test, Field Density Test - Aggregate - Crushing, Abrasion, Impact Tests, Water Absorption, Flakiness and Elongation Index and Stone Polishing Value Test - Bitumen - Penetration, Ductility, Viscosity, Binder Content And Softening Point Tests. - Construction Practice - Water Bound Macadam Road, Bituminous Road And Cement Concrete Road [As Per IRC And Morth Specifications] - Highway Drainage [IRC Recommendations].

### UNIT - IV        FLEXIBLE AND RIGID PAVEMENTS        [9]

Rigid And Flexible Pavements- Components and their Functions -Design Principles of Flexible and Rigid Pavements, Factors Affecting the Design Of Pavements - ESWL, Climate, Sub-Grade Soil And Traffic - Design Practice for Flexible Pavements [IRC Method And Recommendations- Problems] - Design Practice for Rigid Pavements – IRC Recommendations - Concepts Only.

### UNIT - V        HIGHWAY MAINTENANCE        [9]

Types of Defects in Flexible Pavements – Surface Defects, Cracks, Deformation, Disintegration – Symptoms, Causes And Treatments. - Types of Failures in Rigid Pavements – Scaling, Shrinkage, Warping, Structural Cracks, Spallingof Joints and Mud Pumping –  Special Repairs - Pavement Evaluation – Pavement Surface Conditions and Structural Evaluation, Evaluation of Pavement Failure and Strengthening - Overlay Design by Benkelman Beam Method [Procedure Only].

**Total (L: 45 T: 0  ) = 45 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*
- *Acquire skills in selecting the best highway alignment and develop the highway proposal*
- *Design various highway cross sectional elements*
- *Design flexible and rigid pavements as per IRC codes.*
- *Gain knowledge on highway materials and construction practice.*
- *Extend knowledge on  highway maintenance*

**Text Books :**
1      Khanna.S. K., Justo.C.E.G.,Veeraragavan A, "Highway Engineering", Nemchand Publishers,10th edition, 2018.
2      Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Pvt. Ltd., 2018.

**Reference Books :**
1      Kadiyali. L. R, "Transportation Engineering", Hanna Book Publishing; 1st edition, 2016.
2      Huang,Yang H. "Pavement Analysis and Design", Pearson Education, 2nd edition, 2008.
3      Mallick,Rajib B. Tahar El-Korchi, "Pavement Engineering: Principles and Practice",CRC Press, 3rdedition, 2017.
4      Rangwala, "Highway Engineering", Charotar Publishing House pvt. Ltd., 10th edition, 2015.
5      http://nptel.ac.in/courses/105101087/

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<u>**SEMESTER - IV**</u>

| | | L | T | P | C |
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| **18CE421** | **FLUID MECHANICS AND MACHINERY LABORATORY** | 0 | 0 | 3 | 1 |

***Prerequisite:***

***Objectives:***

- *To provide practical knowledge in verification of principles of fluid flow*
- *To impart knowledge in measuring pressure, discharge and velocity of fluid flow*
- *To understand Major and Minor Losses*
- *To gain knowledge in performance testing of Hydraulic Turbines and Hydraulic Pumps*

1. Determination of Co-efficient of Discharge for Orifice

2. Determination of Co-efficient of Discharge for Notches

3. Determination of Co-efficient of discharge for VenturiMeter

4. Determination of Co-Efficient of Discharge for Orifice Meter

5. Study of Impact of Jet on Flat Plate (Normal / Inclined)

6. Study of Friction Losses in Pipes

7. Study of Minor Losses in Pipes

8. Study on Performance Characteristics of Centrifugal Pumps (Constant Speed / Variable Speed)

9. Study on Performance Characteristics of Reciprocating Pump

10. Study on Performance Characteristics of Pelton Turbine

11. Study on Performance Characteristics of Francis Turbine

12. Study on Performance Characteristics of Kaplan Turbine

**Total : 45 Periods**

***Course Outcomes: On Completion of this course, the student will be able to***
1. Draw and plot the performance characteristics for Francis turbine
2. Conduct experiments in pipe flows and open-channel flows and interpreting data from model studies to prototype cases, as well as documenting them in engineering reports
3. Analyze a variety of practical fluid-flow devices and utilize fluid mechanics principles in design
4. Given the required flow rate and pressure rise, select the proper pump to optimize the pumping efficiency
5. Provide knowledge in calculating performance analysis in turbines and pumps and can be used in power plants

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**SEMESTER - IV**

| | L | T | P | C |
|---|---|---|---|---|
| **18CE422**      **SOIL MECHANICS LABORATORY** | 0 | 0 | 3 | 1 |

*Prerequisite: No prerequisites are needed for enrolling into the courses*

*Objective(s):*
- *To learn the method and practices of testing properties of the soil*
- *To learn the principles of permeability of soil*
- *To learn the procedures of testing shear strength parameters of soil*

**List of Experiments:**

1. Grain Size Distribution – Sieve Analysis

2. Grain Size distribution – Hydrometer Analysis

3. Specific Gravity of Soil

4. Relative density of Sands

5. Field Density by Core Cutter Method and Sand Replacement Method

6. Atterberg's Limits Test

7. Coefficient of Permeability - Variable Head Method

8. Coefficient of Permeability – Constant Head Method

9. Unconfined Compression Test

10. Direct Shear Test

11. Standard Proctor Compaction Test

12. Tri-axial compression tests in Cohesion less Soil

13. One Dimensional Consolidation Test

**Total : 45 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*
- *Learn about grain size distribution using sieve analysis and by hydrometer analysis*
- *Identify and classify soils with reference to their characteristics*
- *Able to calculate different soil properties*
- *Able to explain the strength of the soil and be able to calculate shear strength of the soils.*

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<u>**SEMESTER - IV**</u>

| | L | T | P | C |
|---|---|---|---|---|
**18CE423**    **HIGHWAY ENGINEERING LABORATORY** | 0 | 0 | 3 | 1 |

*Objectives:*
- *To learn the procedures of testing highway materials*
- *To characterize the highway materials*

**List of Experiments:**

1. Sieve Analysis of Fine and Coarse Aggregates

2. Specific Gravity &Water Absorption Test on Fine and Coarse Aggregates

3. Crushing Strength of Aggregates.

4. Impact Test on Aggregates.

5. Los Angles Abrasion Test on Aggregates

6. Flakiness Index, Elongation Index of Coarse Aggregates

7. CBR Test on Soil

8. Penetration Test on Bitumen

9. Softening Point Test

10. Viscosity Test

11. Ductility Test

12. Determination of Binder Content on Bituminous Mixes

13. Determination of Marshall Stability Value on Bituminous Mixes

14. Tests on Bituminous Emulsion

**Total : 45 Periods**

*Course Outcomes: On Completion of this course, the student will be able to*
- *Acquisition of skills in selecting the best highway materials*
- *Student knows the techniques to characterize various materials through relevant tests.*
- *Measure the physical properties of the aggregate and bitumen for their suitability as road material.*
- *Test the soil for its suitability as sub grade soil for pavements.*

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**SEMESTER - IV**

| | | L | T | P | C |
|---|---|---|---|---|---|
| **18HR422** | **CAREER DEVELOPMENT SKILLS - II** | 0 | 2 | 0 | 0 |

*Prerequisite: No prerequisites are needed for enrolling into the course*

*Objectives:*
- *To enhance employability skills and to develop career competency.*
- *To help individuals develop a realistic understanding of themselves in regard to decision making and career alternatives.*

### UNIT - I          VERBAL AND LOGICAL REASONING – PART 1          [6]

Alphabet Test – Synonyms & Antonyms – Idioms & Phrases – Analogies - Theme Detection – Odd Words – Statement & Conclusions - Family Tree – Blood Relations – Coding & Decoding – Syllogism – Odd Man Out.

### UNIT - II          QUANTITATIVE APTITUDE – PART 1          [6]

Numbers : Number system - Squaring of Numbers – Square Roots – Cube Roots – Divisibility – HCF , LCM – Decimals.

### UNIT - III          QUANTITATIVE APTITUDE – PART 2          [6]

Percentages – Averages – Ratio & Proportion – Mixtures and Allegations – logarithms.

### UNIT - IV          READING COMPREHENSION&WRITTEN COMMUNICATION –PART 3          [6]

READING SKILLS : Importance of Reading – Definition of Reading – Levels of Reading – Requirements of Reading – Types of Reading – Techniques of Reading - Academic Reading Tips.

What is Writing – Sentence – Phrase – Kinds of Sentences – Parts of Sentence – Parts of Speech – Articles – Academic Essay Writing – Precise Writing – Report Abstracts – Letter Writing – Memo – Cover Letter – Resume Writing.

### UNIT - V          QUANTITATIVE APTITUDE – PART 3          [6]

Profit and Loss – Simple Interest & Compound Interest – Problem on Ages – Calendar.

**Total  = 30 Periods**

*Course Outcomes : On Completion of this course, the student will be able to*
- *Speak and write appropriately by understanding and applying the basic grammatical rules*
- *Demonstrate various principles involved in solving mathematical problems and thereby      reducing the time taken for performing job functions.*
- *Enhance their communication skills and instructiveness.*
- *Enhance interpersonal relationship building skills with self – confidence*
- *Critically evaluate various real life situations by resorting to analysis of key issues and factors.*

**Reference Books :**

1  Agarwal. R.S ,A.Modern  Approach to Verbal and Non- verbal Reasoning, Revised Edition 2008, Reprint 2009, S.Chand& Co Ltd., New Delhi.
2  Abhijit Guha, Quantitative Aptitude, TMH, 3rd Edition.
3  Objective Instant Arithmetic by M.B. Lal & Goswami Upkar Publications.
4  Word Power Made Easy by Norman Lewis W.R.GOYAL Publications