



DEPARTMENT OF CIVIL ENGINEERING

COURSE STRUCTURE W.E.F A.Y-2020-21

SEMESTER I

| Category | Course Title | Contact Periods per week | | | | Credits |
|--------------|---------------------------------------|--------------------------|----------|-----------|-----------|-------------|
| | | L | T | P | Total | |
| BS | Algebra and Calculus | 3 | 1 | 0 | 4 | 4 |
| BS | Chemistry for Civil Engineering | 3 | 0 | 0 | 3 | 3 |
| ES | Problem Solving and Programming | 3 | 0 | 0 | 3 | 3 |
| HS | English | 2 | 0 | 0 | 2 | 2 |
| ES | Engineering Graphics | 0 | 1 | 4 | 5 | 3 |
| BS | Chemistry for Civil Engineering Lab | 0 | 0 | 3 | 3 | 1.5 |
| ES | Problem Solving and Programming Lab | 0 | 0 | 3 | 3 | 1.5 |
| HS | English Language Lab | 0 | 0 | 3 | 3 | 1.5 |
| MC | Mandatory course I :Induction Program | -- | | | | |
| | Counseling / Mentoring | 0 | 0 | 1 | 1 | 0 |
| | Sports/Hobby Clubs/Activities | 0 | 0 | 2 | 2 | 0 |
| | Activity Point Programme | During the Semester | | | | |
| Total | | 11 | 2 | 16 | 29 | 19.5 |

SEMESTER II

| Category | Course Title | Contact Periods per week | | | | Credits |
|--------------|---|--------------------------|----------|-----------|-----------|-------------|
| | | L | T | P | Total | |
| ES | Basic Electrical and Electronics Engineering | 3 | 0 | 0 | 3 | 3 |
| BS | Vector Calculus, Complex Variables and Transforms | 3 | 1 | 0 | 3 | 3 |
| BS | Physics for Civil Engineering | 3 | 0 | 0 | 3 | 3 |
| ES | Building Material Science | 2 | 0 | 0 | 2 | 2 |
| ES | Engineering Mechanics | 3 | 0 | 0 | 3 | 3 |
| ES | Basic Electrical and Electronics Engineering lab | 0 | 0 | 2 | 2 | 1 |
| ES | Engineering and IT workshop | 0 | 0 | 4 | 4 | 2 |
| BS | Physics for Civil Engineering lab | 0 | 0 | 3 | 3 | 1.5 |
| MC | Counseling/Mentoring | 0 | 0 | 1 | 1 | 0 |
| | Sports/Hobby Clubs/Activities | 0 | 0 | 2 | 2 | 0 |
| | Activity Point Programme | During the Semester | | | | |
| Total | | 14 | 1 | 12 | 26 | 19.5 |

SEMESTER III

| Category | Course Title | Contact Periods per week | | | | Credits |
|----------|--|--------------------------|----------|-----------|-----------|-------------|
| | | L | T | P | Total | |
| PC | Strength of Materials | 3 | 0 | 0 | 3 | 3 |
| ES | Fluid Mechanics | 3 | 0 | 0 | 3 | 3 |
| PC | Building Construction and Planning | 3 | 0 | 0 | 3 | 3 |
| PC | Surveying | 3 | 0 | 0 | 3 | 3 |
| BS | Probability, Statics and Numerical methods | 2 | 1 | 0 | 3 | 3 |
| PC | Building drawing | 0 | 0 | 3 | 3 | 1.5 |
| PC | Surveying Lab | 0 | 0 | 3 | 3 | 1.5 |
| PC | Strength of Materials lab | 0 | 0 | 3 | 3 | 1.5 |
| SC | Career competency Development I | 0 | 0 | 2 | 2 | 1 |
| SC | Value added course /Certificate course I | 0 | 0 | 0 | 0 | 1 |
| MC | Counseling/Mentoring | 0 | 0 | 1 | 1 | 0 |
| | Sports/Hobby Clubs/Activities | 0 | 0 | 2 | 2 | 0 |
| | Activity Point Programme | During the Semester | | | | |
| | Total | 15 | 0 | 14 | 29 | 21.5 |

SEMESTER IV

| Category | Course Title | Contact Periods per week | | | | Credits |
|----------|---|--------------------------|----------|-----------|-----------|-------------|
| | | L | T | P | Total | |
| PC | Surveying & Geomatics | 3 | 0 | 0 | 3 | 3 |
| PC | Hydraulics Engineering | 3 | 0 | 0 | 3 | 3 |
| PC | Geotechnical Engineering-I | 3 | 0 | 0 | 3 | 3 |
| PC | Structural Analysis | 2 | 1 | 0 | 3 | 3 |
| OE | Open Elective I | 3 | 0 | 0 | 3 | 3 |
| PC | Surveying & Geomatics Lab | 0 | 0 | 3 | 3 | 1.5 |
| PC | Hydraulics Engineering lab | 0 | 0 | 3 | 3 | 1.5 |
| PC | Structural Analysis practice | 0 | 0 | 3 | 3 | 1.5 |
| SC | Career competency Development II | 0 | 0 | 2 | 2 | 1 |
| SC | Value added course /Certificate course II | 0 | 0 | 0 | 0 | 1 |
| MC | Mandatory course II | 2 | 0 | 0 | 2 | 0 |
| | Counseling/Mentoring | 0 | 0 | 1 | 1 | 0 |
| | Sports/Hobby Clubs/Activities | 0 | 0 | 2 | 2 | 0 |
| | Activity Point Programme | During the Semester | | | | |
| | Total | 15 | 2 | 14 | 31 | 21.5 |

SEMESTER V

| Category | Course Title | Contact Periods per week | | | | Credits |
|----------|--|--------------------------|----------|-----------|-----------|-------------|
| | | L | T | P | Total | |
| PC | Design of Reinforced Concrete Structures | 3 | 0 | 0 | 3 | 3 |
| PC | Water Resources Engineering | 3 | 0 | 0 | 3 | 3 |
| PC | Geotechnical Engineering-II | 3 | 0 | 0 | 3 | 3 |
| OE | Open Elective II | 3 | 0 | 0 | 3 | 3 |
| PE | Professional Elective I | 3 | 0 | 0 | 3 | 3 |
| PC | Computer Aided Drafting of Buildings | 0 | 0 | 3 | 3 | 1.5 |
| PC | Geotechnical Engineering Lab | 0 | 0 | 3 | 3 | 1.5 |
| SC | Career Competency Development III | 0 | 0 | 2 | 2 | 1 |
| SC | Value added course /Certificate course III | 0 | 0 | 0 | 0 | 1 |
| PR | Internship I/on job training/Com Ser Project | 0 | 0 | 0 | 0 | 1.5 |
| MC | Counseling/Mentoring | 0 | 0 | 1 | 1 | 0 |
| | Sports/Hobby Clubs/Activities | 0 | 0 | 2 | 2 | 0 |
| | Activity Point Programme | During the Semester | | | | |
| | Total | 15 | 0 | 11 | 26 | 21.5 |

SEMESTER VI

| Category | Course Title | Contact Periods per week | | | | Credits |
|----------|---|--------------------------|----------|-----------|-----------|-------------|
| | | L | T | P | Total | |
| PC | Environmental Engineering | 3 | 0 | 0 | 3 | 3 |
| PC | Highway Engineering | 2 | 0 | 0 | 2 | 2 |
| PC | Design of Steel Structures | 3 | 0 | 0 | 3 | 3 |
| PC | Concrete Technology | 3 | 0 | 0 | 3 | 3 |
| OE | Open Elective III | 3 | 0 | 0 | 3 | 3 |
| PE | Professional Elective II | 3 | 0 | 0 | 3 | 3 |
| PC | Environmental Engineering Lab | 0 | 0 | 2 | 2 | 1 |
| PC | Concrete Tech and Highway Engineering lab | 0 | 0 | 3 | 3 | 1.5 |
| SC | Career competency Development IV | 0 | 0 | 2 | 2 | 1 |
| SC | Value added course /Certificate course IV | 0 | 0 | 0 | 0 | 1 |
| MC | Mandatory course III | 2 | 0 | 0 | 2 | 0 |
| | Counseling/Mentoring | 0 | 0 | 1 | 1 | 0 |
| | Sports/Hobby Clubs/Activities | 0 | 0 | 2 | 2 | 0 |
| | Activity Point Programme | During the Semester | | | | |
| | Total | 19 | 0 | 10 | 29 | 21.5 |

SEMESTER VII

| Category | Course Title | Contact Periods per week | | | | Credits |
|----------|---|--------------------------|----------|-----------|-----------|-----------|
| | | L | T | P | Total | |
| PC | Estimation & Quantity Surveying | 3 | 0 | 0 | 3 | 3 |
| HS | Humanities and Social Science Elective | 2 | 0 | 0 | 2 | 2 |
| OE | Open Elective IV | 3 | 0 | 0 | 3 | 3 |
| PE | Professional Elective III | 3 | 0 | 0 | 3 | 3 |
| PE | Professional Elective IV | 3 | 0 | 0 | 3 | 3 |
| PE | Professional Elective V | 3 | 0 | 0 | 3 | 3 |
| PC | CAD Lab | 0 | 0 | 2 | 2 | 1 |
| PC | Estimation and Quantity Surveying Practice | 0 | 0 | 3 | 3 | 1.5 |
| SC | Career Competency Development V | 0 | 0 | 2 | 2 | 1 |
| SC | Skill Development Training | 0 | 0 | 2 | 2 | 1 |
| PR | Internship II/On job training/Com Ser Project | 0 | 0 | 0 | 0 | 1.5 |
| MC | Counseling/Mentoring | 0 | 0 | 1 | 1 | 0 |
| | Sports/Hobby Clubs/Activities | 0 | 0 | 2 | 2 | 0 |
| | Activity Point Programme | During the Semester | | | | |
| | Total | 17 | 0 | 12 | 29 | 23 |

SEMESTER VIII

| Category | Course Title | Contact Periods per week | | | | Credits |
|----------|--------------------------------------|--------------------------|----------|----------|----------|-----------|
| | | L | T | P | Total | |
| PR | Project work, seminar and Internship | 0 | 0 | 0 | 0 | 12 |
| | Activity Point Programme | During the Semester | | | | |
| | Total | 0 | 0 | 0 | 0 | 12 |



DEPARTMENT OF CIVIL ENGINEERING

OPEN ELECTIVE COURSES

| S.No | Subject |
|------|------------------------------------|
| 1 | Disaster Management And Mitigation |
| 2 | Green buildings |
| 3 | Air and Noise Pollution |
| 4 | Water shed management |
| 5 | Environmental Impact Assessment |
| 6 | Solid Waste Management |
| 7 | Waste water engineering |
| 8 | Water supply Engineering |
| 9 | Cost Effective Housing Techniques |



DEPARTMENT OF CIVIL ENGINEERING

PROFESSIONAL ELECTIVE (PE)

The Professional Elective Courses (PE) are shown in different tracks/groups: The students will have options of selecting the electives from the different tracks/groups depending on the specialization one wishes to acquire.

| ELECTIVE TRACK/GROUP | Professional Elective -1 (III-I) | Professional Elective -2 (III-II) | Professional Elective -3 (IV-I) | Professional Elective -4 (IV-II) | Professional Elective -5 (IV-II) |
|-----------------------------|--|--|---|---|--|
| Structural Engineering | Advanced Concrete Technology | Green Buildings | Pre Stressed Concrete | Bridge Engineering | Finite Element Methods In Civil Engineering |
| Transportation Engineering | Railway Engineering | Air Port And Harbor Engineering | Pavement Design | Advanced Transportation Engineering | Urban Transportation Planning |
| Environmental Engineering | Ecological Engineering | Air And Noise Pollution | Solid Waste management | Industrial Waste water Treatment | Environmental Impact Assessment |
| Water Resources Engineering | River Engineering | Irrigation Engineering | Hydraulic Structures | Ground Water Engineering | Water Shed Management |
| Geotechnical Engineering | Geotechnical Explorations | Ground Improvement Techniques | Earthquake Engineering | Advanced Foundation Engineering | Instrumentation & Sensor Technologies For Civil Engineering Applications |
| Construction Engineering | Building Services Engineering | Construction Equipment And Automation | Civil Infrastructure For Smart City Development | Cost Effective Housing Techniques | Rehabilitation And Retrofitting Of Structures |



DEPARTMENT OF CIVIL ENGINEERING
B.Tech Honors Degree Subjects

| S.No | Course Name | L-T-P | CREDITS |
|----------------|--|-------|---------|
| POOL- 1 | | | |
| 1 | Stability Of Structures | 3-1-0 | 4 |
| 2 | Experimental Methods In Structural Engineering | 3-1-0 | 4 |
| 3 | Non Linear Structural Analysis | 3-1-0 | 4 |
| 4 | Advanced Design Of Steel Structures | 3-1-0 | 4 |
| POOL- 2 | | | |
| 1 | Advanced Geotechnical Engineering | 3-1-0 | 4 |
| 2 | Geotechnical Measurements And Explorations | 3-1-0 | 4 |
| 3 | Geotechnical Earthquake Engineering | 3-1-0 | 4 |
| 4 | Rock Mechanics | 3-1-0 | 4 |
| POOL- 3 | | | |
| 1 | Intelligent Transportation Systems | 3-1-0 | 4 |
| 2 | Transportation Safety Systems | 3-1-0 | 4 |
| 3 | Advanced Geometric Design Of Highways | 3-1-0 | 4 |
| 4 | Computer Simulation In Traffic Engineering | 3-1-0 | 4 |
| POOL- 4 | | | |
| 1 | Global Navigation Satellite System | 3-1-0 | 4 |
| 2 | Machine Processing Of Remotely Sensed Data | 3-1-0 | 4 |
| 3 | Geospatial Data Processing | 3-1-0 | 4 |
| 4 | Introduction to Geodesy | 3-1-0 | 4 |
| POOL- 5 | | | |
| 1 | Water Resources System Planning and Management | 3-1-0 | 4 |
| 2 | Design and Drawing of Irrigation Structures | 3-1-0 | 4 |
| 3 | Advanced Hydrology | 3-1-0 | 4 |
| 4 | Advanced Irrigation Engineering Design | 3-1-0 | 4 |
| 5 | Hydropower Engineering | 3-1-0 | 4 |



DEPARTMENT OF CIVIL ENGINEERING

B.Tech Minor Degree Subjects

| S.No | Course Name | L-T-P | Credits |
|-------------|-----------------------------|--------------|----------------|
| 1 | Strength of Materials | 3-1-0 | 4 |
| 2 | Fluid Mechanics | 3-1-0 | 4 |
| 3 | Water Resources Engineering | 3-1-0 | 4 |
| 4 | Surveying | 3-1-0 | 4 |
| 5 | Structural Analysis | 3-1-0 | 4 |
| 6 | Geology/Soil Mechanics | 3-1-0 | 4 |
| 7 | Environmental Engineering | 3-1-0 | 4 |
| 8 | Highway Engineering | 3-1-0 | 4 |

HUMANITIES AND SOCIAL SCIENCES (HS)

| SEMESTER | SUBJECT | CREDITS |
|----------|---|------------|
| ISEM | 1. English | 2 |
| | 2. English Language Lab | 1.5 |
| VI SEM | 1. Humanities and Social Science Elective | 2 |
| | TOTAL | 5.5 |

BASIC SCIENCES (BS)

| SEMESTER | SUBJECT | CREDITS |
|----------|--|-----------|
| ISEM | 1. Algebra and Calculus | 4 |
| | 2. Chemistry for civil engineering | 3 |
| | 3. Chemistry for civil engineering lab | 1.5 |
| II SEM | 1. Vector Calculus, Complex Variables and Transforms | 4 |
| | 2. Physics for Civil Engineering | 3 |
| | 3. Physics for civil Engineering Lab | 1.5 |
| III SEM | 1. Probability, Statistics and Numerical methods | 3 |
| | TOTAL | 20 |

ENGINEERING SCIENCES (ES)

| SEMESTER | SUBJECT | CREDITS |
|----------|---|-------------|
| ISEM | 1. Problem Solving & Programming | 3 |
| | 2. Engineering Graphics | 3 |
| | 3. Problem Solving & Programming Lab | 1.5 |
| II SEM | 1. Basic Electrical and Electronics Engineering | 3 |
| | 2. Building Material Science | 2 |
| | 3. Engineering Mechanics | 3 |
| | 4. Basic Electrical and Electronics Engineering lab | 1 |
| | 5. Engineering & IT Workshop | 2 |
| III SEM | 1. Fluid Mechanics | 3 |
| | TOTAL | 20.5 |

PROFESSIONAL CORE(PC)

| SEMESTER | SUBJECT | CREDITS |
|----------|---|-----------|
| III SEM | 1. Building Construction and planning | 3 |
| | 2. Surveying | 3 |
| | 3. Strength of Materials | 3 |
| | 4. Surveying Lab | 1.5 |
| | 5. Building drawing | 1.5 |
| | 6. Strength of Materials lab | 13.5 |
| IV SEM | 1. Surveying & Geomatics | 3 |
| | 2. Hydraulics engineering | 3 |
| | 3. Geotechnical Engineering-I | 3 |
| | 4. Structural Analysis | 3 |
| | 5. Surveying & Geomatics lab | 1.5 |
| | 6. Hydraulics Engineering lab | 1.5 |
| | 7. Structural Analysis practice | 16.5 |
| V SEM | 1. Design of Reinforced Concrete Structures | 3 |
| | 2. Water Resources Engineering | 3 |
| | 3. Geotechnical Engineering-II | 3 |
| | 4. Computer Aided Drafting of Buildings | 1.5 |
| | 5. Geotechnical Engineering Lab | 12 |
| VI SEM | 1. Highway Engineering | 2 |
| | 2. Environmental Engineering g | 3 |
| | 3. Design of steel structures | 3 |
| | 4. Concrete technology | 3 |
| | 5. Environmental Engineering Lab | 1 |
| | 6. Concrete Tech and Highway Engineering lab | 13.5 |
| VII SEM | 1. Estimation and quantity surveying | 3 |
| | 2. CAD lab | 1 |
| | 3. Estimation and quantity surveying Practice | 5.5 |
| | TOTAL | 61 |

PROFESSIONAL ELECTIVES(PE)

| SEMESTER | SUBJECT | CREDITS |
|----------|-------------------------|-----------|
| V SEM | Professional Elective 1 | 3 |
| VI SEM | Professional Elective 2 | 3 |
| VII SEM | Professional Elective 3 | 3 |
| | Professional Elective 4 | 3 |
| | Professional Elective 5 | 3 |
| | TOTAL | 15 |

OPEN ELECTIVE S(OE)

| SEMESTER | SUBJECT | CREDITS |
|----------|-----------------|-----------|
| IVSEM | Open elective 1 | 3 |
| VSEM | Open elective 2 | 3 |
| VI SEM | Open elective 3 | 3 |
| VII SEM | Open elective 4 | 3 |
| | TOTAL | 12 |

SKILL ORIENTED COURSES (SC)

| SEMESTER | SUBJECT | CREDITS |
|----------|--|-----------|
| III SEM | Career competency Development I | 1 |
| | Value added course /Certificate course I | 1 |
| IV SEM | Career competency Development II | 1 |
| | Value added course /Certificate course II | 1 |
| V SEM | Career competency Development III | 1 |
| | Value added course /Certificate course III | 1 |
| VI SEM | Career competency Development IV | 1 |
| | Value added course /Certificate course IV | 1 |
| VII SEM | Career competency Development V | 1 |
| | Skill Development Training | 1 |
| | TOTAL | 10 |

PROJECT WORK AND INTERNSHIP (PR)

| SEMESTER | SUBJECT | CREDITS |
|----------|---|-----------|
| V SEM | Internship I/on job training/Com Ser Project | 1.5 |
| VII SEM | Internship II/on job training/Com Ser Project | 1.5 |
| VIII SEM | Project work, seminar and Internship | 12 |
| | TOTAL | 15 |

CREDITS PER SEMESTER

| SL NO | SUBJECT AREA | CREDITS PER SEMESTER | | | | | | | | CREDITS NECG |
|-------|--------------|----------------------|-------------|-------------|-------------|-------------|-------------|-----------|-----------|--------------|
| | | I | II | III | IV | V | VI | VII | VIII | |
| 1 | HS | 3.5 | | | | | | 2 | | 5.5 |
| 2 | BS | 8.5 | 8.5 | 3 | | | | | | 20 |
| 3 | ES | 7.5 | 11 | 3 | | | | | | 21.5 |
| 4 | PC | | | 13.5 | 16.5 | 12 | 13.5 | 5.5 | | 61 |
| 5 | PE | | | | | 3 | 3 | 9 | | 15 |
| 6 | OE | | | | 3 | 3 | 3 | 3 | | 12 |
| 7 | SC | | | 2 | 2 | 2 | 2 | 2 | | 10 |
| 8 | PR | | | | | 1.5 | | 1.5 | 12 | 15 |
| | TOTAL | 19.5 | 19.5 | 21.5 | 21.5 | 21.5 | 21.5 | 23 | 12 | 160 |



DEPARTMENT OF CIVIL ENGINEERING

Subjects approved by BOS (Up to IV-SEM)

| S.No | Subjects from department of CIVIL | Sem /Branch | Category |
|-------------------------------|------------------------------------|-------------|----------|
| 1. | Building Material Science | II Sem | ES |
| 2. | Strength of Materials | III Sem | PC |
| 3. | Fluid Mechanics | III Sem | ES |
| 4. | Building Construction and Planning | III Sem | PC |
| 5. | Surveying | III Sem | PC |
| 6. | Building drawing | III Sem | PC |
| 7. | Surveying Lab | III Sem | PC |
| 8. | Strength of Materials lab | III Sem | PC |
| 9. | Surveying & Geomatics | IV Sem | PC |
| 10. | Hydraulics engineering | IV Sem | PC |
| 11. | Geotechnical Engineering-I | IV Sem | PC |
| 12. | Structural Analysis | IV Sem | PC |
| 13. | Surveying & Geomatics Lab | IV Sem | PC |
| 14. | Hydraulics Engineering lab | IV Sem | PC |
| 15. | Structural Analysis practice | IV Sem | PC |
| Open Elective Subjects | | | |
| 16. | Disaster Management And Mitigation | | OE |
| 17. | Green buildings | | OE |
| 18. | Air and Noise Pollution | | OE |
| 19. | Water shed management | | OE |
| 20. | Environmental Impact Assessment | | OE |
| 21. | Solid Waste Management | | OE |
| 22. | Waste water engineering | | OE |
| 23. | Water supply Engineering | | OE |
| 24. | Cost Effective Housing Techniques | | OE |



DEPARTMENT OF CIVIL ENGINEERING

Syllabus approved by BOS (Up to IV-SEM)

Subjects from Department of CIVIL

1. BUILDING MATERIAL SCIENCE

| Semester | Hours / Week | | | Total hrs | Credit C | Max Marks | | |
|----------|--------------|---|---|-----------|-------------|-----------|-----|-------|
| | L | T | P | | | CIE | SEE | TOTAL |
| II | 2 | 0 | 0 | 32 | 2 | 40 | 60 | 100 |

MODULE - 1: STONES AND BRICKS 5H

Stones: Introduction, classification of rocks, common building stones, quarrying of stones, dressing of stone, characteristic of good building stone, criteria for selection of stones.

Bricks: Clay bricks, ingredients of good brick earth, manufacturing process of bricks, characteristics of good clay bricks, classification of clay bricks, defects of clay bricks; special bricks- Fly ash bricks, hollow bricks - uses.

MODULE - 2: LIME AND CEMENT 6H

Lime: Introduction-- limestone cycle-sources of lime-properties of lime-uses – constituent of lime-cementing action of lime -classification of lime-precaution in handling of lime-storage of lime.

Cement-Introduction –Portland cement-Composition of Cement-Functions of Cement Ingredients-types of cement-grades of cements-out line of manufacture of Portland cement-properties of cements -field tests for cement -storage of cement.

MODULE - 3: AGGREGATES AND WATER 6H

Aggregates: Classification of aggregate – Coarse and fine aggregates, Particle shape and Texture, Specific gravity, Bulk density, porosity and Absorption, Moisture content of Aggregate – sand;sources,impurities- classification of sand for making concrete-Bulking of sand, Sieve analysis-tests for quality of sand. Pozzolanas- pozzolanaic materials-advantages of addition of pozzolanas.

Water: Introduction – Quality of mixing water – Effect of mixing water from different sources – Water for washing aggregates – Standards for curing water.

MODULE - 4: WOOD AND WOOD PRODUCTS 5H

Wood: Introduction, classification of trees, structure of timber, classification of timber, characteristics of good timber, seasoning of timber, defects in timber, decay in timber, preservation of timber, suitability of timber for specific uses, Properties of timber.

Wood Products: Veneers; Plywood and its types, Fiber boards;laminated wood, merits of plywood and laminated wood, Lamina Boards, Block boards, Batten board, Particle boards.

MODULE - 5: FERROUS MATERIALS, POLYCRYSTALLINE AND POLYMERIC MATERIALS 5H

Ferrous metals: Types (iron, pig iron, cast iron, wrought iron, steel, rolled steel sections and reinforcing steel bars) – Rusting and Corrosion – Tensile testing of steel sections (IS: 1608) – Common anti-corrosive coatings.

Ceramic Materials- introduction,properties; **Refractories**-classification, properties; **Glass**-constituents, commercial forms of glasses,Glass fibers and its applications; **Plastics**-constituents, properties, applications of plastics.

MODULE - 6: MISCELLANEOUS MATERIALS 5H

Paints: Introduction, Constituents, covering power; water paints-classes; enamel paints; varnish, varnishing, types; painting surfaces -plastered, metal and wood surfaces; miscellaneous paints.

Bitumen, tar and asphalt-types and applications; Heat insulating materials; Sound insulating materials; water proofing materials; Geosynthetics; composite materials-examples, applications.

Text Books:

1. Building material by S K Duggal – New Age International Publishers; Second Edition
2. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) ltd., New Delhi

Reference Books:

1. Building materials by Rangawala, charotar Publishing house, New Delhi.
2. Building materials by P.C. Varghese, Prentice-Hall of India private Ltd, New Delhi
3. Building Materials and construction by S.S.Bhavikatti, Vikas Publishing House Pvt. Ltd.

2. STRENGTH OF MATERIALS

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| III | 3 | 0 | 3 | 48 | 3 | 40 | 60 | 100 |

MODULE – 1: REVIEW OF STATICS

8H

Types of external loads – internal stresses – normal and shear stresses – strain – Hooke's law – working stress – stress strain diagrams – Poisson's ratio – relationship between elastic constants
Elongation of bars of constant and varying sections – statically indeterminate problems in tension and compression – Temperature effects – strain energy and complementary energy strain energy due to tension, compression and shear.

MODULE -2: SHEAR FORCE&BENDING MOMENT

8H

Different types of beams – various types of loading – Relationship connecting intensity of loading, shearing force and bending moment – shear force and bending moment diagrams for cantilever beams and Simply supported beams for different types of loading.

MODULE-3: FLEXURAL STRESSES

8H

Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ – Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections
SHEAR STRESSES: Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T and angle sections.

MODULE-4: ANALYSIS OF STRESS AND STRAIN ON OBLIQUE SECTIONS

8H

Stress on inclined planes for axial and biaxial stress fields – principal stresses – Mohr's circle of stress. Thin and Thick Cylinders: Stresses in thin cylinders – thick cylinders – Lamé's equation – stresses in thick cylinders due to internal and external pressures .

MODULE-5: TORSION

8H

Torsion of solid and hollow circular shafts – Pure shear – strain energy in pure shear and torsion. Springs: Close coiled and open coiled helical springs
Theory of columns: Direct and bending stresses in short columns- Kern of a section. Buckling and stability – Euler's buckling/crippling load for columns with different end conditions – Rankine's formula.

MODULE-6: THEORIES OF FAILURES

8H

Various Theories of failures like Maximum Principal stress theory – Maximum Principal Strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory.

Text Book(s):

1. Mechanics of Materials – Dr.B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications.
2. Strength of Materials by R.K Rajput, S.Chand& Company Ltd.
3. Strength of Materials by B.S.Basavarajaiah, Universities Press, Hyderabad.
4. Strength of materials by R.K. Bansal, Laxmi Publications,2005.

Reference Book(s):

1. Timoshenko, Strength of Materials Vol. I & Vol. II , CBS Publishers & Distributors, New Delhi
2. S.S Bhavikatti , Structural analysis Vol, Vikas Publications (P) Ltd.4th Edition

3.

FLUID MECHANICS

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| III | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

MODULE – 1: PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENT 8H

Properties of fluids: introduction: Dimensions and units – properties of fluids-mass density, specific weight, specific volume, specific gravity, viscosity-units, dynamic and kinematic viscosity, newton’s law of viscosity, Newtonian and non-Newtonian fluids, variation of viscosity with temperature; surface tension-surface tension on liquid droplet, hollow bubble and liquid jet; capillarity-capillary rise and capillary fall.

Pressure Measurement: Fluid Pressure at a Point; Pascal’s law, Hydrostatic law, Atmospheric, Absolute, gauge, atmospheric and vacuum pressures; Hydrostatic paradox; Pressure measurement – manometers- Simple, differential and Micro Manometers; vapour pressure and cavitation.

MODULE -2: HYDROSTATIC FORCES AND BUOYANCY 8H

Hydrostatic forces on surfaces: Total Pressure and Centre of Pressure- on Horizontal Plane Surface; Vertical Plane Surface; Inclined Plane Surface and Curved Surfaces.

Buoyancy: Buoyancy; Buoyant Force and Centre of Buoyancy, Stability of submerged bodies and floating bodies; Metacentre and metacentric height, analytical method for metacentric height.

MODULE-3: KINEMATICS OF FLUID FLOW 8H

Kinematics of Fluid Flow: Introduction, Methods of describing fluid motion; Classification of fluid flow; Steady, unsteady, uniform and non-uniform flows; Laminar and turbulent flows; three, two and one dimensional flows; Irrotational and rotational flows. Streamline; Pathline; Streakline.

Rate of flow, continuity equation, continuity equation in three dimension, equation for velocity and acceleration, Local acceleration, convective acceleration; Velocity potential and stream function; relation between stream function and velocity potential function; equipotential line, Flow net. Vortex flow – free vortex and forced vertex flow.

MODULE-4: DYNAMICS OF FLUID FLOW 8H

Dynamics of Fluid flow: Forces acting on a Fluid in Motion; Equations of motion; Euler’s equation of motion; Bernoulli’s equation; assumptions; Energy correction factor; Momentum principle. Practical applications of Bernoulli’s equation: Venturimeter, Rate of flow through venturimeter, inclined venturimeter; Orifice meter, Rate of flow through Orifice Meter; Rate of flow through flow nozzle; Measurement of velocity by Pitot tube, Pitot-static tube; Force exerted by a flowing fluid on a pipe bend.

MODULE-5: ORIFICES, MOUTHPIECES, NOTCHES AND WEIRS 8H

Orifices and Mouthpieces: Orifice-Classification of Orifices; Flow through an orifice, Hydraulic co- efficients, Determination of coefficients for an Orifice, Flow through large rectangular Orifice; Flow through submerged Orifice – fully sub-merged and partially sub-merged. Mouth piece-Classification of Mouthpieces, Flow through external and internal cylindrical Mouthpiece.

Notches and Weirs: Introduction, Classification of Notches and Weirs, Flow through rectangular,

Triangular and trapezoidal notches and weirs; End contractions; Velocity of approach; Cipolletti weir; Discharge over Broad crested weir, narrow crested weir and submerged weir.

MODULE-6: FLOW THROUGH PIPES

8H

Flow through pipes: Energy losses in pipelines; loss of energy due to friction-Darcy Weisbach equation; Minor energy losses in pipelines; Hydraulic Grade Line and Total Energy Line; Siphon; Pipes in series, concept of equivalent length; pipes in parallel & branched pipes.

Laminar & Turbulent flow in pipes: Reynolds's experiment; Characteristics of laminar flow; Steady laminar flow through a circular pipe (Hazen poiseuille equation). Characteristics of turbulent flow, Prandtl's mixing length theory, Hydro dynamically smooth and rough boundaries, Velocity distribution, and friction factor for pipe flow.

Text Book(s):

1. Modi P N and Seth S M, —Hydraulics and Fluid Mechanics, Standard Book House, Delhi, 1998.
2. A text of Fluid mechanics and hydraulic machines by Dr.R.k.Bansal – Laxmi Publications (P) Ltd., New Delhi.
3. Rajput .R.K, “Fluid Mechanics and Hydraulic Machines”, S.Chand and Company Ltd.,2005.
4. S.K.Som&G.Biswas “Introduction to Fluid Machines” (Tata Mc.Grawhill publishers Pvt. Ltd.) 3rd Edition, 2011.

Reference Book(s):

1. C.S.P. Ojha, R. Berndtsson, and P.N. Chandramouli, “Fluid Mechanics and Machinery”, Oxford University Publication, 2010.
2. F.M. White. “Fluid Mechanics”, 5th Edition New York McGraw-Hill, 2003.
3. Y.A. Cengel and J.M. Cimbala. “Fluid Mechanics”, Tata McGraw-Hill Publishing Company limited, 2006.
4. J.F.Douglas, J.M. Gaserek and J.A.Swaffird, “Fluid Mechanics” Prentice Hall 4th Edition, 2000.
5. Mohhanty A K, _Fluid Mechanics‘Second Edition, Prentice Hall of India Private Limited, New Delhi, 2010.

4. BUILDING CONSTRUCTION AND PLANNING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-----|
| | L | T | P | | | C | CIE | SEE |
| III | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

MODULE - 1: COMPONENTS OF BUILDING I 8H

Foundations: components of a building, Concept of foundations; Factors affecting selection of foundations; requirements of a good foundation; Types of foundations-shallow foundations, deep foundations; causes of failures of foundations.

Masonry: Introduction, terms used in masonry; stone masonry-classification of stone masonry; brick masonry-terms used in brick masonry, bonds in brick masonry, supervision of brick work, defects in brick work. Partition walls.

Floors: components of ground floor, selection of flooring material, materials used for flooring, types of flooring.

MODULE – 2: COMPONENTS OF BUILDING II 8H

Arches: Introduction, technical terms, stability of an arch, types of arches; **Lintels:** Introduction, classification of lintels. Stairs: Technical terms, requirement of a good stair, dimension of a step, types of stairs; Elevators, Escalators.

Doors and windows: Introduction, location of doors and windows; Doors-size of doors, door frames, types of doors; windows-Introduction, types of windows; ventilators.

Roofs: Introduction, types of roofs; Pitched roof-Basic elements of pitched roof, types of pitched roofs, trusses, roof covering materials, light weight roofing; flat roofs-advantages, types; curved roofs.

MODULE 3: FINISHINGS, TREATMENT AND SUPPORTING STRUCTURES 8H

Pointing: Introduction, preparation of surface, method of pointing, types of pointing's; Plastering: Introduction, terminology, no of coats of plastering, methods of cement plastering, types of plastering finishes, defects in plastering.

Damp Proofing: Introduction, causes, effects, materials used for damp proofing, methods of damp proofing, DPC treatment in buildings; **Water Leakages:** Reasons, preventive measures, water proofing of flat roofs. **Termite proofing:** Types of termites, anti-termite treatment.

Scaffolding: Introduction, component parts and types; **Shoring:** Introduction, types; **Form work:** introduction, requirements of good form work, cost of form work, material used for preparing form work, form work for-column footings, columns, beam and slab, stairs, walls; removal of form work, failure of form work.

MODULE - 4: VENTILATION AND ACOUSTICS 7H

Ventilation: Introduction, functional requirements of ventilation system, types of ventilation; air conditioning, essentials of comfort air conditioning, systems of air conditioning,, essentials of air conditioning system.

Acoustics: introduction, sound in enclosures, reflection of sound, defects due to reflected sound, absorption of sound, absorbents, absorbent materials, common acoustical defects, acoustical design of halls, sound insulation-wall insulation, floors and ceiling insulations.

MODULE - 5: PLANNING AND REGULATIONS OF BUILDINGS 8H

Planning of Buildings: Types of buildings, types of residential buildings, site selection for residential building; Space requirement for a building-point to be considered, determining areas for different units of buildings, roominess,flexibility,sanitation-lighting,cleanliness,ventilation,sanitary facilities; grouping. Circulation, orientation-aspect and prospect, privacy, elegance, economy.

Building Byelaws and Regulations: Introduction, Terminology ,Objectives of building byelaws, Minimum plot sizes, Open space requirements, Plinth area, floor area, carpet area, Floor area ratio (FAR), Floor space Index (FSI), Principles underlying building byelaws, built up area limitations – Height of Buildings ,Wall thickness, lighting and ventilation requirement; safety from fire, drainage and sanitation, applicability of the bye-laws.

MODULE - 6: PLANNING OF BUILDINGS 9H

Planning of Residential Buildings: Minimum standards for various parts of buildings, requirements of different rooms and their grouping, characteristics of various types of residential buildings.

Planning of Public Building: Planning of Educational institutions, Hospitals, Office buildings, Banks, Industrial buildings, Hotels and Motels, Hostels, Bus Station.

Text Book(s):

- 1.Sanga Reddy and Meyyappan – Construction management – Kumaran Publications.
- 2.Joseph L. Massie, Essentials of Management, Prentice Hall of India.
- 3.Cholt and Dhir – Construction Management
4. L.Sharma Construction Management and Accounts-Satyaprakashan, Tech India Publications.

Reference Book(s):

- 1.C.P.W.D. ManualsPublic Works Accounts Code, PWD, Tamilnadu
- 2.KumarNeerajJha, Construction Project Management -Theory and Practice, Pearson publications, 2nd edition, 2012.
- 3.JimmieHinze, Construction Contracts, McGraw hill education, 2013.
4. Joseph T. Bockreth, Contracts and Legal environment, McGraw hill education, 2013.

5.

SURVEYING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| III | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

MODULE – 1: BASIC CONCEPTS & CHAIN SURVEYING 8 H

Basic concepts: Surveying – History, primary divisions, Classification, Principles of surveying, Basic Measurements; Instruments and Basic methods; units of measurement, Plan and map, Scales. Errors-Accuracy and Precision, Sources and types of errors. **Chain Surveying:** Principles of chain survey, Methods of measuring distance, Direct and indirect ranging, Metric chains, Chaining on plane and sloping ground, Instruments for setting out right angles, Basic problems in chaining, Chaining past obstacles, Cross-staff survey, Plotting of chain survey, Errors.

MODULE – 2: COMPASS SURVEY & PLANE TABLE SURVEYING 8 H

Compass survey: Introduction, Bearings and angles, Designation of bearings, fore bearing and back bearing, Theory of Magnetic compass (i.e. prismatic compass), Measurement of bearings of lines, Open and closed traverse, calculation of included angles, plotting of a traverse, Magnetic Declination, Local attraction-Related Problems, Errors in compass survey. **Plane table surveying:** Introduction, Accessories, Working operations, Methods of plane tabling, Two point and Three point problems.

MODULE – 3: LEVELLING 8 H

levelling: Introduction, basic definitions, methods of levelling, levelling instruments-dumpy level, levelling staff, Sensitivity of a Level tube, Temporary adjustments of dumpy level, theory of simple and differential levelling, Classification of direct levelling methods, Calculation of reduced levels by height of instrument and rise & fall methods, Reciprocal levelling, Profile levelling and Cross sectioning, Curvature and Refraction, Difficulties in levelling, errors in levelling, Degree of Precision.

MODULE – 4: CONTURING & COMPUTATION OF AREAS AND VOLUMES 8 H

Contouring: Introduction, contour interval, Characteristics of contours, Methods of locating contours - Direct and indirect methods, Contour gradient, Uses of contour maps. **Areas:** methods of determining areas, areas by sub-division into triangles, areas from offsets to a base line-regular and irregular intervals, Simpson's rule, area by double meridian distances, area by co-ordinates. **Volumes:** embankments and cutting for a level section, two level sections, three level section and multi-level section, prismoidal formula, trapezoidal formula, volume from spot levels, volume of earth work from contour plan, capacity of a reservoir.

MODULE – 5: THEODOLITE TRAVERSING**8 H**

Theodolite: Vernier Theodolite, Basic definitions, Fundamental lines and desired relations; Temporary adjustments; Measurement of a horizontal angle, Repetition and Reiteration methods of horizontal angle measurement, Measurement of vertical angle. **Traverse surveying:** Introduction, Selection and marking of traverse stations, methods of traversing, traversing by free needle and fast needle method, traversing by direct observation of angles, checks in closed traverse, closing error, methods of balancing the traverse, Omitted measurements.

MODULE – 6: TRIGONOMETRIC LEVELLING & MINOR INSTRUMENTS**8 H**

Trigonometric levelling : Introduction; Determination of the level of the top of an object, When its base is accessible and When its base is not accessible; Determination of the height of the object when the two instrument stations are not in the same vertical plane; Axis signal correction; Difference in elevation by single observation and reciprocal observations. **Minor instruments:** uses and working of the minor instrument-Box sextant, Planimeter, Pentagraph, Clinometers.

TEXT BOOKS

1. Surveying Vol. 1 & II by Dr. K. R. Arora, Standard Book House.
2. Surveying Vol. I & II by B.C. Punmia, Laxmi Publications.

REFERENCE BOOKS

1. Text book of surveying by C.Venkataramaiah, Universities Press.
2. Plane Surveying by Chandra AM, New age International Pvt.Ltd.
3. Surveying Vol. I &II byS.K. Duggal, McGraw Hill Education (India) private limited.
4. Surveying and Levelling by Kanetkar T.P., and Kulkarni, Vols. I and II, United Book Corporation.
5. Surveying and levelling by R.Subramaniah, Oxford university press.
6. Surveying by Mimi Das Saikia, PHI Publications.

6. BUILDING DRAWING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| III | 0 | 0 | 3 | 48 | 1.5 | 40 | 60 | 100 |

Task-1: Drawing of Conventional signs for building materials and symbols for Electrical, sanitary installations and fittings.

Task-2: Drawing of Various Bonds in Brick Work.

Task-3: Structural detailing of Beam, isolated footing and column.

Task-4: Drawing of Fully panelled door / partly glazed and wooden panelled door – Elevation and cross section

Task-5: Drawing of Fully panelled window / fully glazed window – Elevation and cross section

Task-6: Drawing of Dog legged staircase – Plan and Sectional Elevation

Task-7: Drawing of King post / Queen post trusses.

Task-8: Draw Plan, Elevation & Section of the Residential building – Single Bedroom and Hall (Load bearing wall structure) for the given line sketch and specifications.

Task-9: Draw Plan, Elevation & Section of the Residential building- double bedroom, Living room, Kitchen with open veranda(Load bearing wall structure)for the given line sketch and specifications.

Task-10: Draw Plan, Elevation & Section ofthe office building for the given line sketch and specifications.

Task-11: Draw Plan, Elevation & Section ofthe School building for the given line sketch and specifications.

ADDITIONAL DRAWINGS

Task-12: Draw Plan, Elevation & Section of the two storied residential building for the given line sketch and specifications.

Task 13:Electrical, plumbing, gas lines for a residential building as per B.I.S

Task 14: Drawing plan, elevation and section of an industrial building for the given line sketch and specifications

Text Book(s):

1. Building Planning and Drawing by Dr.N. Kumara Swamy and A.Kameswara Rao, Charotar Publishing House.
2. Building Planning Drawing and Scheduling by Gurucharansingh and Jagadish Singh, Standard Publishers Distributors.

Reference Book(s):

1. Building Drawing with an integrated approach to Built environment by M.G.Shah, C.M.Kale and S. Y.Patki, McGraw-Hill Publishing Company Limited, New Delhi.
2. Civil Engineering Drawing Series 'B' by R.Trimurty, M/S Premier Publishing House.

7. SURVRYING LAB

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| III | 0 | 0 | 3 | 45 | 1.5 | 40 | 60 | 100 |

Task 1 - Setting out works – Foundation marking using tapes single Room and Double Room

Task 2 - Simple chain survey – calculation of area using cross staff-Perpendicular offset

Task 3 - Simple chain survey – calculation of area using cross staff-oblique off Set

Task 4 - Determine of distance between two inaccessible points with compass

Task 5 - Reduction of levels: (i) Height of collimation method

Task 6 - Reduction of levels: (ii) Rise and fall method

Task 7 - Levelling – Longitudinal and cross-section and plotting

Task 8 - Surveying of a given area by prismatic compass (closed traverse) andplotting after adjustment

Task 9 - Correction for Local Attraction by Prismatic Compass

Task 10 - Radiation method, intersection methods by plane table survey .

Task 11 - Two point problems in plane table survey

Task 12 -Two exercises on contouring

ADDITIONAL EXPERIMENTS

Task 13 - Three point problems in plane table survey

Task 14 - An Exercise of Longitudinal Section andCross Section and Plotting.

Task 15 - Chaining across obstacles .

Text Book(s):

1. S.S. Bhavikatti, “ Surveying theory & Practice”, 2nd edition, Dreamtech press, wiley distributors.
2. C. Venkataramaiah, “ Text book of surveying”, 2nd edition, university press, 2018.

Reference Book(s):

1. Arora K R “Surveying” Vol 1,2& 3, Standard book house, Delhi, 2004.

8. STRENGTH OF MATERIALS LAB

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| III | 0 | 0 | 3 | 48 | 1.5 | 40 | 60 | 100 |

TASK-1 - Tension test on mild steel bar.

TASK -2 - Double shear test on mild steel bar

TASK -3 - Torsion test on mild steel bar

TASK-4 - Izode Impact test

TASK-5 - Charpy Impact test.

TASK-6 - Rockwell Hardness test.

TASK-7 – Brinell hardness test.

TASK-8 - Determination of modulus of rigidity of springs – close coiled and open coiled.

TASK-9 - Fatigue strength test

TASK -10 - Bending test of wooden / steel beam – determination of flexural strength and Modulus of elasticity

TASK-11 - Compression test on wood and brick.

TASK-12 - Verification of Clark-Maxwell's theorem.

ADDITIONAL EXPERIMENTS

TASK-13 - Tension test on HYSD bar.

TASK -14 - Rockwell Hardness test for Aluminum

Text Books:

1. Gere, J. M. Mechanics of Materials. Brooks/Cole Thomson Learning.

Reference Books:

1. Popov, E. P. Engineering Mechanics of Solids. Prentice-Hall of India Limited, New Delhi, India
2. Timoshenko, S. P. and Young, D. H. Elements of strength of materials. East-West Press Private Limited, New Delhi, India
2. Case, J., Chilver, L. and Ross, C. T. F. Strength of Materials and Structures. Elsevier, New Delhi.

9. SURVEYING AND GEOMATICS

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-----|
| | L | T | P | | | C | CIE | SEE |
| IV | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

MODULE – 1: TACHEOMETRIC SURVEYING 7 H

Tacheometric surveying: Definition, Advantages of tachometric surveying, Basic systems of tacheometric measurement, Principle of stadia measurements, Determination of constants K and C, Inclined sight with staff vertical, Inclined sight with staff normal to the line of sight, Movable hair method, Tangential method, Subtense bar, Errors in tachometry.

MODULE – 2: TRIANGULATION & SETTING OUT WORKS 8 H

Triangulation: Principles of triangulation, Uses of triangulation survey, Classification of triangulation, operations of triangulation survey, Signals and towers, Satellite station, Base line & Extension of the base line. **Setting out works:** Introduction, Control stations; Horizontal control, Reference grid, Vertical control, Positioning of a structure; offset pegs, Setting out a foundation- reference pillars, batter boards, Setting out with a theodolite; Graded stakes; setting out a sewer; Setting out a culvert.

MODULE – 3: CURVES 8 H

Curves: Simple curves–Definitions and Notations, designation of a curve, Elements of simple curves, location of tangent points, selection of peg interval, Methods of setting simple curves(based on equipment) – Rankines method, Two theodolite method. Compound curves – Elements of compound curve, setting out compound curve. Reverse curves – Elements of reverse curve, relationship between various elements.

MODULE – 4: PHOTOGRAMMETRY SURVEYING 8 H

Photogrammetry Surveying: Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereoplottling instruments, mosaics, map substitutes.

MODULE – 5: MODERN FIELD SURVEY SYSTEMS 8 H

Modern Field Survey Systems: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories – Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.

MODULE – 6: CONCEPTS OF REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS 9 H

Remote Sensing: Concept of remote sensing, Principles of remote sensing, Components of remote sensing, Elements in remote sensing, Platforms for remote sensing, Types of remote

sensing, Remote sensing systems, The principle steps used to analyse remotely sensed data, Data reception, transmission and processing. **Geographic Information Systems (GIS)**: Definition, Objectives of GIS, Components of GIS, GIS architecture, Data – Raster and vector data processing methods, Data input , Data storage and retrieval, Data manipulation and analysis, Data output, Applications of GIS in Civil Engineering.

TEXT BOOKS

1. Surveying, Vol- II and III by Arora, K.R., Standard Book House.
2. Advanced Surveying: Total Station, GIS and Remote Sensing by Madhu, N, Sathikumar, R and SatheeshGopi, Pearson India.
3. Surveying Vol. I & II by B.C. Punmia, Laxmi Publications

REFERENCE BOOKS

1. Geomatics Engineering by Manoj, K. Arora and Badjatia, Nem Chand & Bros.
2. Surveying and Levelling, Vol. I and II by Bhavikatti, S.S., I.K. International.
3. Higher Surveying by Chandra, A.M., New Age International (P) Limited.
4. Remote sensing and Geographical information system by Anji Reddy, M., B.S. Publications.

10. HYDRAULICS ENGINEERING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-----|
| | L | T | P | | | C | CIE | SEE |
| IV | 2 | 1 | 0 | 48 | 3 | 40 | 60 | 100 |

MODULE 1: Flow in Open Channels 9 H

Introduction, Classification of flows, types of channels, velocity distribution, the chezy equation, empirical formulae for the chezy constant; most economical section of channel, most economical Rectangular, Triangular channel sections; most economical trapezoidal channel section, Best side slope for most economical trapezoidal channel section; most economical circular channel section for maximum velocity and maximum discharge conditions.

Concept of specific energy, Specific energy curves; critical depth, critical velocity, Critical flow, Critical flow in a rectangular channel, Critical slope, discharge curve; Different slope conditions.

MODULE 2: Non-Uniform Flow in Open Channels 8 H

Gradually Varied Flow: Introduction, Dynamic equation; Dynamic equation for GVF in wide Rectangular channel, classification of channel bottom slopes, Surface Profiles; Characteristics of surface profiles, Back water Curves and Draw down curves; Computation of surface profiles by single step method.

Rapidly Varied Flow: Hydraulic jump; Elements and characteristics of hydraulic jump; Hydraulic jump in rectangular channels, height and length of the jump, Energy loss in a hydraulic jump, Types of hydraulic jump; applications of hydraulic jump.

MODULE 3: Impact of Jets & Impulse Turbine 8 H

Impact of Jets: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for Work done and efficiency. (5h)

Impulse Turbine: Hydraulic Turbines - Introduction, layout of a hydro power plant, head and efficiencies of hydraulic turbines, Classification of hydraulic turbines; Pelton turbine- Introduction, parts, Velocity triangles, work done and efficiency, working proportions, design of Pelton wheel.

MODULE 4: Reaction Turbines 8 H

Radial flow Reaction Turbine: velocity triangles and work done for inward radial flow turbine, degree of reaction, discharge, speed ratio, flow ratio. Francis turbine: main components and working, work done and efficiencies, design proportions.

Axial flow Reaction Turbine: Kaplan turbine- main components and working, working proportions; Draft tube-types of draft tubes, draft tube theory and efficiency of draft tube; Cavitation: causes, effects.

MODULE 5: Centrifugal Pumps & Dimensional Analysis 8 H

Centrifugal Pumps: Introduction, component parts and working of a centrifugal pump, work done by the impeller; heads, losses and efficiencies; minimum starting speed, Priming, specific speed, limitation of suction lift, net positive suction head(NPSH); Cavitation effects, Multistage centrifugal pumps.

Dimensional Analysis and Similitude: Introduction, derived quantities, Dimensional homogeneity; Methods of dimensional analysis- Rayleigh's method, Buckingham–Pi theorem; model analysis; similitude - types of similarities; Dimensionless numbers; Model laws.

MODULE 6: Sub-Merged Bodies 7 H

Sub-merged bodies: Introduction, force exerted by a flowing fluid on a stationary body, Expression for drag and lift; drag on sphere, terminal velocity of a body; Development of lift on airfoil.

Boundary layer theory: concepts, Prandtl's contribution, Characteristics of boundary layer along a thin flat plate, laminar and turbulent Boundary layers, separation of Boundary layer, Methods of preventing the separation.

Text Books:

- (1) Fluid Mechanics, Hydraulic and Hydraulic Machines by Modi & Seth, Standard book house.
- (2) A text of Fluid mechanics and hydraulic machines by Dr.R.K.Bansal – Laxmi Publications (P) Ltd., New Delhi.

Reference Book(s):

- (1) Fluid mechanics and Fluid Machines by Rajput, S.Chand& Co.
- (2) Flow in Open channels by K.Subramanya. Tata McGrawHill Publishers.
- (3) Open channel Hydraulics, VenTe Chow, Tata McGraw Hill Publishing Co. Ltd, New Delhi.
- (4) Elements of Open channel flow, Ranga Raju, Tata Mc.Graw Hill, Publications.

12. Geotechnical Engineering-I

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| IV | 3 | 0 | 3 | 48 | 3 | 40 | 60 | 100 |

MODULE – 1 Introduction and Index Properties of Soils 8 H

Introduction Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass-volume relationship – Relative density. Index Properties of Soils Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – I.S. Classification of soils and unified soil classification .

MODULE -2 Permeability Soil water 8 H

Permeability Soil water – capillary rise – flow of water through soils – Darcy’s law permeability– Factors affecting permeability – laboratory determination of coefficient of permeability – Permeability of layered soils –Insitu permeability tests (Pumping in & Pumping out test)

MODULE-3 Effective Stress & Seepage 8 H

Effective Stress & Seepage through Soils Total, neutral and effective stress –principle of effective stress - quick sand condition – Seepage through soils – 2-D flow and Laplace’s Equation –Flownets: Characteristics and Uses.

MODULE-4 Compaction Mechanism 8 H

Compaction Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.

MODULE-5 Consolidation Types of compressibility 8 H

Consolidation Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log p curves – normally consolidated soil, over consolidated soil and under consolidated soil - preconsolidation pressure and its determination - Terzaghi’s 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time

MODULE-6 Importance of shear strength 8 H

Importance of shear strength– Mohr’s– Coulomb Failure theories – Types of laboratory strength tests – strength tests based on drainage conditions – Shear strength of sands - dilatancy– Critical Void Ratio – Liquefaction- shear strength of clays.

Text Book(s):

1. Basic and Applied Soil Mechanics by GopalRanjan & ASR Rao, New age International Pvt. Ltd, New Delhi. 6th Edition, 2014

2. Principals of Geotechnical Engineering by BrajaM.Das, Cengag e LearningPublishers, 7th Edition,2014
3. Geotechnical Engineering: Principles and practices of soil mechanics andfoundation Engineering by VNS Murthy, Taylor & Francis Group,13th Edition,2015

Reference Book(s):

1. Geotechnical Engineering by C. Venkataramiah, New age International Pvt.Ltd, 7th Edition, 2013.
2. Geotechnical Engineering by ManojDutta&Gulati S.K – Tata Mc.GrawhillPublishers New Delhi, 12th Edition,2013.
3. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers andDistributors, Delhi., 12th Edition,2012
4. Soil Mechanics and Foundation by byB.C.Punmia, Ashok Kumar Jain andArun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi,13th Edition ,2015

12. STRUCTURAL ANALYSIS

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| IV | 3 | 0 | 3 | 48 | 3 | 40 | 60 | 100 |

Module 1: Statically indeterminate Beams and Frames 8 H

Determinateness of structures, stability and indeterminacy, External and Internal Redundancy
 Methods of Analysis-Force Method and Displacement Method. Clapeyron's Theorem of Three
 Moments, Application of theorem for -General Loading, Fixed Beams, Sinking of supports.
 (Involving not more than 3 unknowns)

Castigliano's Second Theorem, Application of theorem for -General Loading, Fixed Beams,
 Sinking of supports and frames. (Involving not more than 3 unknowns)

Module 2: Analysis of Indeterminate Structures 8 H

Slope Deflection Method, sign conventions, development of slope deflection equations,
 modification for simple ends, Application to beams and sway and non-sway Frames. (Involving
 not more than 3 unknowns)

Moment Distribution Method, Carry over moment, distribution factors, fixed end moments,
 modification of stiffness for simple ends, Application to beams and sway and non-sway frames.
 (Involving not more than 3 unknowns)

Module 3: Flexibility Method 8 H

Fundamental concepts, formulation of flexibility matrix, application to beams and sway and non-
 sway frames. (Involving not more than 3 unknowns)

Application to pin jointed plane trusses. (Involving not more than 3 unknowns).

Module 4: Stiffness Method 8 H

Fundamental concepts, formulation of stiffness matrix, application to beams using member
 approach. (Involving not more than 3 unknowns)

Application to sway and non-sway frames. (Involving not more than 3 unknowns)

Module 5: Three Hinged Arches and Influence Line Diagram 8 H

Influence Line Diagram: Basic concepts, influence line diagram for reactions, shear and bending
 moment for simply supported and overhanging beams.

Three Hinged Arches: Concept, analysis of parabolic and semicircular arch with supports at
 same and different levels. Horizontal thrust, radial shear and normal thrust for parabolic and
 semicircular arch.

Module 6: Approximate Methods of Analysis 8 H

Approximate methods of analysis of multistoried multi-bay 2-D rigid jointed frames by
 substitute frame method.

Approximate methods of analysis of multistoried multi-bay 2-D rigid jointed frames by portal method and cantilever method.

Text books:

1. Mechanics of Structures Vol. II - S.B. Junnerkar and H.J. Shaha, Charotar Publishing House
2. Theory of Structures- B.C.Punmia, Ashok kumar Jain and Arun Kumar Jain, Laxmi Publications (P) Ltd.
3. Structural Analysis- Madan Mohan Das, Bhargab Mohan Das and Mimi Das Saikia, PHI Learning Private Ltd.
4. Structural Analysis- S.S.Bhavikatti, Vikas Publishing House Pvt. Ltd.

Reference books:

1. Intermediate Structural Analysis- C.K.Wang, Tata Mc Graw Hill Education Pvt. Ltd. New Delhi
2. Structural Analysis- R.C.Hibbler , Pearson
3. Matrix Methods of Structural Analysis- Dr. A.S.Meghre and S.K.Deshmukh, Charotar Publishing House

13. SURVRYING AND GEOMATICS LAB

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-----|
| | L | T | P | | | C | CIE | SEE |
| IV | 0 | 0 | 3 | 48 | 1.5 | 40 | 60 | 100 |

Task 1 - Measurement of horizontal and vertical angles theodolite by method of repetition & reiteration method.

Task 2 - Determination of horizontal distance between two inaccessible points with theodolite.

Task 3 - Locating given building by theodolite traversing.

Task 4 - Determination of elevation of point by trigonometric levelling.

Task 5 - Height and distances using principles of tachometric surveying

Task 6 - To set out a simple circular curve by Rankine's method

Task 7 - To study the various electronic surveying instruments like EDM, Total Station etc.

Task 8 - Determine of area using total station

Task 9 - Traversing using total station.

Task 10 - Contouring using total station.

Task 11- To take measurements using ASD Spectrometer.

Task 12- To take measurements using ASD Field Spec range.

Task 13- To detect natural energy that is reflected from the observed scene.

Additional experiments

Task 16 - Contour plan of given area.

Task 17 - To give layout of given plan of building.

Task 18 - Determination of remote height using total station.

Text Books:

1. S.S. Bhavikatti, "Surveying theory & Practice", 2nd edition, Dreamtech press, wiley distributors.
2. C. Venkataramaiah, "Text book of surveying", 2nd edition, university press, 2018.

Reference Book(s):

3. Arora K R "Surveying" Vol 1, 2& 3, Standard book house, Delhi, 2004.

14.**Hydraulics Engineering lab**

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| IV | 0 | 0 | 3 | 48 | 1.5 | 40 | 60 | 100 |

Task- 1. Calibration of Venturimeter .

Task- 2. Calibration of Orifice meter

Task- 3. Determination of Coefficient of discharge for an external mouth piece by variable head method.

Task- 4. Calibration of contracted Rectangular Notch and /or Triangular Notch.

Task- 5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.

Task- 6. Verification of Bernoulli's equation.

Task- 7. Impact of jet on vanes.

Task- 8. Study of Hydraulic jump.

Task- 9. Performance test on Pelton wheel turbine.

Task- 10. Performance test on Francis turbine.

Task- 11. Efficiency test on centrifugal pump.

Task- 12. Determination of Coefficient of discharge for a small orifice by a constant head method.

Text Books:

- (1) Fluid Mechanics, Hydraulic and Hydraulic Machines by Modi & Seth, Standard book house.
- (2) A text of Fluid mechanics and hydraulic machines by Dr.R.K.Bansal – Laxmi Publications (P) Ltd., New Delhi.

Reference Book(s):

- (1) Fluid mechanics and Fluid Machines by Rajput, S.Chand& Co.
- (2) Flow in Open channels by K.Subramanya. Tata McGrawHill Publishers.
- (3) Open channel Hydraulics, VenTe Chow, Tata McGraw Hill Publishing Co. Ltd, New Delhi.
- (4) Elements of Open channel flow, Ranga Raju, Tata Mc.Graw Hill, Publications.

15.**Structural Analysis practice**

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| IV | 0 | 0 | 3 | 48 | 1.5 | 40 | 60 | 100 |

Task 1: Statically indeterminate Beams and Frames

Practice problems on Determination of degree of indeterminacy, Clapeyron's Theorem of Three Moments and Castigliano's Second Theorem for General loading (involving not more than 3 unknowns)

Task 2: Analysis of Indeterminate Structures

Practice problems on Slope Deflection Method and Moment Distribution Method applied to beams and sway and non-sway Frames. (Involving not more than 3 unknowns)

Task 3: Flexibility Method

Practice problems on Flexibility Method applied to beams, pin jointed trusses and sway and non-sway frames. (Involving not more than 3 unknowns)

Task 4: Stiffness Method

Practice problems on Stiffness Method applied to beam and sway and non-sway frames. (involving not more than 3 unknowns)

Task 5: Three Hinged Arches and Influence Line Diagram

Practice problems on Influence Line Diagram for reactions, shear and bending moment for simply supported and overhanging beams.

Practice problems on Three Hinged Parabolic and Semicircular Arches to determine Horizontal thrust, radial shear and normal thrust

Task 6: Approximate Methods of Analysis

Practice problems on approximate methods of analysis of multistoried multi-bay 2-D rigid jointed frames by substitute frame method, portal method and cantilever method.

Text books:

5. Mechanics of Structures Vol. II - S.B. Junnerkar and H.J. Shaha, Charotar Publishing House
6. Theory of Structures- B.C.Punmia, Ashok kumar Jain and Arun Kumar Jain, Laxmi Publications (P) Ltd.
7. Structural Analysis- Madan Mohan Das, Bhargab Mohan Das and Mimi Das Saikia, PHI Learning Private Ltd.
8. Structural Analysis- S.S.Bhavikatti, Vikas Publishing House Pvt. Ltd.

Reference books:

4. Intermediate Structural Analysis- C.K.Wang, Tata Mc Graw Hill Education Pvt. Ltd.
New Delhi
5. Structural Analysis- R.C.Hibbler , Pearson Matrix Methods of Structural Analysis- Dr.
A.S.Meghre and S.K.Deshmukh, Charotar Publishing House

Open Elective Subjects

16. DISASTER MANAGEMENT AND MITIGATION

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-----|
| | L | T | P | | | C | CIE | SEE |
| IV | 3 | 0 | 0 | 45 | 3 | 40 | 60 | 100 |

MODULE-1: ENVIRONMENTAL HAZARDS & DISASTERS

8H

Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.

MODULE-2: TYPES OF ENVIRONMENTAL HAZARDS & DISASTERS

7H

Natural hazards and Disasters – Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters – Extra Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards – Exogenous Hazards.

MODULE-3: ENDOGENOUS HAZARDS

7H

Volcanic Eruption – Earthquakes – Landslides – Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions – Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India - - Human adjustment, perception & mitigation of earthquake.

MODULE-4: EXOGENOUS HAZARDS/ DISASTERS

8H

Infrequent events- Cumulative atmospheric hazards/disasters Infrequent events: Cyclones – Lightning – Hailstorms Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes,distribution human adjustment, perception &mitigation)Cumulative atmospheric hazards/ disasters : - Floods- Droughts- Cold waves- Heat waves. Floods:- Causes of floods- Flood hazards India- Flood control measures (Human adjustment, perception &mitigation).Droughts:- Impacts of droughts- Drought hazards in India- Drought control measures- Extra Planetary Hazards/ Disasters- Man induced Hazards /Disasters- Physical hazards/ Disasters.

MODULE-5: SOIL EROSION

8H

Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion-Conservation measures of Soil Erosion. Chemical hazards/ disasters:-- Release of toxic chemicals, nuclear explosion- Sedimentation processes. Sedimentation processes:-Global Sedimentation problems- Regional Sedimentation problems- Sedimentation &Environmental problems- Corrective measures of Erosion & Sedimentation. Biological hazards/ disasters:- Population Explosion.

MODULE-6: EMERGING APPROACHES IN DISASTER MANAGEMENT- THREE STAGES

7H

1. Pre- disaster stage (preparedness)
2. Emergency Stage
3. Post Disaster stage-Rehabilitation

Text Book(s):

1. Disaster Management by Rajib Shah, Universities Press, India, 2003
2. Disaster Science and Management by Tushar Bhattacharya, TMH Publications.
3. Disaster Mitigation: Experiences And Reflections by Pardeep Sahni
4. Natural Hazards & Disasters by Donald Hyndman & David Hyndman – Cengage Learning

Reference Book(s):

1. The Environment as Hazards by Kates, B.I & White, G.F, Oxford Publishers, New York, 1978
2. Disaster Management by R.B. Singh (Ed), Rawat Publication, New Delhi, 2000
3. Disaster Management by H.K. Gupta (Ed), Universiters Press, India, 2003
4. Space Technology for Disaster Mitigation in India (INCED) by R.B. Singh,, University of Tokyo,1994.

17. GREEN BUILDINGS

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| IV | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

MODULE – 1: INTRODUCTION HISTORICAL PERSPECTIVE BUILDINGS 8H

Conventional versus Green Buildings – Comparison. Minor and major aspects of Green Buildings – The Integrated Design Process. GreenBuilding Documentation Requirements. Conventional - Contemporary and Future Ecological Design – Green Design to Regenerative Design.

MODULE -2:GREEN BUILDING SYSTEMS 8H

Sustainable sites and landscaping – Enhancing ecosystems. Building envelopes – selection of green materials, products and applications. Passive design strategies. Internal loadreduction – Indoor environment quality Building water and waste water management. Use of LEED / IGBC standards

MODULE-3: GREEN BUILDING IMPLEMENTATION 8H

Site Planning, Health and Safety Planning, Construction and Demolition. Waste Management – Reducing the Footprint of Construction Operations – Maximizingthe Value of Building Commissioning. HVAC Systems, Lighting and cleaning systems for green buildings. Costs and Benefits of Building Commissioning – use of LEED/ IGBC standards

MODULE-4:GREEN BUILDING ASSESSMENT 8H

International Building Assessment Systems – The USGBC/ LEED Building Assessment Standard – The LEED Certification Process – The Green Globes Building Assessment Protocol- Example of a Platinum / Gold / Silver Building. Comparison of present Building Rating Systems – Code compilation requirements – LeedGriha

MODULE-5:ECONOMICS OF GREEN BUILDINGS 8H

Economic aspects of Green Buildings – Quantifying Green Building Benefits Managing Costs and Barriers Short and long term environment benefits. Some typical case studies of Green Buildings.

MODULE-6: NOISE CONTROL 8H

Characteristics and effect of noise - source and control of noise in buildings of various types - planning and design against outdoor and indoor noise. Noise contour.

Text Book(s):

1. Jerry Yudelson, "Green Buildings A to Z", Understanding the buildings, www.newsociety.com, 2008.
2. Jerry Yudelson, "Green Buildings through Integrated Design", Tata McGraw Hill, 2008.
3. "Green building guidelines: Meeting the demand for low-energy, resource-efficient homes", Sustainable Buildings Industry Council, 2004.
4. Means R.S., "Green building: project planning and cost estimating: a practical guide to materials, systems and standards", 2nd Edition, Kingston, Mass., 2006.

Reference Book(s):

1. Alex Wilson and Mark Peipkorn, "Green Building Products: The Green Spec guide to residential building materials", 2nd ed., Gabriola Island.
2. Jane Anderson, David E. Shiers, and Mike Sinclair, "The green guide to specification: an environmental profiling system for building materials and components", 3rd ed., Oxford; Malden, MA: Blackwell Science, 2002.
3. Charles J. Kibert, "Sustainable Construction: Green Building Design and Delivery", 2nd ed., Wiley, 2007.
4. IS 1893, IS 13920 & IS 4326 Code Books are to be Permitted

18. AIR AND NOISE POLLUTION

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-----|
| | L | T | P | | | C | CIE | SEE |
| IV | 3 | 0 | 0 | 47 | 3 | 40 | 60 | 100 |

MODULE – 1:INTRODUCTION**8H**

Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards –Ambient and stack sampling and Analysis of Particulate and Gaseous Pollutants.

MODULE -2:METEOROLOGY**8H**

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

MODULE-3:CONTROL OF PARTICULATE & GASEOUS CONTAMINANTS 8H

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle, Design and performance equations of Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, and Electrostatic Precipitator. Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters – Process control and Monitoring - Operational Considerations.

MODULE-4:SOURCES & CHARACTERIZATION OF NOISE POLLUTION 8H

Sources of noise – Units and Measurements of Noise – Noise Power level, Intensity level, Pressure level – Relationship, Noise level meter – Weighted networks – Decibel addition – Octave Band – Noise spectrum, Equivalent Noise – Day and night time –Standards, Equations and Application, Characterization of Noise from Construction, Mining, Transportation and Industrial Activities.

MODULE-5:PREVENTION & CONTROL OF NOISE POLLUTION**8H**

Control of noise at source, control of transmission, protection of exposed person, Control of other types of Noise Sound Absorbent – Noise Pollution Analyzer, Auditorium Designing – Anti Noise Device. Designing out Noise – Industrial Noise Control – effects of noise on workers efficiency, Acoustic quieting – mechanical isolation technique, acoustical absorption, constrained layer damping, OSHA Noise standards – public education – other non- legislative measures

MODULE-6:REGULATORY ASPECTS OF NOISE POLLUTION**8H**

Legislation Noise and the Administrative Function – Planning against Noise– Noise and the Law – The Rajasthan noise control Act 1963, Railway Act 1890 (Related to noise only), The Aircraft Act 1934 (Related to noise only), Factories Act 1948 (Related to noise only), The Environmental Protection Act 1986 – Noise pollution remedies.

Text Book(s):

1. Anjaneyulu. Y, “Air Pollution and Control Technologies“, Allied Publishers (P) Ltd., India 2002.
2. Noel de Nevers, “Air Pollution Control Engineering”, Waveland press,Inc 2017.
3. Peterson and E.Gross Jr., “Hand Book of Noise Measurement”, 7thEdn, 2003.
4. S.P.Singal. “Noise Pollution and Control”, Narosa Publishing House, 2000.

Reference Book(s):

1. M.N Rao and HVN Rao, “Air Pollution”,TataMcgraw Hill Publishing Company limited,2007.
2. C.S.Rao, “Environmental Pollution Control Engineering”,New Age International(P) Limited Publishers,2006.
3. Antony Milne, “Noise Pollution: Impact and Counter Measures”, David & Charles PLC, 2009

19. WATER SHED MANAGEMENT

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| III | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

MODULE-1: INTRODUCTION**8H**

Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multi-disciplinary approach for watershed management.

MODULE-2: CHARACTERISTICS OF WATERSHED**8H**

Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

MODULE-3: PRINCIPLES OF EROSION**8H**

Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation.

Measures To Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion.

MODULE-4: PLANNING OF WATERSHED MANAGEMENT ACTIVITIES**8H**

Planning of watershed management activities: people's participation, preparation of action plan, administrative requirements.

Water Harvesting: Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks

MODULE-5: LAND MANAGEMENT**8H**

Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils.

MODULE-6: ECOSYSTEM MANAGEMENT**8H**

Ecosystem Management: Role of Ecosystem, crop husbandry, soil enrichment, Inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvi pasture, horticulture, social forestry and afforestation

Text Books:

1. Watershed Management by JVS Murthy, - New Age International Publishers.
2. Water Resource Engineering by R. Awurbs and WP James, - Prentice Hall Publishers.

Reference Books:

1. Land and Water Management by VVN Murthy, - Kalyani Publications.
2. Irrigation and Water Management by D.K. Majumdar, Prentice Hall of India.

20. ENVIRONMENTAL IMPACT ASSESMENT

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-----|
| | L | T | P | | | C | CIE | SEE |
| VIII | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

MODULE 1: INTRODUCTION**8H**

Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

MODULE 2: EIA METHODOLOGIES**8H**

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods and cost/benefit Analysis.

MODULE 3: IMPACT OF DEVELOPMENTAL ACTIVITIES AND LAND USE**8H**

Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- application of remote sensing and GIS for EIA. E I A with reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on surfacewater environment.

MODULE 4: ASSEMENT OF IMPACT ON VEGETATION AND WILDLIFE**8H**

Introduction - Assessment of Impact of development Activities on Vegetation and wildlife, Environmental impact of deforestation and incorporation of mitigation measures

MODULE 5: ENVIRONEMNTAL AUDIT**8H**

Introduction - Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.

MODULE 6: ENVIRONEMENTAL ACTS & CASE STUDIES**8H**

The Environmental protection Act, The water prevention Act, The Air (Prevention & Control of pollution Act.), Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers.
3. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)

Reference Books:

1. Lawrence, D.P., "Environmental Impact Assessment – Practical solutions to recurrent problems", Wiley-Interscience, New Jersey 2003.
2. Jain, R.K. Urban L.V. Stracy, G.S. "Environmental Impact Analysis", 2nd edition, Van Nostrand and Reinhold Co, New York.
3. UNESCO, 1987, "Methodologies, Guidelines for the Integrated Environmental Evaluation of Water Resources Development", UNESCO/UNEP, Paris.

21. SOLID WASTE MANAGEMENT

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| VII | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

MODULE – 1: INTRODUCTION TO SOLID WASTE MANAGEMENT 8H

Classification of solid wastes (source and type based), solid waste management (SWM), elements of SWM, ESSWM (environmentally sound solid waste management), factors affecting SWM, Indian scenario, progress in MSW (municipal solid waste) management in India.

MODULE -2: WASTE GENERATION ASPECTS 8H

Waste stream assessment (WSA), waste generation and composition, waste characteristics (physical and chemical), health and environmental effects (public health and environmental), comparative assessment of waste generation and composition of developing and developed nations, a case study results from an Indian city, handouts on solid waste compositions.

MODULE-3: COLLECTION, STORAGE AND TRANSPORT 8H

Waste Collection, Storage and Transport: Collection components, storage-containers/collection vehicles, collection operation, transfer station, waste collection system design, record keeping, control, inventory and monitoring, implementing collection and transfer system, a case study.

MODULE-4: DISPOSAL OF WASTES 8H

Waste Disposal: key issues in waste disposal, disposal options and selection criteria, sanitary landfill, landfill gas emission, leachate formation, environmental effects of landfill, landfill operation issues, a case study

MODULE-5: WASTE PROCESSING TECHNOLOGIES & 3R PRINCIPLE 8H

Purpose of processing, mechanical volume and size reduction, component separation, drying and dewatering. Source Reduction, Product Recovery and Recycling: basics, purpose, implementation monitoring and evaluation of source reduction, significance of recycling, planning of a recycling programme, recycling programme elements, commonly recycled materials and processes, a case study.

MODULE-6: RECOVERY OF BIOLOGICAL CONVERSION PRODUCTS 8H

Benefits, processes, stages and technologies of composting; biogasification with anaerobic processing, types of digesters, and biogas plants in India; composting and biogasification: environmental effects.

Text Books:

1. George Tchobanoglous et al, “Integrated Solid Waste Management”, McGraw-Hill Publication, 1993.
2. Charles A. Wentz; “Hazardous Waste Management”, McGraw Hill Publication, 1995.
3. CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000.

Reference Books:

1. Vesilind P.A., Worsel, W.A., and Reinhart, D. R., Solid waste Engineering, Thomson Brooks/code, 1st Ed 2002
2. Lagrerer, M.D., Buckingham, P.L and Evans, J.C, Hazardous Waste Management, 2ndEdn, v McGrawhill, 2011

22. WASTE WATER ENGINEERING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-----|
| | L | T | P | | | C | CIE | SEE |
| IV | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

MODULE – 1:INTRODUCTION & WASTE WATER COLLECTION 8H

Introduction: Introduction to sanitary engineering, historical developments, flowchart-outlines of sanitary engineering, classification of sanitary works, criteria for waste water management system; systems of sanitation, relative merits &demerits; sewerage-classification of sewerage systems; Sanitary sewage: sources of sanitary sewage, factors affecting sanitary sewage, quantity of sanitary sewage and variation; Storm water sewage: Factors affecting storm water sewage, quantity of storm water sewage.

MODULE -2:SEWERS & SEWER APPURTENANCES 8H

Sewers: introduction, types of sewers, sewer sections, sewer materials, sewer joints, storm water drains- sections, classification; Design of sewers: estimate of sanitary sewage, estimate of storm runoff, hydraulics of sewers, method of design of sewer; Construction of sewers: steps involved in the layout and construction of sewers, Testing of sewer lines; Sewer appurtenances: inlets, catch basins, man holes, drop man holes, lamp holes, flushing tanks, grease traps, inverted siphons, storm regulators and ventilation of sewers.

MODULE-3:SEWAGE CHARACTERISTICS AND PRIMARY TREATMENT 8H

Sewage, Sewage Characteristics, cycles of decomposition of sewage, Sampling and analysis of wastewater, Physical, Chemical and Biological Examination; Oxygen demand - dissolved oxygen determination, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Measurement of BOD; Primary treatment: introduction, screening and skimming-purpose of screening, screens, gritchambers, grease traps, floatation, skimming tanks; sedimentation - introduction, theory of sedimentation, classification of sedimentation tanks, design of sedimentation tanks.

MODULE-4:SECONDARY TREATMENT 8H

Secondary treatment: introduction, principle of biological treatment, attached and suspended growth processes; Attached Growth Process - intermittent sand filters, contact beds, trickling filters-types, mechanism of impurities removal, design, operation and maintenance; Suspended growth process - Activated sludge process, Principle of action, Activated sludge process vs Trickling filter process,Features of operation, Organic loading parameters, Methods of aeration-Diffused air system, Mechanical aeration, Combined system, Sludge bulking, Sludge volume index.

MODULE-5:SLUDGE AND TERTIARY SEWAGE TREATMENT 8H

Sludge treatment: Characteristics of sewage sludge, Anaerobic sludge digestion process, Stages of sludge digestion, Factors affecting sludge digestion, Sludge digestion tank, High rate digestion, Sludge thickening, Sludge conditioning, Methods of dewatering the sludge, Methods of sludge disposal. Tertiarysewage treatment: Removal of nitrogen and phosphorus, Refractory organic, Heavy metals, Suspended solids and pathogenic bacteria.

MODULE-6:MISCELLANEOUS TREATMENT METHODS & SEWAGE DISPOSAL**8H**

Miscellaneous treatment methods: Oxidation Ponds- theory of oxidation pond, design and construction, operation and maintenance of oxidation ponds; oxidation ditch; aerated lagoon; septic tank-construction details, design of septic tank, treatment and disposal of septic tank effluent; imhoff tanks. Sewage Disposal: natural methods, dilution, self-purification of streams, factors affecting self-purification, oxygen sag analysis, disposal in sea water; land treatment-filtration, broad irrigation; sewage sickness.

Text Books:

1. Elements of Environmental Engineering by K. N. Duggal; S. Chand & Company Ltd.
2. Environmental Engineering vol. II – Sewage disposal and air pollution engineering by S. K. Garg; Khanna Publishers.
3. Waste Water Engineering by Dr B.C. Punmia, A.K. Jain and Dr Arun K. Jain; Lakshmi Publications
4. Water supply and sanitary Engineering by G.S. Birdie and J.S. Birdie; Dhanpat Rai & Sons Publishers

Reference Books:

1. Wastewater Engineering: Treatment, Disposal & Reuse by Met Calf; McGraw-Hill.
2. Environmental Engineering By Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, Tata McGraw-Hill (India).
3. Water & Wastewater Technology by Mark J. Hammer, PHI.
4. Water Supply and Sewerage by E.W. Steel and Terence J. Mc Ghee; McGraw-Hill.

24. WATER SUPPLY ENGINEERING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-----|
| | L | T | P | | | C | CIE | SEE |
| IV | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

MODULE – 1: INTRODUCTION & WATER DEMAND 7H

Introduction: Historical development, Importance and Necessity of Protected Water Supply systems, Water borne diseases, Objectives of protected water supply system, Flow chart of public water supply system, Role of Environmental Engineer, Agency activities.

Water Demand: Introduction, types of water demands, estimation of water demand for a town or city; Per capita Demand and factors affecting per capita demand; variation in demand of water; design Period, factors affecting the Design period; population forecasting studies.

MODULE -2: SOURCES AND COLLECTION OF WATER 7H

Sources of Water: Lakes, Rivers, Impounding Reservoirs; comparison of sources with reference to quality, quantity and other considerations; Groundwater sources of water: Types of water bearing formations, springs, Wells and Infiltration galleries, Yields from infiltration galleries.

Collection and Conveyance of Water: Intakes, Factors governing the selection of site for the intake structure, Types of Intakes; Conveyance of Water- Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Laying and Jointing of pipes, Leakages and testing of pipeline; Classification of pumps; Choice of pumps.

MODULE-3: QUALITY OF WATER 9H

Introduction, wholesome water, potable water, polluted water, contaminated water, requirements of water for domestic use; impurities in water; quality of source, Comparison of sources with reference to quality; Characteristics of water–Physical, Chemical and Biological characteristics; Water analysis, collection of water samples, Physical, Chemical and Biological tests for water analysis, waterborne disease and their control; B.I.S. Drinking water quality standards and WHO guidelines for drinking water.

MODULE-4: TREATMENT OF WATER – I 9H

Treatment of Water: Introduction, Flowchart of water treatment plant, Treatment methods; Sedimentation: Theory of sedimentation, Stoke's law, Sedimentation tanks, Design aspects, Coagulation: Principle of coagulation, Chemicals used for coagulation, Units of coagulation plant, Optimum Dose of Coagulant. Filtration of Water : Theory of filtration; Filter materials; Slow sand and rapid sand filters; Construction operation and design; Slow sand filters versus rapid sand filters; Under drainage system design in rapid sand filters; Troubles in rapid sand filters; Pressure filters.

MODULE-5: TREATMENT OF WATER - II 9H

Disinfection: theory of disinfection, requirements of good disinfectants, methods of disinfection, minor methods of disinfection; Chlorination, forms of application of chlorine, application of chlorine, forms of chlorination; Softening of Water: introduction, necessity, removal of temporary and permanent hardness, Removal of Iron and manganese, colours, odours and taste; Desalination-Importance, methods; fluoridation and defluoridation.

MODULE-6: DISTRIBUTION OF WATER

7H

introduction, requirements of a good distribution system, methods of distribution, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks- Hardy Cross and equivalent pipe methods; Components of Distribution system: valves such as sluice valves, air valves, scour valves, check valves and pressure reliefvalves; hydrants, and water meters; Laying and testing of pipe lines, selection of pipe materials, pipe joints.

Text Books:

1. Water supply and sanitary Engineering by G.S.Birdie and J.S. Birdie; DhanpatRai& Sons Publishers.
2. Water Supply Engineering by S.K.Garg; Khanna Publishers.
3. Water Supply Engineering by DrB,C.Punmia, A.K.Jain and DrArun K. Jain; Lakshmi Publications.

Reference Books:

1. Environmental Engineering by Gerard Kiely; Tata Mcgraw Hill Publishing Co Ltd.
2. Elements of Environmental Engineering by K.N.Duggal; S.Chand Publishers.
3. Water Supply and Sanitary Engineering Vol. 1 by Gurucharan Singh; Standard Publishers Distributors

24. COST EFFECTIVE HOUSING TECHNIQUES

| Semester | Hours / Week | | | Total hrs | Credit C | Max Marks | | |
|----------|--------------|---|---|-----------|----------|-----------|-----|-------|
| | L | T | P | | | CIE | SEE | TOTAL |
| IV | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

MODULE – 1: INTRODUCTION TO HOUSING**8H**

Definition of Basic Terms – House, Home, Household, Apartments, Multi storied Buildings, Special Buildings, Objectives and Strategies of National Housing Policies including Slum Housing Policy, Principle of Sustainable Housing – Integrated approach on arriving holding capacity and density norms - All basic infrastructure consideration -Institutions for Housing at National, State and Local levels.

MODULE -2: HOUSING PROGRAMMES**8H**

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighborhoods- Plotted land development programs, Open Development Plots, Apartments, Gated communities, Townships, Rental Housing, Co-operative Housing, Slum Housing Programmes – Slum improvement – Slum redevelopment and Relocation – Use of GIS and MIS in Slum Housing Projects,, Role of Public housing agencies, and Private sector in supply , quality, infrastructure and pricing – Role of Non- Government Organizations in slum housing.

MODULE-3: DEVELOPMENT AND ADOPTION OF LOW COST HOUSING TECHNOLOGY**8H**

Introduction - Adoption of innovative cost effective construction techniques - Adoption of precast elements - Adopting of total prefabrication of mass housing in India- General remarks on pre cast roofing/flooring systems -Economical wall system - Single Brick thick loading bearing wall - 19cm thick load bearing masonry walls - Half brick thick load bearing wall - Fly ash gypsum thick for masonry - Stone Block masonry - Adoption of precast R.C. plank and join system for roof/floor in the building

MODULE-4: ALTERNATIVE BUILDING MATERIALS FOR LOW COST HOUSING**8H**

Introduction - Substitute for scarce materials – Ferro cement - Gypsum boards – Timber substitutions - Industrial wastes - Agricultural wastes - Low cost Infrastructure services. Introduce - Present status - Technological options - Low cost sanitation - Domestic wall, Water supply, energy.

MODULE-5: INFRASTRUCTURE SERVICES IN RURAL HOUSES**8H**

Rural Housing Introduction traditional practice of rural housing continuous - Mud Housing technology- Mud roofs - Characteristics of mud – Fire treatment for thatch roof - Soil stabilization - Rural Housing programs

MODULE-6: HOUSING IN DISASTER PRONE AREAS

8H

Introduction – Earthquake - Damages to houses - Traditional prone areas -Type of Damages and Railways of non-engineered buildings. Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions. Requirements of structural safety of thin pre-cast roofing units against Earthquake forces -Status of R& D in earthquake strengthening measures - Floods, cyclone, future safety

Text Books:

1. Hand book of Low Cost Housing by A.K.Lal – New Age International publishers.
2. Low Cost Housing – G.C. Mathur, IBH Publishers.
3. Housing in India by Francis Cherunilam and Odeyar D Heggade, Himalaya Publishing House, Bombay, 1997.

Reference Books:

1. Disaster Management by Rajib Shaw, Universities Press, India.
2. Disaster Science and Management by Tushar Bhattacharya, TMH Publications.
3. Building Materials For Low –Income Houses – International Council For Building Research Studies And Documentation.
4. Modern Trends In Housing In Developing Countries – A.G. MadhavaRao,D.S. Ramachandra Murthy &G.Annamalai.
5. Properties of Concrete – Neville A.M. Pitman Publishing Limited, London.
6. Light Weight Concrete, Academic Kiado, Rudhai.G – Publishing home of Hungarian Academy of Sciences 1963.



AUTONOMOUS

DEPARTMENT OF CIVIL ENGINEERING

B.Tech Honors Degree Subjects

| S.No | Course Name | L-T-P | CREDITS |
|-----------------|--|-------|---------|
| POOL - 1 | | | |
| 1 | Stability Of Structures | 3-1-0 | 4 |
| 2 | Experimental Methods In Structural Engineering | 3-1-0 | 4 |
| 3 | Non Linear Structural Analysis | 3-1-0 | 4 |
| 4 | Advanced Design Of Steel Structures | 3-1-0 | 4 |
| POOL - 2 | | | |
| 1 | Advanced Geotechnical Engineering | 3-1-0 | 4 |
| 2 | Geotechnical Measurements And Explorations | 3-1-0 | 4 |
| 3 | Geotechnical Earthquake Engineering | 3-1-0 | 4 |
| 4 | Rock Mechanics | 3-1-0 | 4 |
| POOL - 3 | | | |
| 1 | Intelligent Transportation Systems | 3-1-0 | 4 |
| 2 | Transportation Safety Systems | 3-1-0 | 4 |
| 3 | Advanced Geometric Design Of Highways | 3-1-0 | 4 |
| 4 | Computer Simulation In Traffic Engineering | 3-1-0 | 4 |
| POOL - 4 | | | |
| 1 | Global Navigation Satellite System | 3-1-0 | 4 |
| 2 | Machine Processing Of Remotely Sensed Data | 3-1-0 | 4 |
| 3 | Geospatial Data Processing | 3-1-0 | 4 |
| 4 | Introduction to Geodesy | 3-1-0 | 4 |
| POOL - 5 | | | |
| 1 | Water Resources System Planning and Management | 3-1-0 | 4 |
| 2 | Design and Drawing of Irrigation Structures | 3-1-0 | 4 |
| 3 | Advanced Hydrology | 3-1-0 | 4 |
| 4 | Advanced Irrigation Engineering Design | 3-1-0 | 4 |
| 5 | Hydropower Engineering | 3-1-0 | 4 |

B.Tech Honors Subjects & Syllabus

STABILITY OF STRUCTURES

1.

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MODULE – 1: BEAM COLUMNS

7 H

Differential equations for beam columns- beam columns with concentrated loads – continuous lateral loads-couples- beam columns with built in ends – continuous beams with axial load – application of trigonometrically series – Effects of initial curvature on deflections – Determination of allowable stresses.

MODULE -2: ELASTIC BUCKLING OF BARS AND FRAMES

10 H

Elastic Buckling of straight columns – Effect of shear stress on buckling – Eccentrically and laterally loaded columns- Buckling of frames-large deflections of buckled bars-Energy methods- Buckling of bars on elastic foundations- Buckle line of bar with intermediate compressive forces - Buckling of bars with change in cross-section – Effect of shear force on critical load- built up columns

MODULE-3: INELASTIC BUCKLING

8 H

Buckle line of straight bar- Double modulus theory – Tangent modulus theory, Inelastic lateral Buckling. Experiments and design formulae: Experiments on columns – Critical stress diagram – Empirical formulae for design – various end conditions.

MODULE-4: TORSION BUCKLING

8 H

Pure torsion of thin walled bars of open cross section – Non-uniform torsion of thin walled bars of open cross section- Torsional buckling – Buckling by torsion and flexure.

MODULE-5: LATERAL BUCKLING OF SIMPLY SUPPORTED BEAMS

7 H

Beams of Rectangular cross-section subjected to pure bending. Buckling of simply supported Rectangular plates: Derivation of equation of plate subjected to constant compression in one and two directions.

MODULE-6: STABILITY ANALYSIS BY FINITE ELEMENT APPROACH

8 H

deviation of shape function for a two noded Bernoulli – Euler beam element (lateral and translation of) – element stiffness and element geometric stiffness matrices – assembled stiffness and geometric stiffness matrices for a discretised column with different boundary condition – calculation of critical loads for a discretised (two elements) column (both ends built in). Buckling of pin jointed frames (maximum of two active DOF) – symmetrical single bay portal frame.

Text Book(s):

1. Theory of elastic Stability by Timshenko & Gere-Mc Graw Hill
2. Stability of metallic structures by Blunch- Mc Graw Hill
3. Theory of Beam- Columns Vol I by Chem. & Atste Mc. Graw Hill

Reference Book(s):

1. Stephen P.Timoshenko, James M Gere, "Theory of Elastic Stability"-2nd Edition, McGraw – Hill, New Delhi.
2. Robert D Cook et.al, "Concepts and Applications of Finite Element Analysis"-3rd Edition, John Wiley and Sons, New York.
3. S.Rajashekar, "Computations and Structural Mechanics"-Prentice – Hall, India.
4. Ray W Clough and J Penzien, "Dynamics of Structures" - 2nd Edition, McGraw Hill, New Delhi
5. H.Zeiglar, "Principles of Structural Stability"-Blaisdall Publications

2.EXPERIMENTAL METHODS IN STRUCTURAL ENGINEERING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MODULE – 1: FUNDAMENTALS OF NUMERICAL METHODS 7 H

Fundamentals of numerical methods Error analysis, Engineering Systems, Physical and Mathematical Modelling, Error Analysis Approximations and round off and Truncation errors; Roots of nonlinear equations, multiple roots, Solution of Linear Simultaneous Solution of Nonlinear Simultaneous Equations

MODULE -2: EIGEN VALUES AND EIGEN VECTORS 10 H

Power method, Relaxation Method, Diagonalization method

MODULE-3: NUMERICAL DIFFERENTIATION AND INTEGRATION 8 H

High Accuracy Differentiation Formulas, Derivatives of Unequal Spaced Data. Newton-Cotes formulae, Integration with unequal segments, multiple integration, Gauss Quadrature rule.

MODULE-4: ORDINARY DIFFERENTIAL EQUATIONS 8 H

Method of Weighted Residuals, Initial Value and Boundary Value Problems, Eulers method, Improvement of Eulers method, Runge-Kutta Method, Multiple Steps Method

MODULE-5: FINITE DIFFERENCE METHOD 7 H

Applications to beam bending, beam vibration, plate bending and plate vibration problems.

MODULE-6: PARTIAL DIFFERENTIAL EQUATIONS 8 H

Elliptic and parabolic Equations, Explicit and Implicit Methods Computer algorithms; Numerical solution for different structural problems using above mentioned numerical methods.

Text Book(s):

1. Chapra S C and Canale R P, Numerical Methods for engineering. Mcgraw-HillInc, 7th Edition, 2016.
2. Scheid F, Theory and problems of Numerical analysis. New York. McGraw Hill Book Co. (Shaum Series), 1988.
3. Sastry S S, Introductory Methods of Numerical Analysis. Prentice-Hall of India, 1998.

Reference Book(s):

1. Mathematical Methods and Models in Composites by vladisav mantic.
2. Finite Difference Methods in Financial Engineering: A Partial Differential Equation Approach- Daniel J. Duffy

NON LINEAR STRUCTURAL ANALYSIS

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MODULE – 1: INTRODUCTION**7 H**

Behavior of idealized structures, linearized load-deformation behavior of structures, effect of axial load, rigid-plastic theory, fully plastic hinge moment, load factor, proportional loading, virtual work equation, collapse mechanisms..

MODULE -2: NON-LINEAR ANALYSIS**10 H**

Non-linear behavior, sources of non-linearity, geometric stiffness matrix, axial force member, combined bending and axial forces, combined torsion and axial forces, three dimensional geometric non-linear analysis

MODULE-3: SOLUTION OF NON-LINEAR EQUILIBRIUM EQUATIONS**8H**

Incremental analysis, Euler Method, Runge-Kutta Methods, load Control method, displacement control method, constant Arc-length method, convergence criteria.

MODULE-4: PROGRAM FOR GEOMETRIC NON-LINEAR ANALYSIS**8 H**

Development of computer program for Geometric non-linear analysis of plane-frame structures. Solution of simple problems involving geometric non-linearity.

MODULE-5: MATERIAL NON-LINEAR ANALYSIS**7 H**

Nonlinear material behavior, plasticity theory, plastic analysis, plastic hinge method for ductile frames, yield surface and plastic reduction matrix, spread of plasticity, reinforced concrete members.

MODULE-6: NON-LINEAR ANALYSIS OF STRUCTURES**8 H**

Analysis of framed structures for Geometric and material non-linearity.

Text Book(s):

1. Madhu Kanchi, "Matrix Methods of Structural Analysis", New Age Publications, 2016.
2. William McGuire, Richard Gallagher and Ronald Ziemian, "Matrix Structural Analysis", Bucknell Publications, 2000.

Reference Book(s):

1. J.L. Meek, "Computer Methods in Structural Analysis", E&FN Spon, 1991.
2. K. I. Majid, "Non-linear Structures", Butterworth, 1972.

4.ADVANCED DESIGN OF STEEL STRUCTURES

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MODULE – 1: LATERALLY UNRESTRAINED BEAMS

8 H

Lateral Buckling of Beams, Factors affecting lateral stability, IS 800 code provisions, Design Approach. Lateral buckling strength of Cantilever beams, continuous beams, beams with continuous and discrete lateral restraints, Mono- symmetric and non- uniform beams – Design Examples. Concepts of -Shear Center, Warping, Uniform and Non-Uniform torsion.

MODULE -2: BEAM- COLUMNS IN FRAMES

8 H

Behaviour of Short and Long Beam - Columns, Effects of Slenderness Ratio and Axial Force on Modes of Failure, Biaxial bending, Strength of Beam Columns, Sway and Non-Sway Frames, Strength and Stability of rigid jointed frames, Effective Length of Columns-, Methods in IS 800 – Examples

MODULE-3: ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS

10 H

Dead loads, live loads and wind loads on roofs. Design wind speed and pressure, wind pressure on roofs; wind effect on cladding and louvers; Design of angular roof truss, tubular truss, truss for a railway platform. Design of purlins for roofs, design of built up purlins, design of knee braced trusses and stanchions. Design of bracings.

MODULE-4: DESIGN OF STEEL TRUSS GIRDER BRIDGES

8 H

Types of truss bridges, component parts of a truss bridge, economic proportions of trusses, self weight of truss girders, design of bridge compression members, tension members; wind load on truss girder bridges; wind effect on top lateral bracing; bottom lateral bracing; portal Bracing; sway bracing.

MODULE-5: DESIGN OF STEEL BUNKERS AND SOILS

6 H

Introduction – Janseen’s Theory – Airy’s Theory – Design of Parameters – Design Criteria – Analysis of Bins – Hopper Bottom –Design of Bins

MODULE-6: FIRE RESISTANCE

8 H

Fire resistance level, Period of Structural Adequacy, Properties of steel with temperature, Limiting Steel temperature, Protected and unprotected members, Methods of fire protection, Fire resistance ratings- Numerical Examples.

Text Book(s):

1. Design of Steel Structures. P. Dayaratnam, Publisher : S. Chand, Edition 2011 – 12.
2. Design Steel Structures Volume – II, Dr. Ramachandra & Vivendra Gehlot Scientific Publishes Journals Department.
3. Limit State Design of Steel Structures S.K. Duggal Mc Graw Hill Education Private Ltd. New Delhi. .
4. Indian Standard Code – IS – 800-2007, IS 811
5. Indian Standard Code – IS 1641, 1642,1643

Reference Book(s):

1. N. Subramanian, “Design of Steel Structures”, Oxford,IBH
2. Design of Steel Structures Galyord & Gaylord, Publisher ; Tata Mc Graw Hill, Education. Edition 2012.

5.ADVANCED GEOTECHNICAL ENGINEERING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 36 | 4 | 40 | 60 | 100 |

MODULE – 1: SHALLOW FOUNDATIONS

6 H

Shallow foundations- estimating bearing capacity- Meyerhof's, Hansen's and I.S code methods- Effect of water table, eccentricity, and inclination of load on Bearing Capacity – Numerical problems using IS method Elastic settlement –Effect of size of footing on settlement. Steinbrenner's method of calculating settlement– Numerical problems.

MODULE -2: FOUNDATION ON EXPANSIVE SOILS

6H

Introduction to expansive soil - Clay mineralogy and mechanism of swelling - Identification of expansive soils - Swelling potential, swelling pressure, free swell - Free swell index - Classification of expansive soil - Tests for swell pressure (IS code method) - Prediction of swell pressure from index properties - Damages in buildings on expansive soils - Elimination of swelling - Environmental solutions such as soil replacement techniques and lime columns - Principles of design of foundations in expansive soil deposits - Structural solutions such as provision of rigid foundation, under reamed piles, T Beams as strip footing for walls etc. (basic aspects).

MODULE-3: PILE FOUNDATIONS

6H

Deep foundations –need. Types. Classification of piles. static equation – Single piles – Critical depth concept. Pile capacity in clay and sand by the I.S. code method. Piles in layered soils. Piles with enlarged base in clays (under reamed piles). Problems. Pile capacity from SPT and CPT values. Problems.

MODULE-4: WELL FOUNDATIONS

6H

Well foundations– Components of a well foundation–Procedure for construction and sinking of wells– Thickness of well steining for sinking under self-weight - Grip length- Problems encountered in well sinking–Tilts and Shifts– Causes – Permissible tilts and shifts - Methods to rectify tilts and shifts – Forces acting on a well foundation –Allowable bearing pressure – Lateral stability of well foundations - Terzaghi's analysis

MODULE-5: SPECIAL FOUNDATIONS

6 H

Special foundations: Introduction to shell foundations - Structural form and efficiency - Different types of shell foundations - General principles of geotechnical design of shell foundations and soil-structure interaction. Special features of the foundations for water tanks, silos, chimneys and transmission line towers. Foundations for marine structures - Design principles.

MODULE-6: MACHINE FOUNDATIONS

6 H

Free and forced vibration with and without damping, Elastic half space for rigid footings. Vibration analysis of foundations subjected to vertical, sliding and rocking modes, Design criteria for m/c foundations.

Text Book(s):

1. Joseph Bowles, "Foundation Analysis and Design", McGraw-Hill Book Company.
2. Varghese P. C., "Foundation Engineering", Prentice-Hall of India Private Ltd, 2009.

Reference Book(s):

1. Gulhati, S. K. and Datta, M. Geotechnical Engineering, Tata McGraw Hill Education, 2005
2. Tomlinson, M. J. and Booman, R. Foundation Design and Construction, Prentice Hall Publishing, 2001.
3. Tomlinson, M. J. and Woodwrđ, J. Pile Design and Construction Practice. CRS Press, 2015
4. Kurien, N. P. Design of foundation systems: principles and practices. Alpha Science International, 2005

6.GEOTECHNICAL MEASUREMENTS AND EXPLORATIONS

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 36 | 4 | 40 | 60 | 100 |

MODULE – 1: RETAINING WALLS

6 H

Different types - Gravity, Cantilever-counter fort and Crib types. Basement or foundation retaining walls. Design principles of retaining walls, Design and Construction of Reinforced Soil Walls, Reinforced Soil Wall (A Case Study), Geosynthetics for Warehouse Grade Slab and Retaining Wall, Geogrid-Reinforced Retaining Walls, Restoration of Wharf Road by Geosynthetic Reinforced Soil Wall, Abutments and wing walls and allowable bearing capacity settlement tilting.

MODULE – 2:SAFETY AND FAILURE

6H

Safety against general slip failure. Type of Failures of Retaining Walls – Stability Requirements – Drainage behind Retaining walls – Provision of Joints – Relief Shells.

MODULE – 3: BRACED CUTS

6H

Lateral Pressure in Braced cuts – Design of Various Components of a Braced cut – Stability of Braced cuts – Bottom Heave in cuts.

MODULE – 4: SHEET PILE STRUCTURES

6H

Types of Sheet piles – Cantilever sheet piles in sands and clays – Anchored sheet piles – Free earth and fixed earth support methods – Row's moment Reduction method – Location of anchors, Forces in anchors.

MODULE – 5: SOIL REINFORCEMENT

6H

Soil reinforcement – Reinforced earth - Different components – their functions – Mechanics of reinforced earth – Failure modes-Failure theories – Design of Embankments on problematic soils.

MODULE – 6: COFFERDAMS

6H

Types, suitability, merits and demerits – Design of single – wall Cofferdams and their stability aspects – TVA method and Cummins' methods.

TEXT BOOKS:

1. Gopal Ranjan and A.S.R. Rao “Basics and Applied soil mechanics ”, New age International Publishing, second edition, 2007
2. G Venkatapparao P.K. Banerjee, J.T. Shahu, G.V. Ramana By Geo-Synthetics-New Horizons - 2004
3. P.C. Varghese Foundation Engineering Prentice-Hall of India Pvt Ltd , New Delhi –2006

REFERENCE BOOKS:

1. Principles of foundation engineering by Braja M. Das, PWS-KENT Publishing company, Boston
2. Foundation analysis and design- Bowles, JE- McGraw Hill
3. Analysis and design of foundation and retaining structures, Prakash, S Saritha Prakashan, Meerut

7.GEOTECHNICAL EARTHQUAKE ENGINEERING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 36 | 4 | 40 | 60 | 100 |

MODULE – 1:SEISMOLOGY AND EARTHQUAKES

6H

Introduction, Seismic Hazards, seismic waves, internal structure of earth, Continental drift and plate tectonics, faults, elastics rebound theory, geometric notations, location of earthquakes, size of earthquakes.

MODULE–2: STRONG GROUND MOTION

6H

Strong ground motion measurement, ground motion parameters, estimation of ground motion parameters. **Seismic Hazard Analysis:** Identification and Evaluation of Earthquake Sources, deterministic seismic hazard analysis, probabilistic seismic hazard analysis.

MODULE–3: WAVE PROPAGATION

6H

Waves in unbounded media, waves in a semi – infinite body, waves in a layered media, attenuation of stresswaves.

Artificial Ground Motion Generation: Modification of actual ground motion records, time – domain generation, frequency domain generation

MODULE – 4: DYNAMIC SOIL PROPERTIES

6H

Representation of stress conditions by Mohr circle, measurement of dynamic soil properties using field and laboratory tests, stress strain behavior of cyclically loaded soils, strength of cyclically loaded soils.

Ground Response Analysis: One– Dimensional Ground response Analysis – Linear and Non- Linear Approaches.

Local Site Effects: Effect of local site conditions on ground motion, design parameters, development of design parameters.

MODULE–5: LIQUEFACTION

6H

Flow liquefaction, cyclic mobility, evaluation of liquefaction hazards, liquefaction susceptibility, initiation of liquefaction, effects of liquefaction.

MODULE–6: SOILIMPROVEMENT FOR SEISMIC HAZARDS

6H

Densification techniques, Reinforcement Techniques, Grouting and Mixing techniques, Drainage techniques.

TEXT BOOK:

1. Geotechnical Earthquake Engineering by Steven L. Kramer, prentice Hall

REFERENCE BOOK:

1. Geotechnical Earthquake Engineering Handbook by Robert W. Day, McGraw-Hill.

8.ROCK MECHANICS

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 36 | 4 | 40 | 60 | 100 |

MODULE– 1: CLASSIFICATION OF ROCKS

6H

Classification of Intact rock mini fissures, joints in rock masses and Engineering Classifications Rock Masses Strength. Physical-mechanical properties, Laboratory tests Seno Controlled Systems. Field shear test, Deformability tests in rockmass.

MODULE – 2: ROCK PROPERTIES

6H

Failure criteria for rock and rock masses, Strength and deformability of jointed rock mass. Rock Joints - Types

MODULE – 3: ROCK MANAGEMENT TECHNIQUES

6H

Insitu stress, various methods of stress measurement, Hydro fracturing technique, Flat jack technique, Overcoming technique. Underground openings Stresses in Tunnels.

MODULE-4: ROCK FAILURES

6H

Stability of rock slopes, Modes of failure, Plane failure, Wedge failure, Circular failure, Toppling failure. Foundation on rocks, Estimation of bearing capacity, Stress distribution in rocks, Settlement in rocks, Pile foundation in rocks.

MODULE-5: ROCK IMPROVEMENT TECHNIQUES

6H

Methods to improve rock mass responses, Grouting in Rocks, Rock bolting, Rock Anchors.

MODULE-6: BEARING CAPACITY OF ROCKS

6H

Foundation on rocks, Estimation of bearing capacity, Stress distribution in rocks, Settlement in rocks, Pile foundation in rocks.

Text Books:

1. Goodman. R.E, John Wiley & Sons. Introduction to RockMechanics.
2. Ramanamurthy. T, Engineering in Rocks for Slopes, Foundation and Tunnels, Prentice Hall India Pvt.Ltd.

Reference Books:

1. Jaeger, Cook and Zimmerman, Blackwell Publishing. Fundamentals of Rock Mechanics, Fourth Edition,
2. ISRM and B. I. S Text Methods of Rocks and RockMasses.

9. INTELLIGENT TRANSPORTATION SYSTEMS

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MODULE-1: Fundamentals of ITS

8 H

Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.

MODULE -2: Telecommunications in ITS

8 H

Telecommunications in ITS – Importance of telecommunications in the ITS system, Information Management, Traffic Management Centers (TMC). Vehicle – Road side communication – Vehicle Positioning System

MODULE-3: ITS User Needs and Services and Functional areas

8H

ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).

MODULE-4: Sensor technologies and Data requirements of ITS

8H

ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management.

MODULE-5: Automated Highway Systems

8H

Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.

MODULE-6: ITS applications

8H

ITS applications: Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road-pricing.; Transportation network operations; commercial vehicle operations and intermodal freight; public transportation applications; ITS and regional strategic transportation planning, including regional architectures: ITS and changing transportation institutions.

Text Book(s):

1. Fundamentals of intelligent transportation systems planning By Mashrur A. Chowdhury, Adel WadidSadek
2. Lawrence A. Klein, Sensor technologies and Data requirements of ITS

Reference Book(s):

1. ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles.
2. Sussman, J. M., Perspective on ITS, Artech House Publishers, 2005.
3. National ITS Architecture Documentation, US Department of Transportation, 2007 (CD-ROM).

10. TRANSPORTATION SAFETY SYSTEMS

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MODULE-1 Fundamentals of Traffic Engineering

8H

Basic Characteristics of Motor-Vehicle Traffic, Highway Capacity, Applications of Traffic Control Devices, Traffic Design of Parking Facilities, Traffic Engineering Studies; Statistical Methods in Traffic Safety Analysis – Regression Methods, Poisson Distribution, Chi- Squared Distribution, Statistical Comparisons.

MODULE -2: Accident Investigations and Risk Management

8 H

Collection and Analysis of Accident Data, Condition and Collision Diagram, Causes and Remedies, Traffic Management Measures and Their Influence on Accident Prevention, Assessment of Road Safety, Methods to Identify and Prioritize Hazardous Locations and Elements, Determine Possible Causes of Crashes, Crash Reduction Capabilities and Countermeasures, Effectiveness of Safety Design Features, Accident Reconstruction

MODULE-3: Road Safety in Planning and Geometric Design

8H

Vehicle and Human Characteristics, Road Design and Road Equipment's, Redesigning Junctions, Cross Section Improvements, Reconstruction and Rehabilitation of Roads, Road Maintenance, Traffic Control, Vehicle Design and Protective Devices, Post Accident Care

MODULE-4: Role of Urban infrastructure design in safety

8H

Geometric Design of Roads; Design of Horizontal and Vertical Elements, Junctions, At Grade and Grade Separated Intersections, Road Safety in Urban Transport, Sustainable Modes and their Safety.

MODULE-5: Traffic Management Systems

8H

for Safety, Road Safety Audits and Tools for Safety Management Systems, Road Safety Audit Process, Approach to Safety, Road Safety Improvement Strategies, ITS and Safety

MODULE-6: Mitigation Measures

8H

Accident prevention by better planning, Accident prevention by better design of roads, Crash Countermeasures, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety; Safety in urban areas; Public transport and safety; Road safety policy making, Stakeholders involvement; Road safety law.

Text Book(s):

1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
2. Fundamentals of Transportation Engineering – C.S. Papacostas, Prentice Hall India.
3. Transportation Engineering – An Introduction, C.Jotinkhisty, B. Kent Lall

Reference Book(s):

1. Fundamentals of Traffic Engineering, Richardo G Sigua
2. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoye, TrulsVaa, Michael Sorenson
3. Road Safety by NCHRP.

11. ADVANCED GEOMETRIC DESIGN OF HIGHWAYS

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MODULE-1: Highway Cross Section Elements and Geometric Design Of Highways 8H

Functional Classification of Highway System; Design Controls – Topography, Driver characteristics, Vehicle Characteristics, Traffic, Capacity and Level of Service, Design Speed. Objectives of Geometric Design. Carriageway, Shoulders, Formation, Right of way; Kerbs, foot paths, Medians- design specifications; Pavement Surface characteristics – Skid Resistance, factors affecting Skid resistance, Measurement of Skid Resistance; Road Roughness, measurement of Road roughness; Camber, Objectives of Camber, design standards.

MODULE -2: Horizontal and Vertical Alignment: 8H

Objective of horizontal curves; Super elevation – Need for Super elevation; Method of computing super elevation; Minimum Radius of Curve; Methods of attainment of super elevation; Extra widening on Curves; Transition Curves – Objective and Design. Gradients – Types of Gradients, Design Standards; Vertical Curves – Summit Curves, Valley Curves and Design criteria for Vertical Curves; Combination of Vertical and Horizontal Curves – Grade Compensation; Sight Distances – Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Importance of Sight Distances for Horizontal and Vertical Curves.

MODULE-3: Intersection Design: 8H

Types of Intersections; Design Principles for Intersections; Design of At-grade Intersections – Channelization, Objective; Traffic Islands and Design standards; Rotary Intersection – Concept and Design, Advantages and Disadvantages; Grade separated Interchanges – Types, warrants and Design standards.

MODULE-4: Traffic Signs and Road Markings 8H

Guidelines for the provision of Road Signs; Cautionary Signs, Regulatory Signs, Information Signs – Design standards; Road markings – Objective of Road Markings; Types of Road Markings; Role of Road markings in Road Safety and Traffic Regulation; Specification for Road Markings. Highway Appurtenances – Delineators, Traffic Impact Attenuators, Safety Barriers.

MODULE-5: Miscellaneous Elements 8H

Requirements of Pedestrians; Pedestrian facilities on Urban Roads; Cycle Tracks – Guidelines and Design standards; Bus bays – Types and Guide lines; Design of On-street and Off street Parking facilities – Guidelines for lay out Design.

MODULE-6: Application of GIS in HIGHWAY Engineering 8H

GIS applications in environment impact assessment and environment monitoring, GIS based Highway alignment, GIS based road network planning, GIS based traffic congestion analysis and accident investigation, Utility management.

Text Book(s):

1. Principles and Practice of Highway Engineering, L.R.Kadiyali and N.B.Lal, Khanna Publications
2. Traffic Engineering and Transportation Planning, L.R.Kadiyali, Khanna Publications

Reference Book(s):

1. Highway Engineering, C.E.G.Justo and S.K.Khanna, Nem Chand and Brothers.
2. IRC Codes for Signs, Markings and Mixed Traffic Control in Urban Areas.

12. COMPUTER SIMULATION IN TRAFFIC ENGINEERING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 45 | 4 | 40 | 60 | 100 |

MODULE-1 : SYSTEM APPROACH

8H

Introduction to systems approach - Typical transportation systems - Mathematical models. Fundamentals of simulation - Monte Carlo method - Analog and digital simulation - Continuous and discrete models - Simulation languages - Introduction to CSMP.

MODULE -2: PROBABILITY CONCEPTS

7H

Probability concepts - Random numbers - Pseudo random generators - Arrival patterns - Service time distributions, Queue discipline – Manual simulation of simple queuing system

MODULE-3: CREATING AND MOVING TRANSACTIONS

7H

Creating and moving transactions - Queues and facilities - Event scheduling - Internal logic of GPSS processor - Program control statements.

MODULE-4: STATISTICS

7H

Priority - Preemption - Functions – Parameters and save values – Standard numerical attributes - Collection of statistics - Report preparation.

MODULE-5: APPLICATIONS OF GPSS

8H

Applications of GPSS - Simple queuing problems - Inventory problems - Simulation of ports - Railway platforms and level crossings - Traffic signals. Analysis of simulation results - Model validation - Replication of random conditions - Time series analysis.

MODULE-6: DBMS

8H

Computer Aided Drafting - DBMS concepts - Civil Engineering Databases – Data entry & Reports. Spreadsheet concepts – Worksheet calculations in Civil Eng., - Regression & Matrix Inversion.

Text Book(s):

1. Rajaraman, V., Computer Oriented Numerical Methods, Prentice – Hall of India, 1995
2. Chapra S.C., and Canale R.P., Numerical Methods for Engineers, McGraw – Hill, 2004
3. Software Manuals

Reference Book(s):

1. Gordon, G., System Simulation, Prentice-Hall of India, 1992
2. GPSS/PC, User Manual, Minuteman Software, USA, 1985

13.GLOBAL NAVIGATION SATELLITE SYSTEM

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 36 | 4 | 40 | 60 | 100 |

MODULE – 1: OVERVIEW OF GPS

6H

Basic concept, system architecture, space segment, user segment, GPS aided Geo-augmented navigation (GAGAN) architecture.

MODULE -2: GPS SIGNALS

6H

Signal structure, antispoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.

MODULE-3: GPS COORDINATE FRAMES, TIME REFERENCES

6H

Geodetic and Geo centric coordinate systems, ECEF coordinate world geodetic 1984 (WGS 84), GPS time.

MODULE-4: GPS ORBITS AND SATELLITE POSITION DETERMINATION

6H

GPS orbital parameters, description of receiver independent exchange format (RINEX) – Observation data and navigation message data parameters, GPS position determination.

MODULE-5: METHODS OF PROCESSING GPS DATA

6H

Basic theory of contributions that need to be included for millimetre level global positioning - Use of differencing, differential position - Wide-lanes and use in kinematic positioning - Relationship between satellite and conventional geodetic systems

MODULE-6: GPS ERRORS

6H

GPS error sources – clock error, ionospheric error, tropospheric error, multipath, ionospheric error estimation using dual frequency GPS receiver.

Text Book(s):

1. B. Hoffman – Wellenhof, H. Lichtenegger and J. Collins, ‘GPS – Theory and Practice’, Springer – Wien, New York (2001).
2. James Ba – Yen Tsui, ‘Fundamentals of GPS receivers – A software approach’, John Wiley & Sons (2001).

Reference Book(s):

1. Parkinson, B. W., J. Spilker, et al. *Global Positioning System: Theory and Applications*. Vol. 1. American Institute of Aeronautics & Ast, 1996.
2. Remote Sensing and Image Interpretation by Lillesand, Kiefer and Chipman, Sixth Edition.

14.MACHINE PROCESSING OF REMOTELY SENSED DATA

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 36 | 4 | 40 | 60 | 100 |

MODULE – 1: INTRODUCTION OF REMOTE SENSING

6 H

Definition, History of Remote Sensing, Basic components of Remote sensing, Electromagnetic Remote sensing process, Passive and active remote sensing. Electromagnetic Spectrum, Spatial Resolution, Spectral Resolution and Radiometric Resolution, Characteristics of Various sensors and satellites: IRS, Fundamentals of ImageProcessing.

MODULE -2:REMOTE SENSING AND IMAGE INTERPRETATION

6H

Introduction, Map as a model, Spatial elements and terminology, Classification of maps, Map scale, Spatial referencing system, Computers inmapproduction, General software’s in map production. General software’s in map production.

MODULE-3: DATA INTERPRETATION

6H

Types of data products; Image interpretation strategy, Levels of interpretation keys; Topography, types of Drainage Pattern and Texture, Erosion, Process of image interpretation; Basic elements of image interpretation. Overview on visual image interpretationequipment.

MODULE-4: FUNDAMENTALS OF GIS

6H

A brief history of GIS, GIS architecture, Components of a GIS, GIS workflow, Theoretical models of GIS: Functional elements, Fundamental operations, Theoretical framework, GIS categories, Levels/scales of measurement. The data stream, Data input methods: Keyboard entry, Manual digitizing, Scanning and automaticdigitizing

MODULE-5: DATA INPUT, DATA EDITING AND DATAQUALITY

6H

Stages of GIS data modeling; Graphic representation of Spatial Data, Raster data representation, Vector data representation, Spatial data models; Raster GIS models: Types of raster GIS models, Compact raster data models; Vector GIS models Data editing, Detecting and correcting errors, Data reduction and generalization Edge matching and Rubber sheeting, Components of data quality.Accuracy,Precisionandresolution,Consistency,Completeness,SourcesoferrorinGIS.

MODULE-6: DATA MODELLING AND MAPPING(APPLICATIONS)

6H

Land use /Land cover studies, slope mapping, preparation of structures map, Ground water prospects mapping, Watershed management and Action plan, Water quality modeling, Salt Water intrusion models, pipeline alignment studies, Solid and hazardous waste disposal site selection, Landslides mapping, Urban planning and Management, GPSapplications.

Text Books:

1. Remote Sensing and ImageInterpretation-5th Edition by Lillesand, Kiefer and Chipman, Published by John Wiley and Sons, Inc, New York,2007
2. Text book of Remote sensing and GIS – 3rd Edition by M. Anji Reddy, BS Publications, Hyderabad,2010.

Reference Books:

1. Geoinformatics for Environmental management” by M. Anji Reddy, B.S Publications, Hyderabad

15.GEOSPATIAL 15.GEOSPATIAL DATA PROCESSING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 36 | 4 | 40 | 60 | 100 |

MODULE – 1: OVERVIEW OF ARCGIS

6H

Arcmap, ArcCatalog and ArcToolBox -Creation of Schema, Tables, Data Definition, and Data Input, Data Updating, Queries on Tables, Simple-Complex Query with Two or More Tables Using SQL. Queries Using Union, Intersection, Join Etc Operations. Use of MS-Excel and MS Access

MODULE -2: SPATIAL DATA INPUT

6H

Vector Data Formats with File Extensions. Scanning, On-Screen Digitization, Editing, Topology Creation, Line and Area Measurements, Data Attribution

MODULE-3: GEODATABASE IN ARCCATALOG AND ARCMAP

6H

Feature Dataset, Feature Classes, Import of Data, Spatial Data Formats, Shape/Coverage Files and Layers, Data Frames, Maps, Managing TOC

MODULE-4: GEOREFERENCING DATA

6H

Coordinate Systems, Datum Conversions, Map Projections, Types, Storing- Viewing Projection Information

MODULE-5: WORKING WITH LAYERS IN ARCMAP.

6H

Building Templates, Classification, Displaying Qualitative and quantitative Values, Labeling Features and Map Creation.

MODULE-6: GPS

6H

GPS Survey, Data Import, Processing and Mapping

Text Book(s):

5. Chang, K. T. (2008): Introduction to Geographic Information Systems, Avenue of the Americas, McGraw-Hill, New York
6. Environmental Systems Research Institute, Inc. (1998): Understanding GIS: The ARC/INFO Method, ESRI Press, Redland.

Reference Book(s):

1. Ahmed, E. L., Rabbany (2002): Introduction to Global Positioning System, Artech House, Boston
2. Kresse, W. and Danko, D. (2002): Springer Handbook of Geographic Information, Springer Drecht, London.
3. Bao, J., Tsui, Y. (2005): Fundamentals of Global Positioning System Receivers, John Wiley Sons, Inc., Hoboken

16.INTRODUCTION TO GEODESY

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 36 | 4 | 40 | 60 | 100 |

MODULE – 1: INTRODUCTION

6 H

What is satellite geodesy - History of satellite geodesy - Examples of applications for satellite geodesy

MODULE -2: COORDINATE SYSTEMS

6H

Precession and Nutation - Earth-fixed and topocentric systems - Earth-centered inertial (ECI) systems - Transformations between ECF (Earth-centered, fixed) and ECI

MODULE-3: TIME SYSTEM IN GEODESY.

6H

The year: Sidereal year, Anomalistic year, Eclipse year, Julian year - Earth rotation time: Sidereal time, Solar time, Universal time - Dynamical time (or uniform time) - Atomic time - Broadcast time: Coordinated Universal time (UTC) - Julian Date (JD) and Modified Julian Date (MJD) - Time measurement devices, and time keeping practices - The most accurate clock: the Atomic Clock Ensemble in Space (ACES) - The Earth's rotation and orbit variation affects LOD and ICE Age:Earth rotation's slowing causes the Length of Day (LOD) longer and Earth's orbit variation dominates the occurrence of the Ice Age.

MODULE-4: TWO-BODY PROBLEM.

6H

Kepler's law - Relative coordinate system - C.M. coordinate system - Derivation and Solution of TBP (Two-Body Problem) - Energy Integral/Angular Momentum Integration - Kepler's Equation - Conic Properties/ellipse.

MODULE-5: KEPLERIAN ELEMENTS AND THEIR PHYSICAL MEANING.

6 H

The six Keplerian orbit elements - Transformation between orbit elements and Cartesian position and velocity vectors - More discussions on Kepler's 3rd Law: what affects the orbit period? - Illustration of the fuel needed to change the inclination - Relationship between the launch site latitude and azimuth angle and the orbital inclination

MODULE-6: N-BODY PROBLEM.

6 H

Derivation of N-body equation of motion - Derivation of energy and angular momentum integrals - Express the equation of motion in the form of a Central Body Term and the Perturbing Term - Three-Body and the Restricted Three-Body Problem -Lagrange Points (L1, L2, L3, L4, L5) of the Earth-Sun system - Practical considerations of the Earth-Moon-Sun system.

Text Book(s):

- 1.Basic GIS Coordinates (Second Edition), Jan Van Sickle.

Reference Book(s):

- 1.Introduction to Geodetic datum and Geodetic Systems, Lu, Zhiping, Qu, Yunying, Qiao, Shubo.

17. WATER RESOURCES SYSTEM PLANNING AND MANAGEMENT

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MOUDLE – 1 INTRODUCTION

7H

concepts of systems analysis, definition, systems approach to water resources planning and management, role of optimization models, objective function and constraints, types of optimization techniques.

MOUDLE – 2 LINEAR PROGRAMMING – I

8H

Formulation linear programming models, graphical method, simplex method, application of Linear programming in water resources.

LINEAR PROGRAMMING – II: Revised simplex method, duality in linear programming, sensitivity and post optimality analysis.

MOUDLE – 3 DYNAMIC PROGRAMMING

7H

Belman's of principles of optimality forward and backward recursive dynamic programming, case of dimensionality, application of dynamic programming for resource allocation.

MOUDLE – 4 NON-LINEAR OPTIMATIZATION TECHNIQUES:

8H

Classical method optimization, Kun-Tecker, gradient based research techniques for simple unconstrained optimization.

SIMULATION: application of simulation techniques in water resources.

MOUDLE – 5 WATER – RESOURCES ECONOMICS

6H

Principles of Economics analysis, benefit cost analysis socio economic intuitional and pricing of water resources.

MOUDLE – 6 WATER RESOURCES MANAGEMENT

8H

Planning of reservoir system, optimal operation of single reservoir system, allocation of water resources, optimal cropping pattern, conjunctive use of surface and subsurface water resources

Text Books:

1. Water Resources System Analysis – Vedula & Mujumdar – Tata Mc.Graw Hill Company Ltd. 2005.
2. Water Resources Economics - James & Lee. Oxford Publishers 2005.
3. Optimisation technique by S.S.Rao

References Books:

1. Optimal design of water distribution networks P.R.Bhave, Narosa Publishing house 2003.
2. Operations research by P.Sankar Iyer, TMH Publications, New Delhi.
3. Operations research by N.Ramanathan, TMH Publications, New Delhi.

18.DESIGN AND DRAWING OF IRRIGATION STRUCTURES

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 44 | 4 | 40 | 60 | 100 |

Design and drawing of the following irrigation structures.

- | | |
|--------------------------------|----|
| 1. Sloping glacis weir. | 7H |
| 2. Tank sluice with tower head | 8H |
| 3. Type III Syphon aqueduct. | 8H |
| 4. Surplus weir. | 7H |
| 5. Trapezoidal notch fall. | 6H |
| 6. Canal regulator. | 8H |

Final Examination pattern: Any two questions of the above six designs may be asked out of which the candidate has to answer one question. The duration of examination will be three hours.

Text Books:

1. Design of minor irrigation and canal structures by C.SatyanarayanaMurthy, Wiley eastern Ltd.
2. Irrigation engineering and Hydraulic structures by S.K.Garg, StandardBook House.

19.ADVANCED HYDROLOGY

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 0 | 3 | 40 | 3 | 40 | 60 | 100 |

MODULE 1:HYDROLOGY

6H

Introduction about Hydrology, Hydrology and hydrologic cycle, World's water resources and India's water resources Hydrologic budget , problems based on water budget, Hydrometeorology.

MODULE 2: PRECIPITATION, EVAPORATION AND INFILTRATION

8H

Precipitation, Types, Measurement, Types, Rain gauge,Density, Estimation of missing data, Optimum rain gaugenetwork, Problems solving, DAD curves, Analysis of rainfall data, Evaporation, Transpiration Evaporation, Factors affecting evaporation, Measurement and Estimation Transpiration, Measurement and estimation, Panevaporation, Blaney Criddle methodInfiltration, Factors affecting infiltration, Measurementand estimation Horton's model, Phi-index, W-index

MODULE 3:RUNOFF

6H

Runoff, Components of stream flow, CatchmentCharacteristics, Factors affecting runoff, Estimation of runoff, DifferentMethods, Flow duration curve, Rainfall runoff modeling.

MODULE 4:HYDROGRAPHS

6H

Hydrograph, Unit hydrograph,Problems, S- curve hydrograph, Synthetic hydrograph,Applications.

MODULE 5:FLOOD ESTIMATION ANDFORECASTING

7H

Estimation of peak flood, Flood frequency studies,Gumbel's method, Methods of flood control, Flood routing through aReservoir, Channel flow routing, Muskingum method, Flood forecasting and warning.

MODULE 6:RESERVOIR PLANNING ANDMANAGEMENT

7H

Reservoir , Single and multipurpose, Multi objective Fixation of storage capacity, Strategies for reservoir Operation, Sedimentation of reservoirs, Design flood Levees and flood walls, Channel improvement.

Text Books

- 1.Raghunath, H.M, " Hydrology: Principles, Analysis and Design ", New age publications, 2006
2. K. Subramanya " Engineering Hydrology" Tata McGraw- Hill Education,

Reference Books

- 1.Chow V T and Maidment, "Hydrology for Engineers", McGraw Hill Inc , Ltd., 2000
- 2.Singh V P, "Hydrology", McGraw Hill Inc., Ltd., 2000

20.ADVANCED IRRIGATION ENGINEERING DESIGN

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 42 | 4 | 40 | 60 | 100 |

MODULE 1: IRRIGATION

7H

Introduction - overview of syllabus, Necessity and importance of irrigation -Advantages and ill effects of irrigation – Types of irrigation irrigation, Irrigation methods – Types of Surface, subsurface and sprinkler irrigation, Pressurized irrigation - Drip, Sprinkler, Lift Irrigation, Methods of improving soil fertility – Standards of quality for irrigation water

MODULE 2: WATER REQUIREMENTS OF CROPS

7H

Preparation of land for irrigation – Classes and availability of soil water – Soil moisture deficiency– Depth of water stored in root zone - Limiting soil moisture conditions – Depth and Frequency of irrigation, Crop season - Duty and Delta – Factors affecting duty – Methods of improving duty, Consumptive use - Estimation - Blaney Criddle method - Pan evaporation method, Irrigation efficiencies – Types – Principle crops and Crop rotation – Assessment of irrigation water.

MODULE 3: DIVERSION HEAD WORKS – I

6H

Weirs and barrages – Gravity and non-gravity weirs – Diversion head works and its components Diversion weir and its types – Afflux, pond level – Under sluices – Divide wall – River training works– Guide banks, Marginal bunds, Groynes – Fish ladder Canal head regulator – functions.

MODULE 4: DIVERSION HEAD WORKS – II

7H

Design of waterway of regulator, Silt control devices – Silt excluders and Silt ejectors, Failure of hydraulic structures – Failure by piping and failure by direct uplift, Bligh's creep theory, Lane's weighted creep theory and Khosla's theory, Khosla's method of independent variables for determination of pressures and exit gradient for seepage below a weir or a barrage. Design of a vertical drop weir on Bligh's creep theory. Design of pucca floor and aprons.

MODULE 4:

CONVEYANCE AND DISTRIBUTION SYSTEM

8H

Canal – Classification – Canal alignment - Canal losses – Balancing depth Maintenance of irrigation channels – Canal breaches – Regulation of canal system Measurement of discharge of a canal – Area velocity method, Chemical method, Weir method, Meter flume method, Stage discharge method, Water logging – Causes and control – Reclamation of saline land - Land drainage – types – Layout of tile drain system, Canal lining – Advantages and Disadvantages of canal lining – Type of lining.

MODULE 6: CANAL STRUCTURES

7H

Canal falls – Necessity and location of falls – Types – Design of a trapezoidal notch fall – Design of simple vertical drop fall Canal regulators – Alignment of the off taking channel - Head and cross regulators – Functions – Design Canal escape – Types - Canal outlets – Types Cross drainage works – Types – Selection of suitable type of cross drainage work.

Text Books

1. Santhosh Kumar Garg, "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, 2000.
2. Punmia B.C. and Pande B.B. Lal, "Irrigation and Water Power Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2009

Reference Books

1. Asawa .G.L, "Irrigation and Water Resources Engineering", New Age International Publishers, New Delhi, 2005.
2. Sharma .R.K, "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Company, New Delhi, 2002.

21.HYDROPOWER ENGINEERING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 44 | 4 | 40 | 60 | 100 |

MODULE - 1HYDROPOWER PLANT DEVELOPMENT

6H

Sources and forms of energy Hydropower plants classification Layout and components, Development of hydropower schemes Comparison of Hydro and Thermal power, Survey and Investigation.

MODULE – 2 POWER POTENTIAL

6H

Estimation of Hydropower potential Flow duration curve, Firm power, Secondary Power Load and Load duration curves, Load factor, Firm capacity, Reservoir capacity, Capacity factor

MODULE – 3 WATER CONVEYANCE SYSTEM

8H

Intake structures: Location function and types of intakes, Energy losses at intake trash rock Power canals , Alignment, Design of power canals Penstocks, Alignment, types of penstock, Economic diameter of penstocks and Anchor blocks Water hammer pressure Behavior of surge tanks, Types of surge tanks Hydraulic design of simple surge tank.

MODULE – 4 IMPACT OF JET ON VANES

8H

Introduction to Impulse Momentum equation and its applications Force exerted by a Jet on a fixed target Force exerted by a Jet on a moving target Force exerted by a Jet on a series of curved vane

MODULE – 5 MISCELLANEOUS HYDRAULIC MACHINES

8H

Francis Turbine, Component and Working Velocity triangle, Work done Design parameters, Problems Draft tube theory, Runaway speed Hydraulic accumulator, Hydraulic intensifier Hydraulic press and ram, Hydraulic cranes and Lift.

Text Books

- 1.Modi .P.N. and Seth .S.M, “Hydraulics and Fluid Mechanics”, Standard Book House, 2005.
- 2.Rajput .R.K, “Fluid Mechanics and Hydraulic Machines”, S.Chand and Company Ltd., 2013.

Reference Books

- 1.Bansal .R.K, “Fluid Mechanics and Hydraulic Machines”, Laxmi Publications 2010.
- 2.M.M.Dandekar and K.N.Sharma, “Water Power Engineering”, Vikas ublications 1979.



AUTONOMOUS

DEPARTMENT OF CIVIL ENGINEERING

B.Tech Minor Degree Subjects

| S.No | Course Name | L-T-P | Credits |
|------|-----------------------------|-------|---------|
| 1 | Strength Of Materials | 3-1-0 | 4 |
| 2 | Fluid Mechanics | 3-1-0 | 4 |
| 3 | Water Resources Engineering | 3-1-0 | 4 |
| 4 | Surveying | 3-1-0 | 4 |
| 5 | Structural Analysis | 3-1-0 | 4 |
| 6 | Geology/Soil Mechanics | 3-1-0 | 4 |
| 7 | Environmental Engineering | 3-1-0 | 4 |
| 8 | Highway Engineering | 3-1-0 | 4 |



AUTONOMOUS

DEPARTMENT OF CIVIL ENGINEERING

B.Tech Minor Subjects&Syllabus

1. STRENGTH OF MATERIALS

| Semester | Hours / Week | | | Total hrs | Credit C | Max Marks | | |
|----------|--------------|---|---|-----------|-------------|-----------|-----|-------|
| | L | T | P | | | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MODULE – 1 REVIEW OF STATICS

8H

Types of external loads – internal stresses –normal and shear stresses – strain – Hooke’s law – working stress –stress strain diagrams – Poisson’s ratio – relationship between elastic constants Elongation of bars of constant and varying sections – statically indeterminate problems in tension and compression – Temperature effects – strain energy and complementary energy strain energy due totension, compression and shear.

MODULE -2: SHEAR FORCE&BENDING MOMENT

8H

Different types of beams – various types of loading – Relationship connecting intensity of loading, shearing force and bending moment – shear force and bendingmomentdiagrams for cantilever beams and Simply supported beams for different types of loading.

MODULE-3: FLEXURAL STRESSES

9H

Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ – Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections SHEAR STRESSES: Derivation of formula – Shear stress distribution across various beam sections likerectangular, circular, triangular, I, T and angle sections.

MODULE-4: ANALYSIS OF STRESS AND STRAIN ON OBLIQUE SECTIONS

8H

Stress on inclined planes for axial and biaxial stress fields – principal stresses –Mohr’s circle of stress. Thin and Thick Cylinders: Stresses in thin cylinders – thick cylinders – Lamé’s equation – stresses in thick cylinders due to internal and external pressures .

MODULE-5: TORSION

8H

Torsion of solid and hollow circular shafts – Pure shear –strain energy in pure shear and torsion. Springs: Close coiled and open coiled helical springsTheory of columns: Direct and bending stresses in short columns- Kern of a section. Buckling and stability – Euler’s buckling/crippling load for columns with different end conditions – Rankine’s formula.

MODULE-6: THEORIES OF FAILURES

7H

Various Theories of failures like Maximum Principal stress theory –Maximum Principal Strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory.

Text Book(s):

1. Mechanics of Materials – Dr.B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications.
2. Strength of Materials by R.K Rajput, S.Chand& Company Ltd.
3. Strength of Materials by B.S.Basavarajaiah, Universities Press, Hyderabad.
4. Strength of materials by R.K. Bansal, Laxmi Publications,2005.

Reference Book(s):

1. Timoshenko, Strength of Materials Vol. I & Vol. II , CBS Publishers & Distributers, New Delhi.
2. S.S Bhavikatti , Structural analysis Vol, Vikas Publications (P) Ltd.4th Edition.

FLUID MECHANICS

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MODULE – 1: PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENT**8H**

Properties of fluids: introduction: Dimensions and units – properties of fluids-mass density, specific weight, specific volume, specific gravity, viscosity-units, dynamic and kinematic viscosity, newton’s law of viscosity, Newtonian and non-Newtonian fluids, variation of viscosity with temperature; surface tension-surface tension on liquid droplet, hollow bubble and liquid jet; capillarity-capillary rise and capillary fall.

Pressure Measurement: Fluid Pressure at a Point; Pascal’s law, Hydrostatic law, Atmospheric, Absolute, gauge, atmospheric and vacuum pressures; Hydrostatic paradox; Pressure measurement – manometers- Simple, differential and Micro Manometers; vapour pressure and cavitation.

MODULE -2: HYDROSTATIC FORCES AND BUOYANCY**8H**

Hydrostatic forces on surfaces: Total Pressure and Centre of Pressure- on Horizontal Plane Surface; Vertical Plane Surface; Inclined Plane Surface and Curved Surfaces.

Buoyancy: Buoyancy; Buoyant Force and Centre of Buoyancy, Stability of submerged bodies and floating bodies; Metacentre and metacentric height, analytical method for metacentric height.

MODULE-3: KINEMATICS OF FLUID FLOW**8H**

Kinematics of Fluid Flow: Introduction, Methods of describing fluid motion; Classification of fluid flow; Steady, unsteady, uniform and non-uniform flows; Laminar and turbulent flows; three, two and one dimensional flows; Irrotational and rotational flows. Streamline; Pathline; Streakline.

Rate of flow, continuity equation, continuity equation in three dimension, equation for velocity and acceleration, Local acceleration, convective acceleration; Velocity potential and stream function; relation between stream function and velocity potential function; equipotential line, Flow net. Vortex flow – free vortex and forced vertex flow.

MODULE-4: DYNAMICS OF FLUID FLOW**8H**

Dynamics of Fluid flow: Forces acting on a Fluid in Motion; Equations of motion; Euler’s equation of motion; Bernoulli’s equation; assumptions; Energy correction factor; Momentum principle. Practical applications of Bernoulli’s equation: Venturimeter, Rate of flow through venturimeter, inclined venturimeter; Orifice meter, Rate of flow through Orifice Meter; Rate of flow through flow nozzle; Measurement of velocity by Pitot tube, Pitot-static tube; Force exerted by a flowing fluid on a pipe bend.

MODULE-5: ORIFICES, MOUTHPIECES, NOTCHES AND WEIRS**8H**

Orifices and Mouthpieces: Orifice-Classification of Orifices; Flow through an orifice, Hydraulic coefficients, Determination of coefficients for an Orifice, Flow through large rectangular Orifice; Flow through submerged Orifice – fully sub-merged and partially sub-merged. Mouth piece-Classification of Mouthpieces, Flow through external and internal cylindrical Mouthpiece.

Notches and Weirs: Introduction, Classification of Notches and Weirs, Flow through rectangular, Triangular and trapezoidal notches and weirs; End contractions; Velocity of approach; Cipolletti weir; Discharge over Broad crested weir, narrow crested weir and submerged weir.

MODULE-6: FLOW THROUGH PIPES

8H

Flow through pipes: Energy losses in pipelines; loss of energy due to friction-Darcy Weisbach equation; Minor energy losses in pipelines; Hydraulic Grade Line and Total Energy Line; Siphon; Pipes in series, concept of equivalent length; pipes in parallel & branched pipes.

Laminar & Turbulent flow in pipes: Reynolds's experiment; Characteristics of laminar flow; Steady laminar flow through a circular pipe (Hazen poiseuille equation). Characteristics of turbulent flow, Prandtl's mixing length theory, Hydro dynamically smooth and rough boundaries, Velocity distribution, and friction factor for pipe flow.

Text Book(s):

1. Modi P N and Seth S M, —Hydraulics and Fluid Mechanics, Standard Book House, Delhi, 1998.
2. A text of Fluid mechanics and hydraulic machines by Dr.R.k.Bansal – Laxmi Publications (P) Ltd., New Delhi.
3. Rajput .R.K, “Fluid Mechanics and Hydraulic Machines”, S.Chand and Company Ltd.,2005.
4. S.K.Som&G.Biswas “Introduction to Fluid Machines” (Tata Mc.Grawhillpublishers Pvt. Ltd.) 3rd Edition, 2011.

Reference Book(s):

1. C.S.P. Ojha, R. Berndtsson, and P.N. Chandramouli, “Fluid Mechanics and Machinery”, Oxford University Publication, 2010.
2. F.M. White. “Fluid Mechanics”, 5th Edition New York McGraw-Hill, 2003.
3. Y.A. Cengel and J.M. Cimbala. “Fluid Mechanics”, Tata McGraw-HillPublishing Company limited, 2006.
4. J.F.Douglas, J.M. Gaserek and J.A.Swaffird, “Fluid Mechanics” Prentice Hall 4th Edition, 2000.
5. Mohhanty A K, _Fluid Mechanics‘Second Edition, Prentice Hall of India Private Limited, New Delhi, 2010.

3. WATER RESOURCES ENGINEERING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MODULE – 1: INTRODUCTION TO HYDROLOGY

8H

History of hydrology, applications in engineering, sources of hydrological data; Hydrologic cycle; catchment, stream patterns; basin characteristics, classifications of watersheds precipitation- types and forms of precipitation; weather systems for precipitation, characteristics of precipitation in India; measurement of precipitation , types of rain gauges, Presentation of Rainfall data, computation of average rainfall over a basin, presentation and interpretation of rainfall data. Probable maximum precipitation (PMP).

MODULE-2:ABSTRACTIONS FROM PRICIPITATIONS

8H

Introduction, Evaporation, factors affecting evaporation, measurement of evaporation, methods to reduce evaporation losses; Transpiration, Factors effecting transpiration; Evapotranspiration, measurement of evapotranspiration; Infiltration, infiltration capacity factors affecting infiltration capacity, measurement of infiltration, classification of infiltration capacities, infiltration indices.

MODULE-3:HYDROGRAPHS

8H

Runoff process, Components of stream flow, Factors affecting runoff, Estimation of runoff, Empirical formulae and Infiltration method; Flow-duration curve, Flow-mass curve; Hydrographs, Components of hydrograph, Base flow separations, Unit hydrograph, Derivation of Unit hydrograph, Unit hydrograph of different durations, Use and limitations of UH, Duration of the Unit hydrograph, S-Unit hydrograph, Instantaneous Unit hydrographs.

MODULE-4:GROUNDWATER

8H

Introduction, Aquifer, Aquiclude, Aquifuge, aquifer parameters- porosity, Specific yield, Specific retention; Divisions of sub–surface water; Water table; Types of aquifers; storage coefficient-coefficient of permeability and transmissibility; well hydraulics- Darcy’s law; Steady radial flow to a well –Dupuit’s theory for confined and unconfined aquifers; Tube well; Open well; Yield of an open well–Constant level pumping test, Recuperation test.

MODULE-5: STREAMGAUGING

8H

Necessity; Selection of gauging sites; Measurement of stage; methods of Discharge Measurement: Area-Velocity method, Slope-Area method, Tracer method, Electromagnetic induction method, Ultrasonic method; Measurement of depth –Sounding rod, Echo-sounder; Measurement of velocity: Floats – Surface floats, Sub–surface float or Double float, Velocity rod; Pitot tube; Current meter- rating of current meter, measurement of velocity; chemical method; Measurement of stage-Staff gauge, wire gauge, water stage recorder, bubble gauge recorder; stage-discharge curve; units of stream flow.

MODULE-6: RESERVOIR PLANNING

8H

Introduction; Investigations for reservoir planning; Selection of site for a reservoir; Zones of storage in a reservoir; Storage capacity and yield; Mass inflow curve and demand curve; Calculation of reservoir capacity for a specified yield from the mass inflow curve; Determination of safe yield from a reservoir of a given capacity; Sediment flow in streams: Reservoir sedimentation; Life of reservoir; Reservoir sediment control; Flood routing; Methods of flood routing-Graphical Method (Inflow – storage discharge curves method).

Text Book(s):

1. Santhosh Kumar Garg, “*Irrigation Engineering and Hydraulic Structures*”, Khanna Publishers, 2000.
2. Raghunath .H.M, “*Hydrology*”, New Age International Publishers, New Delhi, 2007.
3. Irrigation engineering and Hydraulic structures by S.K.Garg, Standard Book House.

Reference Book(s):

1. Asawa .G.L, “*Irrigation and Water Resources Engineering*”, New Age International Publishers, New Delhi, 2005.
2. Sharma .R.K, “*Irrigation Engineering and Hydraulic Structures*”, Oxford and IBH Publishing Company, New Delhi, 2002.
2. Punmia B.C. and Pande B.B. Lal, “*Irrigation and Water Power Engineering*”, Laxmi Publications Pvt. Ltd., New Delhi, 2009.
3. Design of minor irrigation and canal structures by C.Satyanarayana Murthy, Wiley eastern Ltd.

SURVEYING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-----|
| | L | T | P | | | C | CIE | SEE |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MODULE – 1: BASIC CONCEPTS & CHAIN SURVEYING**8 H**

Basic concepts: Surveying – History, primary divisions, Classification, Principles of surveying, Basic Measurements; Instruments and Basic methods; units of measurement, Plan and map, Scales. Errors- Accuracy and Precision, Sources and types of errors. **Chain Surveying:** Principles of chain survey, Methods of measuring distance, Direct and indirect ranging, Metric chains, Chaining on plane and sloping ground, Instruments for setting out right angles, Basic problems in chaining, Chaining past obstacles, Cross-staff survey, Plotting of chain survey, Errors.

MODULE – 2: COMPASS SURVEY & PLANE TABLE SURVEYING**8 H**

Compass survey: Introduction, Bearings and angles, Designation of bearings, fore bearing and back bearing, Theory of Magnetic compass (i.e. prismatic compass), Measurement of bearings of lines, Open and closed traverse, calculation of included angles, plotting of a traverse, Magnetic Declination, Local attraction-Related Problems, Errors in compass survey. **Plane table surveying:** Introduction, Accessories, Working operations, Methods of plane tabling, Two point and Three point problems.

MODULE – 3: LEVELLING**8 H**

levelling: Introduction, basic definitions, methods of levelling, levelling instruments-dumpy level, levelling staff, Sensitivity of a Level tube, Temporary adjustments of dumpy level, theory of simple and differential levelling, Classification of direct levelling methods, Calculation of reduced levels by height of instrument and rise & fall methods, Reciprocal levelling, Profile levelling and Cross sectioning, Curvature and Refraction, Difficulties in levelling, errors in levelling, Degree of Precision.

MODULE – 4: CONTURING & COMPUTATION OF AREAS AND VOLUMES**8 H**

Contouring: Introduction, contour interval, Characteristics of contours, Methods of locating contours - Direct and indirect methods, Contour gradient, Uses of contour maps. **Areas:** methods of determining areas, areas by sub-division into triangles, areas from offsets to a base line- regular and irregular intervals, Simpson's rule, area by double meridian distances, area by co- ordinates. **Volumes:** embankments and cutting for a level section, two level sections, three level section and multi-level section, prismoidal formula, trapezoidal formula, volume from spot levels, volume of earth work from contour plan, capacity of a reservoir.

MODULE – 5:THEODOLITE TRAVERSING

8 H

Theodolite: Vernier Theodolite, Basic definitions, Fundamental lines and desired relations; Temporary adjustments; Measurement of a horizontal angle, Repetition and Reiteration methods of horizontal angle measurement, Measurement of vertical angle. **Traverse surveying:** Introduction, Selection and marking of traverse stations, methods of traversing, traversing by free needle and fast needle method, traversing by direct observation of angles, checks in closed traverse, closing error, methods of balancing the traverse, Omitted measurements.

MODULE – 6:TRIGONOMETRIC LEVELLING & MINOR INSTRUMENTS

8 H

Trigonometric levelling : Introduction; Determination of the level of the top of an object, When its base is accessible and When its base is not accessible; Determination of the height of the object when the two instrument stations are not in the same vertical plane; Axis signal correction; Difference in elevation by single observation and reciprocal observations. **Minor instruments:** uses and working of the minor instrument-Box sextant, Planimeter, Pentagraph, Clinometers.

TEXT BOOKS

1. Surveying Vol. 1 & II by Dr. K. R. Arora, Standard Book House.
2. Surveying Vol. I & II by B.C. Punmia, Laxmi Publications.

REFERENCE BOOKS

1. Text book of surveying by C.Venkataramaiah, Universities Press.
2. Plane Surveying by Chandra AM, New age International Pvt.Ltd.
3. Surveying Vol. I &II byS.K. Duggal, McGraw Hill Education (India) private limited.
4. Surveying and Levelling by Kanetkar T.P., and Kulkarni, Vols. I and II, United Book Corporation.
5. Surveying and levelling by R.Subramaniah, Oxford university press.
6. Surveying by Mimi Das Saikia, PHI Publications.

5.STRUCTURAL ANALYSIS

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MODULE – 1 ANALYSIS OF FRAMES

8H

Analysis of Frames Types of frames- Perfect and Imperfect pin jointed frames. Analysis of determinate pin jointed frames using method of joints and method of sections for vertical, horizontal and inclined loads.

MODULE – 2 ENERGY THEOREMS

8H

Energy Theorems Introduction-Strain energy in linear elastic system, expression of strain energy due axial load, bending moment and shear forces- castigliano's first theorem - Unit Load Method. Deflections of simple beams and pin jointed plane trusses.

MODULE-3 MOVING LOADS AND INFLUENCE LINES

8H

Influence lines for reactions, Shear force and bending moment for statically Determinate beams influence lines for members' forces in pin-jointed frames.

MODULE-4 DEFLECTION OF STATICALLY DETERMINATE BEAMS

8H

Differential equation of the elastic curve – Method of successive integration, Macaulay's method, Method of superposition, moment area method

MODULE-5 FIXED AND CONTINUOUS BEAMS

8H

Propped cantilever and fixed beams-fixed end moments for propped cantilever and fixed beams subjected to concentrated loads and uniformly distributed load, triangular load –Clapeyron theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams for continuous beams

MODULE-6 SLOPE DEFLECTION METHOD

8H

Analysis of continuous beams- beams with overhang- analysis of rigid frames - frames without sway andwith sway - different types of loads -settlement effects

Text Book(s):

- 1.Structural Analysis – I by Dr.Hemant Patil, Dr.Yogesh Patil and Jignesh Patil by Synergy Knowledge ware publications, Mumbai.
- 2.S.S. Bhavikatti, Structural Analysis II, Vikas Publication Houses (P) Ltd, 2016
- 3.R. Vaidyanathan and P. Perumal, Structural Analysis Volume I & II, Laxmi Publications (P) Ltd., 2017

Reference Book(s):

- 1.Reddy . C.S., Basic Structural Analysis, Tata McGraw Hill, 3e, 2011
2. S.S Bhavikatti , Structural analysis Vol, Vikas Publications (P) Ltd.4th Edition
- 3.Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi

6.GEOLOGY/SOIL MECHANICS

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | C | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MODULE-1 INTRODUCTION

8H

:Importance of Geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological drawbacks. Importance of Physical geology, Petrology and Structural geology. **WEATHERING OF ROCKS** : Its effect over the properties of rocks importance of weathering with REFERENCE to dams, reservoirs and tunnels weathering of common rock like “Granite”

MODULE-2 MINERALOGY

8H

Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economic minerals such as Pyrite, Hematite, Magnetite, Chromite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite.

MODULE-3 PETROLOGY

10H

Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of Igneous, Sedimentary and Metamorphic rocks. Their distinguishing features, Megascopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

STRUCTURAL GEOLOGY : Outcrop, strike and dip study of common geological structures associating with the rocks such as folds, faults and unconformities, and joints – their important types. Their importance In situ and drift soils, common types of soils, their origin and occurrence in India.

MODULE-4 GROUND WATER, EARTH QUAKE & LAND SLIDES

8H

Ground water, Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration. Earth quakes, their causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Land slides, their causes and effect; measures to be taken to prevent their occurrence. Importance of study of ground water, earth quakes and land slides.

MODULE-5 GEOPHYSICAL STUDIES

6H

Importance of Geophysical studies Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and Geothermal method. Special importance of Electrical resistivity methods, and seismic refraction methods. Improvement of competence of sites by grouting etc.

MODULE-6 GEOLOGY OF DAMS ,RESERVOIRS AND TUNNELS

8H

Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factor's Contributing to the success of a reservoir. Geological factors influencing water Lightness and life of reservoirs. Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (ie. Tithological, structural and ground water) in tunneling over break and lining in tunnels.

Text books:

1. Engineering Geology by N.Chennkesavulu, Mc-Millan, India Ltd. 2005
2. Engineering Geology by Vasudev Kanthi, Universities Press, Hyderabad.

References:

1. Engineering Geology by Duggal.S.K., TMH Publishers.
2. Engineering Geology by Subinoy Gangopadhyay, Oxford University Press.
3. Engineering Geology by Prabin Singh, Katson Pubilcations
4. Principals of Engineering Geology by K.V.G.K. Gokhale – B.S publications

7.ENVIRONMENTAL ENGINEERING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-----|
| | L | T | P | | | C | CIE | SEE |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MODULE-1 SOURCES, DEMAND AND COLLECTION OF WATER

6H

Sources of water – Source Selection – Water demand – Types – Factors affecting water demand – Fluctuations in water demand – Design period – Population forecasting methods and their suitability – Intake structures – Site selection.

MODULE-2 QUALITY AND ANALYSIS OF WATER

6H

Characteristics of water – Physical, Chemical and Biological. Analysis of Water – Physical, Chemical and Biological. Impurities in water, Water borne diseases. Drinking water quality standards.

MODULE-3 WATER TREATMENT

10H

Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation-flocculation clarifier design – coagulants – feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation comparison of filters – disinfection – theory of chlorination, chlorine demand, other disinfection practices- Miscellaneous treatment methods .

MODULE-4 WATER DISTRIBUTION

8H

Distribution systems – Requirements, Layout of Water distribution systems - Design procedures- Hardy Cross and equivalent pipe methods service reservoirs – joints, valves such as sluice valves, air valves, scour valves and check valves water meters – laying and testing of pipe lines – pump house, waste detection and prevention.

MODULE-5 WASTE WATER COLLECTION AND CHARACTERISTICS

8H

Conservancy and water carriage systems – sewage and storm water estimation – time of concentration – storm water overflows combined flow – characteristics of sewage – cycles of decay – decomposition of sewage, examination of sewage – B.O.D. – C.O.D. equations.

MODULE-6 WASTE WATER & SLUDGE TREATMENT

10H

Layout and general outline of various units in a waste water treatment plant – primary treatment: design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – biological treatment – trickling filters – standard and high rate – Construction and design of Oxidation ponds. Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks and Imhoff Tanks, working principles and design – soak pits.

Text books:

1. Water Supply Engineering by S.K. Garg.
2. Water Supply Engineering by B.C.Punmia
3. Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B.C.Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt.Ltd, New Delhi
4. Wastewater Engineering by B.C.Punmia
5. Sewage Disposal and Air Pollution Engineering by S.K. Garg

References Books:

1. Wastewater Engineering, Treatment, Disposal and Reuse by Metcalf and Eddy.
2. Environmental Engineering I Water Supply Engineering by Modi. P. N
3. Water Supply and Sanitary Engineering by G. S. Birdie & J. S. Birdie.
4. Environmental Science and Engineering by J.G.Henry and G.W.Heinke – Person Education

8. HIGHWAY ENGINEERING

| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
|----------|--------------|---|---|-----------|--------|-----------|-----|-------|
| | L | T | P | | | CIE | SEE | TOTAL |
| | 3 | 1 | 0 | 48 | 4 | 40 | 60 | 100 |

MODULE-1 HIGHWAY PLANNING AND ALIGNMENT

8H

Significance of highway planning – Modal limitations towards sustainability – History of road development in India – factors influencing highway alignment – Soil suitability analysis – Road ecology – Engineering surveys for alignment, objectives, conventional and modern methods – Classification of highways – Locations and functions – Typical cross sections of Urban and Rural roads

MODULE-2 HIGHWAY GEOMETRICS

6H

Highway classification (Rural and Urban roads), Road Geometrics – Highway cross section elements – Camber – Sight Distance, Horizontal Alignment Design, Super Elevation, Extra widening, Transition curves, set back distance, Design of Vertical curves.

MODULE-3 TRAFFIC ENGINEERING

6H

Characteristics of traffic elements – Design of Intersections, Interchanges, Parking Layout & Road signs – Urban traffic management - Traffic regulation and control, Accidents, Causes and Preventions.

MODULE-4 HIGHWAY MATERIALS AND CONSTRUCTION

8H

Material requirement for pavements – Soil classification for Highway – Soil tests – CBR and Plate Load Test, Aggregate – materials testing and specification, Bitumen – material testing and specification – Concrete Mix Design, construction of bituminous and rigid pavements, Highway Maintenance – Material recycling.

MODULE-5 HIGHWAY DESIGN

10H

Pavement Analysis – Factors affecting pavement thickness – Soil – Wheel load – Temperature – Environmental factors; Flexible Pavement Design – Axle Load surveys – CBR method of Design, Rigid Pavement Design – IRC method.

MODULE-6 EVALUATION AND MAINTENANCE OF PAVEMENTS

10H

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

Text books:

1. Khanna, S.K. & Justo, C.E.G., Highway Engineering, NemChand& Bros, Roorkee(U.A)..
2. Kadiyali, L.R., Traffic Engineering & Transport Planning, Khanna Publishers, New Delhi.
3. Kadiyali, L.R. & Lal, N.B., Principles & Practices of Highway Engineering, Khanna Publishers, New Delhi.

References:

1. Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand & Co., New Delhi.
2. IRC – 37 “Guidelines for Design of flexible Pavements”, IRC, New Delhi, 2001.
3. IRC – 67 “Code of Practice for Road Signs”, IRC, New Delhi – 2001. 30
4. IRC: 58, 2002: “Guidelines for the Design of Plain Jointed Rigid Pavements for Highways”, IRC, N. Delhi, December, 2002.
5. IRC:70, 1977: “Guidelines on Regulation and Control of Mixed Traffic in Urban Areas”
6. IRC:106, 1990: “Guidelines for Capacity of Urban Roads in Plain Areas”
7. IRC-73 11. IRC-

