

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**



NAAC Accredited-2015'B' Grade  
(CGPA 2.62)

**Name of the Faculty: Science & Technology**

**CHOICE BASED CREDIT SYSTEM**

**Syllabus Structure: B. Tech. (Civil Engineering)**

**T.Y. B. Tech (Civil Engineering)  
w. e. f. Academic Year 2022-23**



**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**  
**Faculty of Science & Technology**

**Credit System structure of T. Y. B. Tech. Civil Engg.- I, Semester- V,**  
**(Revised from 2022-2023)**

| Course Code | Theory Course Name                         | Hrs./week |          |          |          | Credits   | Examination Scheme |            |            |            |
|-------------|--|-----------|----------|----------|----------|-----------|--------------------|------------|------------|------------|
|             |  | L         | T        | P        | D        |           | ISE                | ESE        | ICA        | Total      |
| CE51C       | Design of Steel Structures                 | 3         | -        | -        | -        | 3         | 30                 | 70         | -          | 100        |
| CE52C       | Geotechnical Engineering                   | 3         | -        | -        | -        | 3         | 30                 | 70         | -          | 100        |
| CE53C       | Highway and Tunnel Engineering             | 3         | -        | -        | -        | 3         | 30                 | 70         | -          | 100        |
| CE54C       | Hydrology and Water Resources Engineering  | 3         | -        | -        | -        | 3         | 30                 | 70         | -          | 100        |
| CE55C       | Design of Concrete Structures I            | 3         | -        | -        | -        | 3         | 30                 | 70         | -          | 100        |
| CE56C       | Environmental Engineering-II               | 3         | -        | -        | -        | 3         | 30                 | 70         | -          | 100        |
| SL-5        | HSS Course – Elective (Self Learning mode) | -         | -        | -        | -        | 1         | -                  | 50         | -          | 50         |
|             | <b>Total</b>                               | <b>18</b> | <b>-</b> | <b>-</b> | <b>-</b> | <b>19</b> | <b>180</b>         | <b>470</b> | <b>-</b>   | <b>650</b> |
|             | <b>Laboratory/Drawings</b>                 |           |          |          |          |           |                    | <b>POE</b> | <b>OE</b>  |            |
| CE57L       | Geotechnical Engineering                   | -         | -        | 2        | -        | 1         | -                  | 25         | -          | 25         |
| CE58L       | Highway & Tunnel Engineering               | -         | -        | 2        | -        | 1         | -                  | -          | -          | 25         |
| CE59L       | Planning & Design of Public Building       | 1         | -        | -        | 2        | 2         | -                  | 50         | -          | 25         |
| CE510L      | Environmental Engineering-II               | -         | -        | 2        | -        | 1         | -                  | -          | 25         | 25         |
|             | <b>Total</b>                               | <b>1</b>  | <b>-</b> | <b>6</b> | <b>2</b> | <b>5</b>  | <b>-</b>           | <b>100</b> | <b>100</b> | <b>200</b> |
|             | <b>Grand Total</b>                         | <b>19</b> | <b>-</b> | <b>6</b> | <b>2</b> | <b>24</b> | <b>180</b>         | <b>570</b> | <b>100</b> | <b>850</b> |

**Abbreviations:** L- Lectures, P –Practical, T- Tutorial, D- Drawing. \*- Alternate week, ISE -Internal Tests, ESE – University Examination (Theory &/ POE &/Oral examination), ICA- Internal Continuous Assessment.

Note:- Students shall undergo a field training of 15 days in the winter vacation after T.Y. B. Tech Part I and submit the field training report, which shall be assessed by faculty associated with ‘Principles of Management and Quantitative Techniques’, in T.Y. B. Tech. Part II.

**1) Self-Learning Module- I at T.Y. B. Tech. Civil Engineering, Semester – I:**

(A) Student can select & enroll a ‘Self Learning Module- I’ (HSS) Course from following list

**SL5- A:- Self Learning Module – I (HSS)**

| No | Course title   |
|----|--|
| 1  | Economics  |
| 2  | Intellectual Property Rights for Technology Development and Management |
| 3  | Introduction to Sociology  |
| 4  | Stress and Coping  |
| 5  | Professional Ethics & Human Value                                      |

**OR**

(B) Student can select and enroll for minimum eight weeks NPTEL HSS course SL31-(B), complete its assignments, and appear for certificate examination conducted by NPTEL. The list of courses as shown in Table SL31-(B) will be updated from time to time by Institute. Latest updated list will be valid for selection of self learning Module-I (HSS) courses.

More details about NPTEL are available at <http://nptel.ac.in>

**SL31-(B): Self Learning Module-I (HSS)**

**University approved NPTEL- HSS course List (SL31-B)**

| No | Course title                                   | No | Course title  |
|----|--|----|---|
| 1  | Soft skills                                    | 15 | Management of Inventory Systems   |
| 2  | Introduction to Modern India Political Thought | 16 | Economic Growth and Development   |
| 3  | Intellectual Property                          | 17 | Ethic in Engineering Practice   |
| 4  | Technical English for Engineers                | 18 | Corporate Social Responsibility   |
| 5  | Developing Soft Skills and Personality         | 19 | Marketing Management –I   |
| 6  | Educational Leadership                         | 20 | Marketing Research and Analysis   |
| 7  | Microeconomics: Theory & Applications          | 21 | Selected Topics in Decision Modeling                                    |
| 8  | Engineering Economics                          | 22 | Innovation, Business Models and Entrepreneurship                        |
| 9  | Human Resource Development                     | 23 | Simulation of Business Systems: An Applied Approach                     |
| 10 | Project Management for managers                | 24 | Sustainability through Green Manufacturing Systems: An Applied Approach |
| 11 | Data Analysis and Decision Making - I          | 25 | Total Quality Management - I  |
| 12 | E-Business                                     | 26 | Introduction to Operations Research                                     |
| 13 | Working Capital Management                     | 27 | Knowledge Management  |
| 14 | Industrial Safety Engineering                  |    |   |



# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

## Faculty of Science & Technology

### Credit System structure of T. Y. B. Tech. Civil Engg. –II, Semester –VI, W. E.F. 2022-2023

| Course Code | Theory Course Name  | Hrs./week |          |          |          | Credits   | Examination Scheme |            |           |            |
|-------------|---|-----------|----------|----------|----------|-----------|--------------------|------------|-----------|------------|
|             |   | L         | T        | P        | D        |           | ISE                | ESE        | ICA       | Total      |
| CE61C       | Foundation Engineering  | 3         | -        | -        | -        | 3         | 30                 | 70         | -         | 100        |
| CE62C       | Hydraulic Structures and Water Power Engg.                      | 3         | -        | -        | -        | 3         | 30                 | 70         | -         | 100        |
| CE63E       | Professional Elective Course-I ( <i>Refer list at the end</i> ) | 3         | -        | -        | -        | 3         | 30                 | 70         | -         | 100        |
| CE64C       | Design of Concrete Structures II                                | 3         | -        | -        | -        | 3         | 30                 | 70         | -         | 100        |
| CE65C       | Principles of Management and Quantitative Techniques            | 3         | -        | -        | -        | 3         | 30                 | 70         | -         | 100        |
| CE66C       | Railway, Airport & Harbour Engineering                          | 3         | -        | -        | -        | 3         | 30                 | 70         | -         | 100        |
|             | <b>Total</b>  | <b>18</b> | <b>-</b> | <b>-</b> | <b>-</b> | <b>18</b> | <b>180</b>         | <b>420</b> | <b>-</b>  | <b>600</b> |
|             | <b>Laboratory/Drawings:</b>                                     |           |          |          |          |           |                    | <b>POE</b> | <b>OE</b> |            |
| CE67L       | Project on Steel Structures                                     | -         | -        | -        | 2        | 1         | -                  | -          | 25        | 25         |
| CE68L       | Principles of Management and Quantitative Techniques            | -         | -        | 2        | -        | 1         | -                  | -          | 25        | 25         |
| CE69L       | *Mini Project using Application Software                        | -         | -        | 2        | -        | 1         | -                  | -          | -         | 25         |
|             | <b>Total</b>  | <b>-</b>  | <b>-</b> | <b>4</b> | <b>2</b> | <b>3</b>  | <b>-</b>           | <b>50</b>  | <b>75</b> | <b>125</b> |
|             | <b>Grand Total</b>  | <b>18</b> | <b>-</b> | <b>4</b> | <b>2</b> | <b>21</b> | <b>180</b>         | <b>470</b> | <b>75</b> | <b>725</b> |

Abbreviations: L- Lectures, P –Practical, T- Tutorial, D- Drawing, ISE -Internal Tests, ESE - University Examination (Theory &/ POE &/Oral examination), ICA- Internal Continuous Assessment.

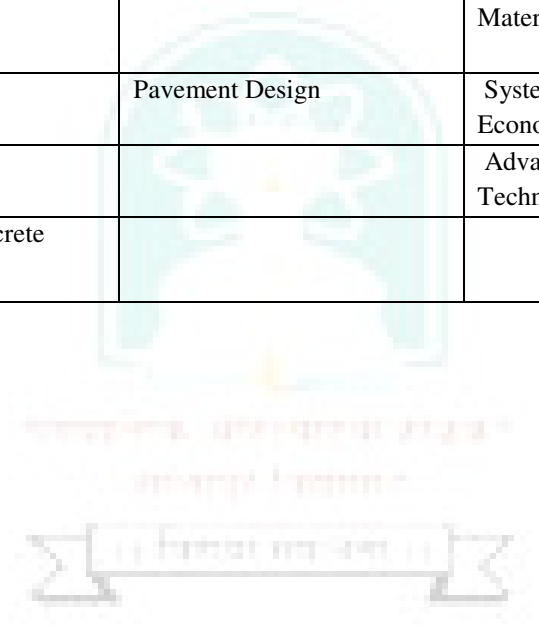
\* The students shall carry out 'Mini Project' in any one of the using suitable application software. The Mini project shall be assessed by the concerned subject teachers for ICA.

#### Note:

- 1) Students shall undergo a field training of 15 days in the summer vacation after T.Y. B. Tech. Part II. The training report shall be assessed in Final Year B.Tech. Part -I by the concerned 'Seminar' guides.
- 2) Internal Continuous Assessment (ICA): ICA shall be a continuous process based on the performance of the student in assignments, class tests, quizzes, attendance and interaction during theory and lab sessions, journal writing, report presentation etc., as applicable
- 3) The batch size for the practical/tutorial is of 15 students. On forming the batches, if the number of remaining students exceeds 7 students, then a new batch be formed.

**Professional Elective Courses: Student shall choose any one course of the following**

| Elective No            | Semester           | (I) Structural Engineering                 | (II) Geotechnical Engineering & Transportation Engg. | (III) Construction Engineering & Management | (IV) Environmental Engineering & Hydraulics, Hydrology & Water Resources Engineering |
|------------------------|--------------------|--|--|---|--|
| <b>Prof Elective-I</b> | <b>Semester-VI</b> | Structural Analysis by Matrix Methods      | Airport Planning and Design                          | Construction Engineering Materials          | Open Channel flow & River Hydraulics   |
|                        |                    | Structural Dynamics                        | Pavement Design                                      | Systems Engineering & Economics             | Solid and Hazardous Waste Management   |
|                        |                    | Design of Bridges                          |  | Advanced Concrete Technology                | Urban Hydrology and Hydraulics   |
|                        |                    | Design of Pre stressed concrete structures |  |   |  |





**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part I**

**CE51C- DESIGN OF STEEL STRUCTURES**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

### **Course Outcomes:**

After successful completion of the course, students will be able to

1. Understand the Philosophy and design criteria, Select appropriate load combinations for 'Limit State' design of various elements of steel structures for strength and serviceability
2. Analyze and design simple connections between structural members including Bolted and welded connections
3. Analyze and design Tension members, Compression members, and their connections.
4. Analyze and design of flexural members by limit state method.
5. Plastic analysis of (flexural members) beams.
6. Design Columns, Column base (slab base, gusseted base) for given loading conditions.

## **SECTION I**

### **Unit 1: Introduction to Design of Steel Structures**

**(4)**

Steel as a structural member, Philosophy of limit state design for strength and serviceability, partial safety factor for load and resistance, various design load combinations, various types of standards rolled sections, Types of connections (Flexible, rigid, semi-rigid connection), Classification of cross section such as plastic, compact, semi-compact and slender.

### **Unit 2: Design of Connections**

**(6)**

Bolted Connections, Types of bolts and bolted joints, Failure of bolted joints, Specifications of bolted connections (Pitch, gauge, Edge distance, End distance, tacking bolts etc), Bearing type connection, Shear strength of bolts, bearing strength of bolts, Tensile strength of bolts, Tensile strength of plate, Efficiency of bolted connections, design of eccentric bolted subjected to in plane and out of plane loading.

Welded connections, types of welded joints, Design strength of fillet weld, Design strength of butt weld, design of eccentric welded connections subjected to in plane and out of plane loading.

**Unit 3: Tension Members** (6)

Various cross sections such as solid threaded rod, cable and angle sections, net effective area of bar, angle, tees and flats, Limit strength due to yielding, rupture and block shear, Load carrying capacity, Design of tension member, connections of member with gusset plate by bolts and welds, Design of tension splice.

**Unit 4: Compression Members-Struts** (6)

Common sections used for compression members, buckling classification as per geometry of cross section, buckling curves, effective length and slenderness ratio, permissible stresses, Load carrying capacity, design of struts, connections of members with gusset plate by bolts and welds.

**SECTION II**

**Unit 5: Beams** (6)

Laterally supported and unsupported beams (Design of Purlins), Design of laterally supported/ laterally unsupported beams subjected to low/ high shear. Secondary and main beam arrangement for floor of building, design of beam-to-beam connections using bolt / weld.

**Unit 6: Columns** (6)

Simple and built-up section, Design of built-up column, lacing and battening, connection of lacing/battening with main components by bolts and welds, column subjected to axial force and bending moment, column splices, design of eccentrically loaded column subjected to uniaxial bending (check for section strength only), design of beam to column connections using bolt / weld.

**Unit 7: Column Bases** (4)

Column base under axial load: design of slab base, gusseted base, design of anchor bolts, design of pedestal, Column base for axial load and uniaxial bending.

**Unit 8: Introduction to Plastic Analysis for Beams** (4)

Plastic moment, moment curvature relationship, plastic hinges, yield spread in section, shape factor for cross-sections, Types of mechanisms, theorem of plastic analysis, collapse load, complete, partial and over complete collapse, application of virtual work method to beams.

**Unit 9: Introduction to Pre-Engineered Buildings** (3)

Introduction – History - Advantages of PEB - Applications of PEB – Materials used for manufacturing of PEB. Difference between Conventional Steel Buildings and Pre-Engineered



buildings

**Note:**

Use of IS: 800-2007, Steel Table, IS: Handbook No. 1 for steel section and steel table is permitted for theory examinations.

**ASSIGNMENTS**

At least one assignment one assignment on each topic.

**TEXT BOOKS**

1. Design of Steel Structures, N. Subramanian, Oxford, 2008
2. Limit State Design of Steel Structures, S. K. Duggal.
3. Design of steel structure by Limit State Method as per IS: 800- 2007 by Bhavikatti S. S, I K International Publishing House, New Delhi
4. Limit state design in Structural Steel by Dr M. R. Shiyekar
5. Design of Steel structures by K. S. Sai Ram
6. Design of Steel structures by L. S. Jayagopal and D. Tensing
7. K.S.Vivek &P. Vaishavi – Pre Engineered Steel Buildings, Lambert Academic Publishing

**REFERENCE BOOKS**

1. Limit state design of Steel Structure by V. L. Shah & Gore, Structures Publication, Pune
2. Limit State Design of Steel Structures by D. Ramchandra & Virendra Gehlot, Scientific Publishers
3. Design of Steel Structures by K. S. Sai Ram, published by Dorling Kindersley (India) Pvt. Ltd.
4. Structural Design and Drawing Reinforced Concrete and Steel by N. Krishnaraju,
5. Universities Press (India) Pvt. Ltd. Hyderabad.
6. Teaching Resource Material by INSDAG
7. Bureau of Indian Standards, IS:800-2007, IS:875 part- I to III
8. Steel Tables SP: 6(1) and SP: 6(6)
9. Alexander Newman, Metal Building Systems Design and Specifications, 2nd Edition



**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part I**

**CE52C- GEOTECHNICAL ENGINEERING**

**Teaching Scheme**

**Lectures:-**3Hrs/Week, 3 Credits

**Practical:-**2 Hr/Week, 1 Credit

**Examination Scheme**

**ISE:** 30 Marks

**ESE:** 70 Marks

**POE:** 25 Marks

**ICA:-** 25 Marks

**Course Outcomes:**

After successful completion of the course, students will be able to

1. Determine various index properties of soil in the laboratory to characterize and classify the soil.
2. Estimate the permeability and seepage through soil mass by applying basic hydraulic flow principles.
3. Draw stress contours in soil mass by applying stress distribution theory.
4. Determine shear strength parameters of soil under various drainage conditions
5. Determine compaction properties and consolidation settlement of soil for given loading conditions.
6. Determine earth pressure for earth retaining structure.

**SECTION –I**

**Unit 1:**

**(9)**

**Introduction:** - Definition of soil, formation and type of soil, Application areas of soil mechanics, 3- phase soil system.

**Index properties of soil:-** Terminology used in basic soil properties (Voids ratio, Porosity, Degree of saturation, Percentage air voids, air content, different densities & unit weights) and their inter relationship, Method for determination of field density viz. Sand Replacement and Core Cutter. Specific gravity and its determination methods, Density index.

**Soil consistency:-** Atterberg's limits and their significance.

**Soil classification:-** Soil classification based on particle size and consistency, Grain size distribution by mechanical & sedimentation analysis, I.S. classification system of soil ( IS-1498-1970)- Plasticity chart.

**Unit 2:** (10)

**Flow of water through soil:-** Permeability – head , gradient and potential , Darcy's law and its validity, Factors affecting permeability, Field and laboratory methods of determining permeability, seepage pressure, Quick sand condition, critical hydraulic gradient, Derivation of Laplace's equation, flow net and its application, Construction of flow net, Piping phenomenon, concept of total, neutral & inter granular stress.

**Stress Distribution in Soil:** Boussineq's Equation for point load, Vertical pressure under uniformly loaded circular area and uniformly loaded rectangular area, Pressure bulb and its significance, Newmarks's Chart. Contact pressure distribution under rigid footing.

**Unit 3:** (10)

**Shear strength :-** Concept of shear, Coulomb's theory and failure envelope, Total stress approach, effective stress approach and pore water pressure, Representation of stresses on Mohr's circle for different types of soil such as cohesive and cohesion less in terms of total stress & effective stress, Application of shear strength parameters in the field.

**Different types of shear tests:** - Unconsolidated Undrained (U-U), Consolidated Undrained (C-U) and consolidated drained test ( C-D). Choice of type of test, Box shear test, Triaxial compression test with pore pressures and volume change measurements, Unconfined compression test, Vane shear test, Sensitivity and thixotropy of cohesive soils, factors affecting shear strength.

**SECTION –II**

**Unit 4:** (09)

**Compaction:-** Theory of compaction, factors influencing compaction, Laboratory Standard and Modified compaction test, Method and measurement of field compaction with their suitability, field compaction control. (Different equipment for field compaction)

**Unit 5:** (10)

**Compressibility and consolidation:**

**Compressibility:-** Definition, compressibility of laterally confined soil, compression of sand and clay,  $e - p$  curve,  $e - \log p$  curve, compression index

**Consolidation:-** Basic terminology , Terzaghi's theory of one dimensional consolidation, relevance of one dimensional consolidation to field condition , consolidation test, determination of coefficient of consolidation, degree of consolidation, time factor

**Unit 6:****(10)**

**Earth pressure theories:-** Concepts, area of application, Earth pressure at rest, active and passive conditions. Rankine's and Coulomb's theory of earth pressure, Graphical solution- Trial wedge method, Culman's method – Rehphan's construction and modification. Critical depth of open cut in cohesive soil.

**INTERNAL CONTINUOUS ASSESSMENT (ICA)**

ICA shall consist of at least eight of following experiments in the laboratory:

1. Specific gravity determination of coarse and fine grained soil
2. Particle size distribution- Mechanical sieve analysis, wet sieve analysis
3. Determination of Atterberg's consistency limits
4. Permeability- Determination of coefficient of permeability
5. Field density determination: Sand replacement & Core cutter method.
6. Proctor compaction test : Light & Heavy
7. Direct box shear test
8. Unconfined compression test
9. Tri-axial test
10. Laboratory Vane Shear Test.
11. One dimensional consolidation test

**TEXT BOOKS**

1. Soil Mechanics and foundation Engineering- B.C. Punmia (Laxmi publications (Pvt) Ltd, New Delhi)
2. Geotechnical Engineering- Purushottam Raj (Tata Mcgraw hill company Ltd, New Delhi)
3. Basic and applied Soil Mechanics (Revised Edition) – Gopal Rajan and Rao A.S.R. (New Age, New Delhi. 1998)
4. Soil Mechanics and Foundation Engineering - Dr. K. R. Arora, (Standard Publication)
5. Soil Mechanics and Foundation Engineering -V.N.S. Murthy (UBS publishers and distributors, New Delhi)
6. Geotechnical Engineering- Kasamalkar B.J. (Pune Vidyarthi Griha Prakashan, Pune)
7. Geotechnical Engineering - C. Venkatachalam (New Age International ( I ) Ltd, New Delhi)
8. Principles of Geotechnical Engineering- Braja M. Das (Cengage Learning India Pvt. Ltd, New Delhi)

## REFERENCE BOOKS

1. Soil Mechanics in Engineering Practice - Terzaghi and Peck, John Wiley and sons, New York
2. Fundamentals of Soil mechanics - Taylor D.W, (John Wiley, New York)
3. Soil mechanics in theory and practice- Alam Singh (Asian Publishing House, Bombay)
4. Soil Testing -T.W. Lambe (Willey Eastern Limited, New Delhi)
5. Geotechnical Engineering by Shashi K. Gulati & Manoj Datta, Tata McGraw Hill





**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part I**

**CE53C- HIGHWAY AND TUNNEL ENGINEERING**

**Teaching Scheme**

**Lectures:-**3Hrs/Week, 3 Credits

**Practical:-**2 Hr/Week, 1 Credit

**Examination Scheme**

**ISE:** 30 Marks

**ESE:** 70 Marks

**ICA:-** 25 Marks

**Course Outcomes:**

After successful completion of the course, students will be able to

1. Choose the ideal alignment for highways after thorough understanding of planning and different surveys.
2. Design various geometric elements of highway as per IRC standards.
2. Evaluate the pavement materials through various tests in the laboratory and design the crust thickness of flexible and rigid pavements as per IRC standards.
4. Recognize different layers of pavement and illustrate the construction process and also suggest maintenance activities for flexible and rigid pavement.
5. Select appropriate method of tunnel construction in different types of soils.

**SECTION- I**

**Unit 1:**

**(6)**

**Introduction to Transportation engineering:** Modes of transportations, their importance and limitations, the importance of highway transportation.

**Highway Development and Planning:** Principles of Highway planning, Road development in India, Classification of roads, road network patterns, Planning Surveys. Salient features of road development plan 2021 and present scenario of road development in India

**Highway Alignment and Surveys:** Requirements, Engineering Surveys.

**Unit 2:**

**(8)**

**Highway Geometric Design:** Cross Section elements, carriageways, camber, stopping and overtaking sight distances, Sight distance at uncontrolled intersection Horizontal alignment- Curves, design of super elevation, extra widening, transition curves, Set back distance and design of vertical curves.

**Unit 3:** (7)

**Highway Materials:** Properties of sub grade and pavement component materials, Tests on subgrade soils (CBR and Plate load tests), properties and requirements of road aggregates and bituminous materials, bituminous mix design by Marshall Method. Applications of Geosynthetics and Modified Binders in road construction.

## SECTION- II

**Unit 4:** (9)

**Pavement Design:** Types of pavements, Design parameters, Axle and Wheel load, tyre pressure, ESWL concept, EWL factors, IRC method of flexible pavement design based on CSA method using IRC-37-2018. Analysis of wheel load and temperature stresses of rigid pavement, joints, Design of Rigid Pavement as per IRC-58-2015 and Design of Dowel and Tie bars.

**Unit 5:** (10)

**Highway Construction and Maintenance:**

Flexible Pavement: Specifications, construction steps and quality control tests for Granular sub base course, Water Bound Macadam, Cement Treated Base and Subbase, Wet Mix macadam, Bituminous Concrete pavement, Stone Mastic Asphalt, Micro surfacing, Stress Absorbing Membrane Interlayer (SAMI), Recycling of Bituminous Pavement, Slurry Seal, Fog spray, surface dressing, Premix carpet.

Rigid Pavement: Dry Lean Concrete, Cement Concrete pavement and construction of joints

**Highway Maintenance:** Pavement failures (flexible and rigid), causes and remedies, Pavement evaluation, Functional and Structural evaluation. Demonstration (Animation and videos) of various equipment's such as Bump Integrator, Benkelman Beam Deflection, Falling Weight Deflectometer and Network Survey Vehicle. **Highway drainage:** Surface and sub-surface drainage.

**Unit 6:** (5)

**Tunnel Engineering:** Introduction to tunneling, size and shape of tunnel and suitability, tunneling through soils, soft and hard rocks, tunnel lining, drainage and ventilation. Demonstration of Tunnel Construction using Tunnel Boring Machine (TBM)

## INTERNAL CONTINUOUS ASSESSMENT (ICA)

### Test on Aggregates

1. Impact test on aggregate
2. Abrasion Test on aggregate
3. Crushing strength test on aggregate
4. Soundness test on aggregate
5. Shape test on aggregate

### Test on Soil

1. CBR test on soil
2. Compaction test on soil

### Test on Bitumen

1. Penetration test on bitumen
2. Ductility test on bitumen
3. Softening Point test on bitumen
4. Specific gravity test on bitumen 8.
5. Flash and Fire point test on bitumen
6. Viscosity Test on Bitumen.

From the above tests, Minimum 10 Tests have to be performed and assignments on each unit based on syllabus.

### Suggested Student Activities:

Other than the classroom and laboratory learning, following are the suggested student-related co-curricular activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports for each activities.

1. Undertake micro-projects related to road construction.
2. Observe the components of roadway and record the details of the same with necessary sketches.
3. Collect the information of NH and SH constructed and under construction across the country.
4. Visit the various plants such as RMC, Hot Mix Plant, stone crushing unit and Pug Mill Plant.
5. Collect the typical samples of drawings and legal documents required for road project form PWD office and prepare the detailed report



6. Search the software/freeware on the courses content related to Geometric Design of Road and Pavement Design and prepare the detailed report stating their applications.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

1. Collect all the details of all types of existing NH, SH across the country.
2. Evaluate the camber and gradient of any one road of each type of pavement in the vicinity of area of college.
3. Conduct topographical survey using total station or any other advanced equipment and prepare Plan and Profile of road using advanced geometrical design software's.
4. Advance Techniques of repairs like, White topping, Preventive maintenance, overlays, MSA (Million Standard Axle Load) calculation, utility system, encroachment, forest land under roads and road deflection studies.
5. Calculation of quantity estimation of flexible and rigid pavement.
6. Any other micro-projects suggested by subject faculty on similar line.

#### **TEXT BOOKS**

1. Highway Engineering By C.E.G.Justo, A. Veeraragavan & S.K.Khanna., *Nemchand Bros.*
2. Harbour, Dock and Tunnel engineering By R. Shrinivasan, *Charotar Publishing House.*
3. Transportation Engineering By Subramanian. K.P Scitech Publications, Chennai.
4. Principles of Transportation and Highway Engineering By Rao, G.V., McGraw – Hill Publishing Company Limited, New Delhi.
5. Highway Engineering, Kadiyali L.R, Khanna Publishers, New Delhi

#### **REFERENCE BOOKS**

1. Principles of Transportation Engineering, Partha Chakroborty and Animesh Das, PHI Publication.
2. Transportation Engineering – An Introduction, Khistry, C.J., PHI Publication.
3. Specifications of Road and Bridge Works (MoRTH) Publication – 5<sup>th</sup> Revision. New Delhi.
4. IRC: 37-2018, IRC: 58-2015, Road Development Plan Vision: 2021 and other relevant IRC codes



**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part I**

**CE54C-HYDROLOGY AND WATER RESOURCE ENGINEERING**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

### **Course Outcomes:**

After successful completion of the course, students will be able to

1. Estimate runoff, based on rainfall data and watershed characteristics.
2. Estimate design flood for a civil engineering project.
3. Calculate yield of open well and tube well for various types of aquifers using knowledge of ground water hydrology.
4. Elaborate National and State Water Policies.
5. Select appropriate water application technique of irrigation, depending upon type of crop, soil moisture and water availability.
6. Select suitable soil & water conservation techniques for particular watershed.

### **SECTION-I**

#### **Unit 1: Introduction to Hydrology**

**(7)**

Definition, History and importance of hydrology, The hydrological cycle, Weather and its precipitation potential. Precipitation :Forms and types of precipitation, Different methods of measurement, Factors affecting precipitation at a location, Correcting precipitation data, Estimating missing data, Estimation of extreme values, Rain gauge network, Determination of average precipitation over the catchments, Analysis of precipitation data, Mass rainfall curves, Intensity-duration curves, Concept of depth-area- duration analysis, Frequency analysis.

Evaporation and Evapo-transpiration: Factor affecting evaporation, Measurement and control of evaporation upon reservoirs. Evapo-transpiration - definition and measurement

Infiltration: Process of Infiltration, Factor affecting infiltration, Infiltration indices, Effect of infiltration of on runoff and ground water recharge.

**Unit 2: Rainfall – runoff Relationship (6)**

Factors affecting runoff, Catchment yield calculations, Rainfall-runoff relationship Hydrograph: Base flow, Separation of base flow, Unit hydrograph – theory, assumptions and limitations, Derivation and use of unit hydrograph, S-curve hydrograph.

**Unit 3: Stream gauging (5)**

Selection of a site, various methods of discharge measurements, Area velocity method, Slope Area method, S.W.F. and other modern methods.

Floods: Definition, Factors affecting, Estimation of peak flow, Rational and other methods, Design flood, hydrograph components, Recurrence period.

**Unit 4: Ground-water Hydrology (5)**

Occurrence and distribution of ground water, Specific yield of aquifers, Movements of ground water, Darcy's law, Permeability, Safe yield of basin, Hydraulics of well under steady flow condition in confined and unconfined aquifers, Specific capacity of a well, Well irrigation: tube wells, open wells, their design and construction.

**SECTION-II**

**Unit 5: Water Resources Development in India and Maharashtra (6)**

Water Resources Development in India & Maharashtra: National water policy of India, Water Policy of Maharashtra State, Development of irrigation potential through five year plans, Water resources potential of India, Water Resources development in India, Problems in water resources developments in country and Maharashtra state.

Inter basin transfer of water: Concept of inter basin transfer of water, Proposed inter basin transfer of water from surplus regions of India to deficit regions of India, National perspective plan of India-Himalayan rivers component and peninsular rivers component.

**Unit 6: Irrigation (6)**

- a. Irrigation: Definition and necessity of Irrigation, Different systems of irrigation-Flow, Lift, Inundation, Storage.
- b. Sources of water-river, well, tanks. Water Application Methods: Methods of lifting water and application of water to soils, Sprinkler, Drip, Basin, Furrow. Layout of Drip Irrigation System.
- c. Lift Irrigation: Necessity, General Layout, Main Components of a lift irrigation scheme, Elementary design of Lift Irrigation Scheme.
- d. Minor Irrigation System: Necessity and general layout of percolation tanks, Bandhara irrigation,

Kolhapur type weirs.

**Unit 7: Soil and Crop Water requirements (5)**

Soils: Types of Soils, Suitability of soils for different crops, Soil moisture, Wilting coefficient, Texture and physical structure, Harmful components in soil, Preparation of soil for irrigation. Crop Water requirements: Cash crops and food crops, Water requirement of different crops, Duty and Delta, Factors affecting duty and delta, Crop Seasons in Maharashtra and India, Command Area-Gross, Culturable, Irrigable, Calculation of water required.

**Unit 8: Water Management (5)**

- a. Watershed Management: Need of Watershed management, Importance of soil and water conservation measures, Reservoir sedimentation. Techniques for Rainwater harvesting and ground water harvesting.
- b. Water Management: Application of water, Water management and distribution, cooperative water users' organizations, Warabandi, Rotational applications, Assessment of canal revenue- Various methods.
- c. Applications of Remote Sensing and Geographic Information Systems in Water Resources Engineering

**INTERNAL CONTINUOUS ASSESSMENT (ICA)**

Internal Continuous Assessment (ICA) shall consist of minimum six assignments based on the entire curriculum.

**TEXT BOOKS**

1. Irrigation Engineering and Hydraulic Structures-S. K. Garg, Khanna Publishers, Delhi.
2. Irrigation and Water Power Engineering- Dr. Punmia, Dr. Pande, Laxmi Publications.
3. Engineering hydrology- K. Subramanya ,Tata McGraw- Hill Publishers.
4. Efficient Use of Irrigation Water-G. H. Sankara Reddi, Kalyani Publishers, Noida.
5. Water Management in India-J. V. S. Murthy.
6. Water Management, Conservation, Harvesting and Artificial Recharge- Dr. A. S. Patel, Dr. D. L. Shah, New Age International Publishers.
7. Hydrology and Water Resources-R. K. Sharma, Dhanpat Rai & Sons.
8. Fundamentals of Irrigation Engineering-Bharat Sing, Nem Chand & Bros, Roorkee.
9. Applied Hydrology, K.N. Muthreja, McGraw Hill Publications
10. Water Resources Engineering, PN Modi, Standard Publishers

## REFERENCE BOOKS

1. Irrigation theory & Practice – Michael, Vikas Publishing House.
2. Irrigation Structures- Milos Holy-CBIP
3. Water Management-Jaspal Singh, M. S. Acharya , Arun Sharma .Pub- Himanshu Publication
4. Design of Minor Irrigation and Canal Structure- Satyanarayan and R. Murthy

## WEBSITES

1. Ministry of Jal Shakti, Department of Water Resources, River Development and Ganga Rejuvenation: <http://mowr.gov.in/policies-guideline/policies/national-water-policy>
2. Maharashtra water resources regulatory authority: <https://mwrra.org/>
3. National Remote Sensing Center: <https://www.nrsc.gov.in/>
4. National Water Development Agency: <http://nwda.gov.in>





**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part I**

**CE55C- DESIGN OF CONCRETE STRUCTURES-I**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

**Course Outcomes:**

After successful completion of the course, students will be able to

1. Interpret the basic concept of limit state method.
2. Design appropriate type of slab for a given condition.
3. Analyze and Design suitable type of beam for a given condition.
4. Analyze and Design beam subjected to combined bending, shear and torsion.
5. Analyze and Design axially as well as eccentrically loaded columns.

**SECTION I**

**Unit 1: Introduction**

**(4)**

Philosophies of Design and their relative advantages and disadvantages, Types and classification of limit states, Characteristics strength and characteristics load, load factor, Partial safety factors. Limit State of Serviceability – Significance of deflection, I.S. Recommendations.

**Unit 2: Design of Slabs (Limit state method)**

**(6)**

One Way, Two Way and cantilever slabs as per IS code.

**Unit 3: Limit state of Collapse (Flexure, Shear and Bond)**

**(6)**

Analysis and Design of singly and doubly reinforced rectangular sections.

**Unit 4: Analysis and Design of Flanged Sections**

**(6)**

Analysis and Design of Singly and doubly Reinforced T & L Beams for flexure .

## SECTION II

### **Unit 5: Design of Continuous beams (8)**

Design of Continuous beams by Limit State Method.

### **Unit 6: Design of beam subjected to combined bending, shear and torsion (7)**

Behavior of R.C. rectangular sections subjected to torsion, Design of sections subjected to combined bending and torsion, combined shear and torsion, Design of beams for torsion.

### **Unit 7: Design of an axially as well as eccentrically loaded columns. (8)**

Analysis and Design of axially and eccentrically (Uni-axial) loaded Circular and Rectangular Columns, Introduction to biaxial bending of columns, Interaction diagrams, Circular columns with helical reinforcement.

#### **NOTE:**

1. Only IS: 456-2000 shall be allowed in University Exam.
2. IS 456-2019 Amendment
3. Unless otherwise mentioned separately, all the design should be by Limit State method.
4. Assignments as homework - One assignment on each topic

#### **TEXT BOOKS**

1. Limit State Theory & design –Karve & Shah Structures Pub., Pune
2. Reinforced Concrete Design (Limit State) - A.K. Jain
3. Reinforced Cement Concrete - B.C. Punmia
4. Design of R.C.C. structural elements by S.S. Bhavikatti (Volume I & II).
5. Design of R.C.C Structures by S. Ramamrutham, Dhanpat Rai Publications

#### **REFERENCE BOOKS**

1. IS: 456-2000
2. Fundamentals of Reinforced Concrete- Sinha & Roy
3. Limit State Design of Reinforced Concrete - P.C. Varghese, Prentice Hall of India, New Delhi.
4. Handbook of Reinforced Concrete: SP- 16
5. Reinforced Cement Concrete Design by Neelam Sharma, Katson Books



**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part I**

**CE56C- ENVIRONMENTAL ENGINEERING-II**

**Teaching Scheme**

**Lectures:-**3Hrs/Week, 3 Credits

**Practical:-**2 Hr/Week, 1 Credit

**Examination Scheme**

**ISE:** 30 Marks

**ESE:** 70 Marks

**ICA:-** 25 Marks

**OE:** 25 Marks

**Course Outcomes:**

After successful completion of the course, students will be able to

1. Plan the layout of sewage collection system, matching with topography of the region and characterization of sewage.
2. Select aerobic or anaerobic wastewater treatment processes and decide their sequence.
3. Design of aerobic and anaerobic wastewater treatment units and disposal of treated wastewater into the streams.
4. Elaborate the novel decentralized wastewater treatment systems.
5. Select appropriate methods of Solid waste Disposal and Management of hazardous waste based on their characteristics.
6. Analyze air pollution and adopt various measures to control air pollution.

**SECTION-I**

**Unit 1: Collection and conveyance of Sewage (8)**

Components of wastewater flows, waste water sources and flow rate. Variation in flow rates, Waste water constituents: Characteristics of various types of waste waters, Sewerage system, layout, types of sewers, collection system. Appurtenances, Design of sanitary and storm water sewers, Maintenance of sewerage systems, Sewage and sludge pumping, location, capacity and pumping station design.

**Unit 2: Unit Operations (10)**

Primary treatment- Screening, comminuting, grit removal, oil and grease trap, chemical precipitation.

Secondary treatment- Activated sludge process, Process design and operating parameters,



modification of ASP, operational problems, MBBR, SBR and MBR, Trickling filter, classification, process design considerations, Secondary Clarifications.

**Unit 3: Anaerobic treatment and Low cost treatment (6)**

Fundamentals of anaerobic treatment, sludge characteristics, Treatment and disposal, Concept of different anaerobic reactors.

Low cost waste water treatment methods- Principle of waste stabilization pond, Design and operation of oxidation pond, aerobic and anaerobic lagoons, Oxidation ditch, septic tank, Selection of alternative treatment process flow sheets.

**SECTION-II**

**Unit 4: Disposal of waste water (8)**

Disposal of waste water stream pollution, Self-purification, DO sag curve, Streeter Phelp's Equation, Emerging Technology for wastewater Treatment: objectives of small & decentralized wastewater Treatment systems:

- i. Root zone Technology,
- ii. Constructed Wetlands,
- iii. Duckweed Ponds,
- iv. Fluidized aerobic bed Technology,
- v. UASB
- vi. Anaerobic baffled reactor

**Unit 5: Solid Waste Disposal (6)**

Solid waste management - Solid waste definition, Types, sources, characteristics. Functional outlines- storage, collection, processing techniques, Treatments of solid waste-Composting, Incineration, Pyrolysis and sanitary land filling.

**Unit 6: Air Pollution (7)**

Air Pollution- Definition, Sources and classification of pollutants, Effects. Introduction to meteorological aspects of control of industrial air pollution- Settling Chamber, Bag filter, Cyclone separator, Scrubbers, Electrostatic precipitators. Control of vehicular air pollution. Air quality standards.

**LABORATORY WORK**  
**INTERNAL CONTINUOUS ASSESSMENT (ICA)**

The Internal Continuous Assessment (ICA) work includes practical work to find the characteristics of wastewater and demonstration of Air monitoring equipments and design of sewage treatment plant

Internal Continuous Assessment (ICA) work shall consist of the following:-

(A) List of Experiments (Any Eight)

Analysis of Waste Water,

- 1.pH Value
- 2.Total Solids
- 3.Dissolved Oxygen
- 4.Biochemical Oxygen Demand
- 5.Chemical Oxygen Demand
- 6.Chlorides
- 7.Oil & Grease
- 8.Sulphate Content
- 9.Total Nitrogen
- 10.Demonstration of High Volume Sampler
- 11.Demonstration of Auto Exhaust Analyzer.

(B) Design of sewerage system & Treatment system for a small urban area.

(C) Visit to sewage treatment plant

Internal Continuous Assessment (ICA) submission shall consist of the following –

Journal containing experiments carried out in part A of the Internal Continuous Assessment (ICA) and visit Report on (C).

Detail design and appropriate drawings required for part B of the Internal Continuous Assessment (ICA) work.

**END SEMESTER EXAMINATION (Oral)**

Oral examination will be based on the above syllabus.

## TEXT BOOKS

1. Environmental Engineering by Peavey- H. S. Rowe, D.R. and Thobanoglous, McGraw – Hill Book Company
2. Water supply and pollution control - Viessman W. and Hammer M.J. Harper Collins College Publishers.
3. Waste Water Engineering Treatment & Disposal - Metcalf & Eddy, Tata McGraw Hill, 1982
4. Sewage Disposal and Air Pollution Engineering - Garg S.K., Khanna Publishers
5. Waste water Supply Engineering by B. C. Punmia
6. Solid Waste Management in Developing countries - Bhide A.D. and Sundersen B.B. Indian National Scientific Documentation Centre, New Delhi
7. Air Pollution- Rao M.N. and Rao H.V.N. Tata McGraw Hill, 1990
8. Environmental Engineering, S.C. Sharma, Khanna Publishing House
9. Basic Environmental Engineering, R.C. Gaur, Newage Publications
10. Environmental Engineering, Dr. A.K. Jain (ISBN: 978-93-86173560), Khanna Publishers





**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**  
**T.Y. B. Tech Civil – Part I**  
**CE59L- PLANNING & DESIGN OF PUBLIC BUILDING**

**Teaching Scheme**

**Lectures:-1 Hr/Week, 1 Credit**

**Drawing:-2 Hr/Week, 1 Credit**

**Examination Scheme**

**POE: 50 Marks**

**ICA:- 25 Marks**

**Course Outcomes:**

After successful completion of the course, students will be able to

1. Plan and design a “Public Building” according to requirements adhering to National Building Code norms and standards.
2. Prepare “Permission Drawing” for public buildings for obtaining building permission from competent authority by using suitable ‘Computer Aided Drawing and Design’ application software.
3. Plan and design appropriate building services layout for “Furniture requirement, Electrification points, Water supply and Drainage System” for a building as per standards norms by using suitable ‘Computer Aided Drawing and Design’ application software.
4. Prepare “Perspective drawing of the Building” and “Line plan of any two Public Buildings” by using suitable ‘Computer Aided Drawing and Design’ application software.
5. Prepare a report on selected Public Building.

**INTERNAL CONTINUOUS ASSESSMENT (ICA)**

**A. Preparation of drawings for any one public building by using AutoCAD**

- 1) Permission Drawing
- 2) Furniture layout
- 3) Water supply and Drainage layout along with electrification layout
- 4) Perspective drawing of the building.

**B. Line plan of any two public buildings by using AUTOCAD**

**C. Report on building project under (A) above.**

**D. Site visit for the type of public building selected for planning and designing for Internal Continuous Assessment (ICA) submission.**

## **END SEMESTER EXAMINATION (Practical - Oral)**

1. Practical examination shall be based on assessment of knowledge of students about planning skill and AutoCAD drafting skills related to public building. (Maximum two hours shall be allotted to students to complete given task on AutoCAD during Practical and viva Exam.)
2. In addition Oral examination shall be based on Practical and ICA.

### **TEXT BOOKS**

1. Building Construction: Arora and Bindra, Dhanpat Rai Publications
2. Building Design and Drawing – Y. S. Sane, Allies Book Stall
3. Principles of Perspective drawing- Shah, Kale, Patki, Tata McGraw Hill Publication Ltd, Delhi
4. Building Construction by Sushil Kumar, Standard Publishers Distributors, Delhi
5. Interior Design- Principles and Practice- M. Pratap Rao, Standard Publishers and Dist., Delhi
6. Building Planning and Design by Kumar Swami and Kameshwar Rao, Charotar Publishing House.
7. Civil Engg. Drawing- by M. Chakraborty, Published by M. Chakraborty – Kolkata
8. Civil Engineering Drawing – by R.S.Malik, G.S.Meo, Computech Publication Ltd New Asian.
9. AutoCad software

### **REFERENCE BOOKS**

1. National Building Code, BIS, New Delhi.
2. Model Building Bye Laws, Town and Country Planning Departments, Ministry of Urban Development, Government of India.
3. Building Construction by McKay, W. B. & McKay, J. M. ,Vol.III and IV, Donhead Publishing Limited
4. Modern Building Construction by Warland D. E., Vol. I and II, Pitman Publishing
5. Building Drawing – Shah, Kale, Patki, Tata McGraw-Hill Education
6. Built Environment by Shah, Kale, Patki, Tata McGraw-Hill Education
7. Construction science – by Edwin Walker, Selwyn Morgan, Hutchinson Educational
8. Time savers standards for buildings – Calendar Pub. McGraw Hill
9. Alternative Building Materials & Technology-by Jagdish ,Reddy, Rao Published by New Age International, New Delhi
10. Development Control Rules- Building Byelaws of Local Authority.



**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part I**

**SL5- ELECTIVE (SELF LEARNING MODE)**

**ECONOMICS**

**Teaching Scheme**

**Credit- 1 Credit**

**Examination Scheme**

**ESE: 50 Marks**

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### **Course Outcomes:**

After successful completion of the course, students will be able to

1. Identify the Basic Economic problems, Resource Constraints
2. Apply various theories of economics for economic growth
3. Identify causes of Inflation consequence and remedies
4. To assess the impact of International Trade, foreign exchange on Indian economy

### **Unit 1: Introduction**

History of Economic thought, Basic Economic problems, Resource Constraints and Welfare maximization,

Nature of Economics: Positive and Normative Economics, Micro and Macro Economics, Basic concepts in Economics, The role of State in economic activity, Market and Government failures, New economic Policy in India.

### **Unit 2: Theories of Economics**

Theory of utility and consumer's choice, Theories of Demand, supply and market equilibrium, Theories of firm, production and costs, Market structures, Perfect and imperfect competitions, oligopoly, monopoly.

### **Unit 3: Macroeconomics**

An overview of Macroeconomics, measurement and determination of national income, Consumption, saving and investment.

### **Unit 4: Banking & Inflation**

Commercial and Central Banking, Relationship between money, output and prices. Inflation causes, consequences and remedies.

## **Unit 5: International Influences on Economics**

International Trade, foreign exchange and balance payments, stabilization policies, Monetary, Fiscal and exchange rate policies.

### **ASSIGNMENTS**

Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

### **TEXT BOOKS**

1. Economics: P.A. Samuelson & W.D Nordhaus (McGraw Hill, New York, 1995.)
2. Modern Microeconomics : A. Koutsoyiannis (Macmillan,1975)

### **REFERENCE BOOKS**

1. Microeconomics: R. Pindyck and D.L. Rubinfeld. (Macmillan New York, 1989)
2. Microeconomics: Gordon, 4<sup>th</sup> edition, Little Brown & Co., Boston,1987.
3. The Organization of Industry: William F. Shughart II, Richard D. Irwin, Illinois, 1990.



Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part I

SL5- ELECTIVE (SELF LEARNING MODE)

**INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY  
DEVELOPMENT AND MANAGEMENT**

**Teaching Scheme**

**Credit- 1 Credit**

**Examination Scheme**

**ESE: 50 Marks**

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**Course Outcomes:**

After successful completion of the course, students will be able to

1. Appreciate the intellectual property rights coming out of research and intellectual works
2. Demonstrate their knowledge about the process of acquiring the patents and copyrights for the innovative works.
3. Elaborate the role of Indian IPR system and role of WTO in protecting Intellectual Property Rights
4. Avoid the plagiarism in their thesis, research papers etc. which can be questioned legally.

**Unit 1:**

Dynamics of Knowledge evolution, creation of ownership domains in the knowledge space using various instruments of IPR

**Unit 2: International Influences on Economics**

Outlines concepts of confidentiality and information security, explores their role in technology development and transfer integrating Intellectual Property in project planning, execution & commercialization,

**Unit 3:**

Discussion on the shifting paradigms of R&D and their linkage to IPR, Introduction to concepts of Valuation of IP & Value Realization

**Unit 4:**

Comparison the Indian IPR system with international IPR frameworks especially in the context of WTO, followed by a few sessions on IPR litigations both for the enforcement of rights and business strategy.



## **Unit 5:**

Discussion on contentious issues of current interest such as Biotechnology and Intellectual Property, Protection of Traditional Knowledge, IPR and Electronic Commerce, TRIPS and Access to Medicines, Copyright issues in creative works, etc.

### **ASSIGNMENTS**

Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

### **TEXT BOOKS**

1. Prabuddha Ganguli: Intellectual Property Rights Unleashing the Knowledge Economy. Tata McGraw Hill, New Delhi, 2001.
2. Prabuddha Ganguli: Gearing Up for Patents The Indian Scenario. Universities Press India Ltd., Hyderabad, 1998.
3. P. Narayan: Patent Law. Eastern Law Co., Calcutta.

### **REFERENCE BOOKS**

1. Global Dimensions of Intellectual Property Rights in Science and Technology, Author: National Research Council , National Academies Press, 1993.
2. Technology Transfer: Intellectual Property Rights, C Sri Krishna, ICFAI University press (2008)



Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part I

SL5- ELECTIVE (SELF LEARNING MODE)

INTRODUCTION TO SOCIOLOGY

**Teaching Scheme**

**Credit-** 1 Credit

**Examination Scheme**

**ESE:** 50 Marks

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**Course Outcomes:**

After successful completion of the course, students will be able to

1. Interpret the effect of various social phenomena on sociology
2. Elaborate the role of urbanization on the society
3. Appreciate the need of social institutions for better society.
4. Assess the role of modernization, industrialization, environmental/ecological changes in the development of society.

**Unit 1:**

What is sociology, some sociological concepts: social structure, status, role, norms, values etc., Socialization, and culture and change.

Social stratification - various approaches and concept of social mobility.

**Unit 2:**

Population and society - Trends of demographic change in India and the world, Human Ecology, Trends of Urbanization in the developing countries and the world.

**Unit 3:**

Major social institutions - Family and marriage, caste and tribe and organizations:

- i. Formal organization (bureaucracy)
- ii. Informal Organization

**Unit 4:**

Processes of social change- Modernization (including Sanskritization), industrialization, environmental/ecological changes and development.

**Unit 5:**

Social movements - protest movements, reformist movement and radical movements in India.

## **ASSIGNMENTS**

Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

## **TEXT BOOKS**

1. Sociology, L. Broom, P. Selznick and D. Dorrock, 11th Edn. 1990 (Harper International).
2. Sociology: Themes and Perspectives, M. Haralambos, Oxford University Press, 1980.
3. General Introduction to Sociology, Guy Rocher, A. , MacMillan, 1982.

## **REFERENCE BOOKS**

1. Social movements in India, vols. 1-2, 1984, M.S.A. Rao, Manohar Publications.
2. Society in India, David Mandelbaum, 1990, Popular Publications.
3. Social change in modern India, M.N. Srinivas, 1991, Orient Longman Publications.





Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part I

SL5- ELECTIVE (SELF LEARNING MODE)

STRESS AND COPING

**Teaching Scheme**

**Credit-** 1 Credit

**Examination Scheme**

**ESE:** 50 Marks

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**Course Outcomes:**

After successful completion of the course, students will be able to

1. Identify various sources and nature of a stress.
2. Elaborate the effects of medical, psychological and behavioral stress.
3. Provide social support to mitigate the stress.
4. Adopt various stress management techniques.

**Unit 1:**

Concept of stress-current and historical status. The nature of the stress response.

**Unit 2:**

Common sources of stress biological, personality and environmental.

**Unit 3:**

Coping styles defensive behaviors and problem-solving. Consequences of stress - medical, psychological and behavioral.

**Unit 4:**

The role of social support in mitigating stress.

**Unit 5:**

Stress management techniques-relaxation, meditation, cognitive restructuring, self-control, bio-feedback and time management, Preparing stress profile of a student.

**ASSIGNMENTS**

Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment

such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

### **TEXT BOOKS**

1. Walt, S. "Stress Management for Wellness". Harcourt Brace & Jovanovich, N.York, 1994.
2. D. Girdano and G. Everly., "Controlling Stress and Tension", Prentice-Hall, 1986.
3. Monat and R. Lazarus, "Stress and Coping: An Anthology", Columbia Univ. Press, 1985.

### **REFERENCE BOOKS**

1. Weisman, "The Coping Capacity", Human Services Press, 1984.
2. Stress and Coping: The Indian Experience, D.M. Pestonjee, SAGE India; Second edition (1998)





Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part I

SL5- ELECTIVE (SELF LEARNING MODE)

PROFESSIONAL ETHICS & HUMAN VALUE

**Teaching Scheme**

**Credit-** 1 Credit

**Examination Scheme**

**ESE:** 50 Marks

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### **Course Outcomes:**

After successful completion of the course, students will be able to

1. Inculcate the human values in their behavior.
2. Demonstrate the Engineering ethics in their professional practice.
3. Practice the safety and responsibility and professional rights in their professional practice.
4. Incorporate the code of ethics of Global organizations such as ASME, ASCE, and IEEE

### **Unit 1: Human Values**

Morals, Values and Ethics, Integrity, Work Ethics, Service Learning, Civic Virtue, Respect for others, Living Peacefully, Caring, sharing, Honesty, Courage, Valuing Time, Cooperation, Commitment, Empathy, Self-Confidence, Character, spirituality

### **Unit 2: Engineering Ethics**

Senses of engineering ethics, Variety of Moral Issues, Types of inquiry, Moral Dilemmas Moral Autonomy, Kohlberg's Theory, Gilligan's Theory, Consensus and Controversy, Models of Professional Roles, Theories about Right Action, Self Interest, Customs and Religion.

### **Unit 3: Safety, Responsibilities and Rights**

Safety and Risk, Assessment of safety and Risk, Risk Benefit Analysis and Reducing Risk, The Three Mile Island and Chernobyl Case Studies.

Collegiality and Loyalty, Respect for Authority, Collective Bargaining, Confidentiality, Conflicts of Interest, Occupational Crime, Whistle Blowing, Professional Rights – Employee Rights, Intellectual Property Rights (IPR) – Discrimination

### **Unit 4: Global Issues**

Multinational Corporations, Environmental Ethics, Computer Ethics, Weapons Development, Engineers as Managers, Consulting Engineers, Engineers as Expert Witnesses and Advisors, Sample Code of Ethics of ASME, ASCE, IEEE, Institution of Engineers (India), etc.

## **ASSIGNMENTS**

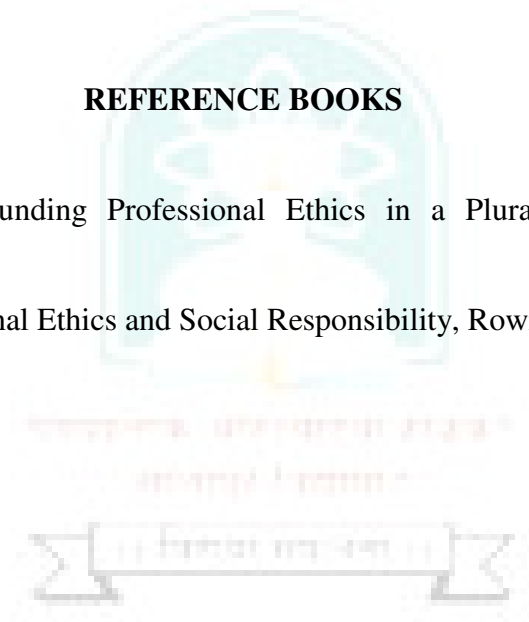
Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

## **TEXT BOOKS**

1. Bayles, M.D.: Professional Ethics, California: Wadsworth Publishing Company, 1981.
2. Koehn, D.: The Ground of Professional Ethics, Routledge, 1995.
3. R.S. Naagarazan, A Text Book of Professional Ethics & Human Values, New Age International, 2006

## **REFERENCE BOOKS**

1. Camenisch, P.F.: Grounding Professional Ethics in a Pluralistic Society, N.Y.: Haven Publications, 1983.
2. Wuest, D.E.: Professional Ethics and Social Responsibility, Rowman & Littlefield, 1994





Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part I

NPTEL

**SL31-(B): Self Learning Module-I (HSS)**  
**University approved NPTEL- HSS course List (SL31-B)**

| No | Course title                                   | No | Course title  |
|----|--|----|---|
| 1  | Soft skills                                    | 15 | Management of Inventory Systems   |
| 2  | Introduction to Modern India Political Thought | 16 | Economic Growth and Development   |
| 3  | Intellectual Property                          | 17 | Ethic in Engineering Practice   |
| 4  | Technical English for Engineers                | 18 | Corporate Social Responsibility   |
| 5  | Developing Soft Skills and Personality         | 19 | Marketing Management –I   |
| 6  | Educational Leadership                         | 20 | Marketing Research and Analysis   |
| 7  | Microeconomics: Theory & Applications          | 21 | Selected Topics in Decision Modeling                                    |
| 8  | Engineering Economics                          | 22 | Innovation, Business Models and Entrepreneurship                        |
| 9  | Human Resource Development                     | 23 | Simulation of Business Systems: An Applied Approach                     |
| 10 | Project Management for managers                | 24 | Sustainability through Green Manufacturing Systems: An Applied Approach |
| 11 | Data Analysis and Decision Making - I          | 25 | Total Quality Management - I  |
| 12 | E-Business                                     | 26 | Introduction to Operations Research                                     |
| 13 | Working Capital Management                     | 27 | Knowledge Management  |
| 14 | Industrial Safety Engineering                  |    |   |





# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

## Faculty of Science & Technology

### Credit System structure of T. Y. B. Tech. Civil Engg. –II, Semester –VI, W. E.F. 2022-2023

| Course Code | Theory Course Name                                     | Hrs./week |          |          |          | Credits   | Examination Scheme |            |           |            |
|-------------|--|-----------|----------|----------|----------|-----------|--------------------|------------|-----------|------------|
|             |  | L         | T        | P        | D        |           | ISE                | ESE        | ICA       | Total      |
| CE61C       | Foundation Engineering                                 | 3         | -        | -        | -        | 3         | 30                 | 70         | -         | 100        |
| CE62C       | Hydraulic Structures and Water Power Engg.             | 3         | -        | -        | -        | 3         | 30                 | 70         | -         | 100        |
| CE63E       | Professional Elective Course-I (Refer list at the end) | 3         | -        | -        | -        | 3         | 30                 | 70         | -         | 100        |
| CE64C       | Design of Concrete Structures II                       | 3         | -        | -        | -        | 3         | 30                 | 70         | -         | 100        |
| CE65C       | Principles of Management and Quantitative Techniques   | 3         | -        | -        | -        | 3         | 30                 | 70         | -         | 100        |
| CE66C       | Railway, Airport & Harbour Engineering                 | 3         | -        | -        | -        | 3         | 30                 | 70         | -         | 100        |
|             | <b>Total</b>   | <b>18</b> | <b>-</b> | <b>-</b> | <b>-</b> | <b>18</b> | <b>180</b>         | <b>420</b> | <b>-</b>  | <b>600</b> |
|             | <b>Laboratory/Drawings:</b>                            |           |          |          |          |           | -                  | <b>POE</b> | <b>OE</b> |            |
| CE67L       | Project on Steel Structures                            | -         | -        | -        | 2        | 1         | -                  | -          | 25        | 25         |
| CE68L       | Principles of Management and Quantitative Techniques   | -         | -        | 2        | -        | 1         |                    |            | 25        | 25         |
| CE69L       | *Mini Project using Application Software               |           |          | 2        |          | 1         |                    |            |           | 25         |
|             | <b>Total</b>   | <b>-</b>  | <b>-</b> | <b>4</b> | <b>2</b> | <b>3</b>  |                    | <b>50</b>  | <b>75</b> | <b>125</b> |
|             | <b>Grand Total</b>                                     | <b>18</b> | <b>-</b> | <b>4</b> | <b>2</b> | <b>21</b> | <b>180</b>         | <b>470</b> | <b>75</b> | <b>725</b> |

Abbreviations: L- Lectures, P –Practical, T- Tutorial, D- Drawing, ISE -Internal Tests, ESE - University Examination (Theory &/ POE &/Oral examination), ICA- Internal Continuous Assessment.

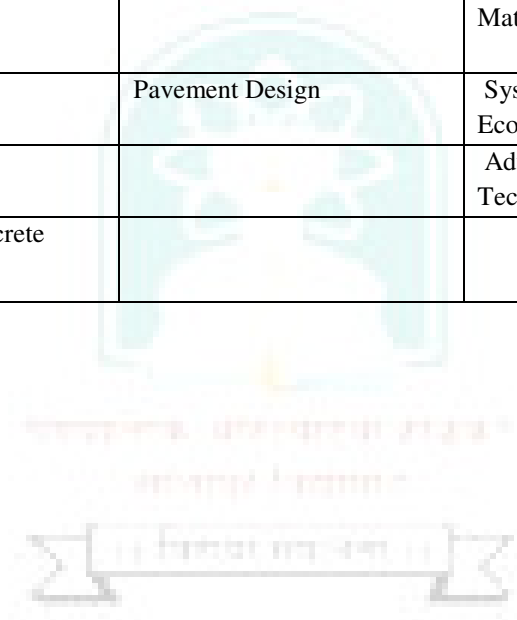
\* The students shall carry out 'Mini Project' in any one of the using suitable application software. The Mini project shall be assessed by the concerned subject teachers for ICA.

#### Note:

- 1) Students shall undergo a field training of 15 days in the summer vacation after T.Y. B. Tech. Part II. The training report shall be assessed in Final Year B.Tech. Part -I by the concerned 'Seminar' guides.
- 2) Internal Continuous Assessment (ICA): ICA shall be a continuous process based on the performance of the student in assignments, class tests, quizzes, attendance and interaction during theory and lab sessions, journal writing, report presentation etc., as applicable
- 3) The batch size for the practical/tutorial is of 15 students. On forming the batches, if the number of remaining students exceeds 7 students, then a new batch be formed.

**Professional Elective Courses: Student shall choose any one course of the following**

| Elective No            | Semester           | (I) Structural Engineering                 | (II) Geotechnical Engineering & Transportation Engg. | (III) Construction Engineering & Management | (IV) Environmental Engineering & Hydraulics, Hydrology & Water Resources Engineering |
|------------------------|--------------------|--|--|---|--|
| <b>Prof Elective-I</b> | <b>Semester-VI</b> | Structural Analysis by Matrix Methods      | Airport Planning and Design                          | Construction Engineering Materials          | Open Channel flow & River Hydraulics   |
|                        |                    | Structural Dynamics                        | Pavement Design                                      | Systems Engineering & Economics             | Solid and Hazardous Waste Management   |
|                        |                    | Design of Bridges                          |  | Advanced Concrete Technology                | Urban Hydrology and Hydraulics   |
|                        |                    | Design of Pre stressed concrete structures |  |   |  |





Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part II

CE61C- FOUNDATION ENGINEERING

**Teaching Scheme**

**Lectures:-**3Hrs/Week, 3 Credits

**Examination Scheme**

**ISE:** 30 Marks

**ESE:** 70 Marks

### Course Outcomes

After successful completion of the course, students will be able to

1. Evaluate bearing capacity of soil by various analytical and experimental approaches by obtaining the data from soil exploration.
2. Perform geotechnical design of shallow foundation such as isolated footing, combined footing, raft foundation.
3. Apply suitable ground improvement techniques for construction of footing in difficult soil.
4. Perform geotechnical design of deep foundation such as Pile foundation and Caisson foundation
5. Investigate slope stability of embankments

### SECTION –I

**Unit 1:**

**(8)**

**Introduction:** - General requirements for satisfactory performance of foundations.

**Soil Exploration:-** Necessity, Planning, Exploration methods, Different types of boring- Hand and continuous flight augers, Wash boring, Rotary drilling. Soil sampling- Disturbed and Undisturbed. Rock drilling and sampling. Core barrels, Core boxes, Core recovery, RQD

**Unit 2:**

**(12)**

**Bearing Capacity Analysis:** Bearing capacity – Ultimate, safe and allowable. Modes of failure, Terzaghi's bearing capacity equation with derivation, I S code method of bearing capacity (IS 6403 -1981), Effect of water table, Eccentricity of load.

**Field Test for Bearing Capacity Evaluation:** - Plate load test, Standard Penetration test and Pressure meter test. Test procedures and limitations.

**Foundation Settlement:** - Immediate settlement – computations as per IS 8009 – 1976 (part-I) approach and from plate load test observations. Consolidation settlement, Total settlement, Differential settlement, Tolerable settlement, Angular distortion

**Unit 3: Foundation Construction in Difficult Soil (9)**

Guide lines and care to be exercised in weak and compressible soil, Expansive soil, Collapsible soil, Corrosive soils

**Ground Improvement Techniques:** - Pre compression, Sand drains, Vibro-floatation, Grouting, Soil reinforcement Foundations on filled up soils. Contamination of soils and foundation problems.

**Geosynthetic and its applications:** - Geotextiles- Definition and Types, Functions of Geotextiles, Different applications in Civil Engineering (Roads, Railways, Embankments, Earth Retainment, Erosion control etc)

**SECTION –II**

**Unit 4: Shallow foundations (6)**

**Shallow foundations:** - Design of Isolated, Combined, Strap footing (Rigid analysis), Raft foundations (Conventional method), Floating foundations ( RCC design is not expected)

**Unit 5: Deep foundations (10)**

**Pile foundation:** Classification, Single pile capacity for RCC cast in situ pile in Cohesive, Non cohesive and mixed soils by Static method, Dynamic formulae, Negative skin friction. Under reamed piles- equipment, construction and precautions. Load carrying capacity of pile group, Group action of piles- Spacing of piles in a group, group efficiency- empirical formulae.

**Caisson Foundations:** Box, Pneumatic, open (well) caissons, Shapes of well, components. Forces on caisson, grip length, well sinking, practical difficulties and remedial measures

**Unit 6: (08)**

**Cofferdams:** Various Types, Cell fill material, Stability of cellular cofferdam.

**Sheet Piles:** Classifications, Design of cantilever sheet pile in cohesion less (approximate method) and cohesive soils. Design of anchored sheet pile by free earth support method

**Unit 7: Slope Stability (6)**

Stability of finite slopes- slip circle method, Semi graphical and graphical methods- Swedish slip circle method, Method of slices, Friction circle method. Fellenius construction to locate critical slip center, Stability Number and it's use.

## INTERNAL CONTINUOUS ASSESSMENT (ICA)

The ICA shall consist of Laboratory work, Field work and Assignments on above topics

### A) Field tests:-

1. Standard penetration test
2. Plate Load test

### B) Visit to foundation construction sites and preparation of report.

### C) Laboratory work:-

1. Swelling pressure test
2. Vane shear test

### D) Assignments consisting design problems on:-

1. Bearing capacity calculation by various methods
2. Settlement calculations
3. Design of shallow foundation - Isolated, Combined, Raft using conventional method.
4. 4. Pile and Pile group - Load carrying capacity of piles, Design of pile group
5. Sheet piles - Cantilever, Anchored using 'Free earth support method'
6. Stability analysis – Slip circle, slice method, Fellenius construction, Taylor's Stability number.

## TEXT BOOKS

1. Soil Mechanics and foundation Engineering -B.C. Punmia (Laxmi publications Pvt. Ltd, New Delhi)
2. Geotechnical Engineering- Purushottam Raj (Tata Mcgraw hill company Ltd, New Delhi)
3. Principals of Foundation Engineering – Braja M. Das (Cengage Learning India Pvt. Ltd, New Delhi)
4. Geotechnical Engineering - C. Venkatachalam (New Age International ( I ) Ltd, New Delhi)
5. Soil mechanics and foundation engineering- V.N.S. Murthy (UBS publisher's and distributors, New Delhi)
6. Foundation Design Manual- Dr. N.V. Nayak (Dhanpat Rai and Sons)
7. Foundation Engineering- Kasamalkar B.J. (Pune Vidyarthi Griha, Pune)
8. SP36-1 Compendium of Indian Standards on Soil Engineering Part 1
9. SP36-2 Compendium of Indian Standards on Soil Engineering Part 2
10. Design of sub structure- Swami Saran (Oxford and IBH Publications)

## REFERENCE BOOKS

1. Foundation analysis and design- Bowles J. E. (Tata McGraw hill company Ltd New Delhi)
2. Foundation design and construction- Tomlinson (M.J. English Language Book Society, Essex)
3. Foundation Design- Teng W.C, (Prentice Hall publications)
4. Soil mechanics in theory and practice- Alam Singh, (Asian Publishing House, Bombay)





**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**  
**T.Y. B. Tech Civil – Part II**  
**CE62C - HYDRAULIC STRUCTURES AND WATER POWER**  
**ENGINEERING**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

**Course Outcomes:**

After successful completion of the course, students will be able to

1. Plan and design the reservoirs depending upon the water resources potential.
2. Analyze and design Gravity dams and Earth dams (Simple Designs).
3. Elaborate the design principles of Arch dams.
4. Carry out Hydraulic Design of spillways
5. Select appropriate method of river training depending upon river characteristics
6. Estimate water power potential at a site.

**SECTION – I**

**Unit 1: Dams and Reservoir Planning (5)**

Dams – Necessity, types of dams, selection of site for dams, selection of type of dam, Introduction to dam instrumentation

Planning of Reservoirs: Storage calculations, Control levels, silting of reservoirs, reservoir sedimentation surveys, reservoir losses. Use of remote sensing for reservoir sedimentation surveys.

**Unit 2: Gravity and Arch Dams (8)**

Gravity Dams - Forces acting on dam, design criteria, theoretical and practical profile, high and low dam, stability calculations, materials and methods of Construction, Galleries, joints, Dam Instrumentation, Computer Application for Design of Dam. Decommissioning of dams

Arch Dams – Types, Layout of Constant angle and Constant radius arch dam, Forces acting on arch dams.

**Unit 3: Earth Dams (5)**

Earth Dams: Components and their functions, Design Criteria; Seepage through and below earth dam, Application of Slip circle method, Inverted Filters, Downstream Drainage, relief

wells, Construction of earth dam.

**Unit 4: Spillways and Outlets through Dams (5)**

Spillways: Necessity and different types, factors affecting choice and type of spillway, elementary hydraulic design, jump height and tail water rating curve, energy dissipation below spillway, gates for spillway. Spillway operations for different discharge values.

Outlets through Dams: types and energy dissipation in outlets transition

**SECTION – II**

**Unit 5: Weirs on Permeable Foundations (6)**

Weirs on Permeable Foundations: Theories of seepage, Bligh's creep theory, Khosla's theory exit gradient, Piping and undercutting, Concept of flow net etc. Kolhapur type weirs- working principles, suitability and construction.

**Unit 6: Canals and Canal Structures (6)**

Canals: Types, Alignment, Design – Kennedy's and Lacey's Silt theories, Canal losses, Typical canal sections, canal lining – Necessity and types, Economics of canal lining.

Canal Structures (Introduction): Cross drainage works and canal regulatory works - Aqueduct, Culvert, Super passage, Level Crossing, Cross and Head regulator, Canal Siphon, Canal Escape, canal fall, canal outlets.

**Unit 7: River Training Works and Water logging (5)**

River and River Training Works: Types of rivers, Meandering phenomenon, Types of river training works, river navigation.

Water Logging and Drainage: Causes, effects, preventive and curative measures, alkaline soils, soil efflorescence, drainage arrangements.

**Unit 8: Hydropower Engineering (5)**

Elements of Hydropower Engineering: Power crisis and competing uses of water, need of harnessing solar energy. Types of water power plants, small hydropower plants, layout and components of each type, Intakes, Conveyance system, Surge tanks, Power house types, components and layout, tail race. Managing power demand using various sources of power.



## INTERNAL CONTINUOUS ASSESSMENT (ICA)

A) Minimum seven assignments from the following:

1. Determination of height of dam: Reservoir capacity calculations based on demand and Supply, fixing control levels of dam for completed project or ongoing project.
2. Design of gravity dam: Elementary and practical profile with stability calculations
3. Earth dam
  - a. Design- Determination of section – slip circle calculations.
  - b. Filters and Drainage arrangements.
4. Spillway: Geometrical section, Design of spillway; Energy dissipation arrangements and gates.
5. Arch dam layout of constant angle and constant radius
6. Drawing sheet: Outlets through earth dam. Masonry dam, layout.
7. Drawing sheet: Typical plan and section of Kolhapur type barrage.
8. A typical layout of Hydropower plant and its functioning. Calculating reservoir capacity for hydropower plant
9. Design of any one Canal Structure / Cross Drainage Works

B) Report based on Field visits to Irrigation and Water Power Engineering Projects

### END SEMESTER EXAMINATION - ORAL EXAMINATION

Oral Examination will be based on the ICA

#### TEXT BOOKS

1. Irrigation Engineering – S. K. Garg , Khanna Pub. Delhi
2. Irrigation and Water Power Engineering - Priyani , Charoter pub. House, Anand
3. Irrigation and Water Power Engineering – Punmia, B. C.
4. Irrigation – Bharat Singh, NEW CHAND & bros. Roorkee
5. Irrigation Engineering Vol. I – Varshhey and Gupta
6. Engineering Hydrology - K. Subramanya
7. Design of Canals – Circular of Government of Maharashtra, 18 February 1995
8. Irrigation Water Power & Water Resource Engineering, Arora, Standard Publishers

#### REFERENCE BOOKS:

1. Design of Small Dam – U. S. B. R., OXFORD & IBH pub.co.
2. Engineering for Dam Vol. I, II, III – Justinn, Creager and Hinds
3. Design of Hydraulic Structures Vol. I & II – Leliavsky
4. River Behaviour, Management and Training - CBIP Publication



**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part II**

**CE63E- PROFESSIONAL ELECTIVE COURSE-I  
STRUCTURAL ANALYSIS BY MATRIX METHODS**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

**Course Outcomes:**

After successful completion of the course, students will be able to

1. Describe the concepts of flexibility and stiffness method of analysis for simple problems.
2. Analyze continuous beams, rigid frames and trusses by using element flexibility method.
3. Analyze continuous beams, rigid frames and trusses by using element stiffness method.
4. Analyze continuous beams, trusses by direct stiffness method.
5. Evaluate secondary stresses.

**SECTION –I**

**Unit 1:**

**(8)**

Introduction: Structural systems, geometric and material non-linearity, principle of superposition, equilibrium and compatibility conditions, static and kinematic indeterminacy, principle of minimum potential energy and minimum complementary energy, concepts of stiffness and flexibility, flexibility and stiffness matrices of beam and truss elements.

**Unit 2:**

**(8)**

Element Flexibility Method: Force transformation matrix, global flexibility matrix, analysis of continuous beams, rigid frames and trusses.

**Unit 3:**

**(7)**

Element Stiffness Method: Displacement transformation matrix, global stiffness matrix, analysis of continuous beams, rigid frames and trusses.

**SECTION –II**

**Unit 4:**

**(6)**

Effects of Temperature Changes and Lack of Fit: Related numerical problems by flexibility and

stiffness method as in Unit 2 and Unit 3.

**Unit 5:** (9)

Direct Stiffness Method Beams: Local and global coordinates systems, global stiffness matrices of beam, analysis of continuous beams

**Unit 6:** (8)

Direct Stiffness Method Trusses: Local and global coordinates systems, global stiffness matrices of truss element. Analysis of trusses

**INTERNAL CONTINUOUS ASSESSMENT (ICA)**

ICA shall consist of

1. At least one assignment on each unit.
2. Answers of few of the assignment problem shall be checked with the application software.

**TEXT BOOKS**

1. Weaver W. and Gere J. H., "Matrix Analysis of Framed Structures", CBS publications, New Delhi.
2. Rajasekaran S., "Computational Structural Mechanics", PHI, New Delhi.
3. Madhujit Mukhopadhyay and Abdul Hamid Sheikh, "Matrix and Finite Element Analysis of Structures", Ane Books Pvt. Ltd.

**REFERENCE BOOKS**

1. Godbole P. N. et.al, "Matrix Method of Structural Analysis", PHI ltd, New Delhi.
2. Pundit and Gupta, "Theory of Structures Vol II", TMH publications, New Delhi
3. A K Jain, "Advanced Structural Analysis", Nemchand Publications, Roorkee.
4. Manikaselvam, "Elements of Matrix Analysis and Stability of Structures", Khanna Publishers, New Delhi.
5. H. C. Martin, "Introduction to Matrix Methods in Structural Analysis", International textbook company, McGraw Hill.



**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part II**

**CE63E- PROFESSIONAL ELECTIVE COURSE-I**

**STRUCTURAL DYNAMICS**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

**Course Outcomes:**

After successful completion of the course, students will be able to

1. Develop mathematical models for engineering structures using knowledge of structural Dynamics
2. Apply different theories for vibration study of structures.
3. Interpret dynamic analysis results for design, analysis and research purposes
4. Apply structural dynamics theory to earthquake analysis and design of structures.

**SECTION – I**

**Unit 1 - Single-Degree-of-Freedom System (9)**

Single-Degree-of-Freedom System, Analysis models, Equations of motion, Free vibration, damping, Types of Damping, Response to harmonic loading, Resonance, Support motion, Transmissibility, Vibration isolation

**Unit 2 - SDOF systems subjected to periodic and impulsive loading (7)**

SDOF systems subjected to periodic and impulsive loading, and other different loading conditions, introduction to frequency-Domain Analysis.

**Unit 3 - SDOF system subjected to general dynamic loading (6)**

SDOF system subjected to general dynamic loading, Numerical evaluation of SDOF –Duhamel's integral, Application to simple loading cases

## SECTION – II

### **Unit 4 - MDOF System, Selection of DOFs (8)**

MDOF System, Selection of DOFs, Formulation of Equation of motion, Structure matrices, Static condensation, Free vibrations, Frequencies and Mode Shapes, Determination of natural frequencies and mode shapes, Orthogonality conditions.

### **Unit 5 - Discrete systems (8)**

Discrete systems, Fundamental mode analysis, Rayleigh method, Dunkerly's Method, Response of MDOF systems to dynamic loading, Mode superposition Method

### **Unit 6 - Distributed Parameter Systems (6)**

Distributed Parameter Systems, Partial differential equations of motion, free and forced vibrations, Application to beams in flexure.

## **Internal Continuous Assessment (ICA)**

ICA shall be based upon Problems/ tutorials based on topics in the curriculum.

### **TEXT BOOK:**

1. Structural Dynamics–Mario Paz

### **REFERENCE BOOKS:**

1. Dynamics of structures-R.W. Clough and J. Penzien, McGraw-Hill Pub.
2. Structural Dynamics–Roy Craig, John-Wiley & Sons
3. Dynamics of Structures–Theory & Application to Earthquake Engineering-A.K. Chopra, Prentice Hall Publications
4. Dynamics of Structures–Mukhopadhyay
5. Elements of Earthquake Engineering by Jaikrishna, A. R. Chandrashekharan, Brijesh Chandra, Standard Publishers & Distributors.



**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part II**

**CE63E- PROFESSIONAL ELECTIVE COURSE-I**

**DESIGN OF BRIDGES**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

**Course Outcomes:**

After successful completion of the course, students will be able to

1. Identify the various elements of bridges along with evaluation of various loads acting on the bridges as per the IRC bridge code
2. Design the Solid Deck slab and T Beam Bridge superstructure for two lane and four lane bridges.
3. Design various components of substructure such as Pier, Abutments, foundations
4. Design Bearing and expansion joint
5. Carry out maintenance and repair of the bridge.

**SECTION I**

**Unit 1:**

**(4)**

Components of bridges, Classification, importance of bridges, Investigation for Bridges.

**Unit 2:**

**(8)**

Standard specification for Road Bridges. I.R.C. bridge code, width of carriageway, clearances, loads to be considered i.e. D.L., L.L., Impact load, wind load, Earthquake load, Longitudinal force, Centrifugal force, buoyancy, Earth pressure, water current force, thermal force etc.

**Unit 3:**

**(12)**

General design considerations for R.C.C. & P.S.C. Bridges., Relative costs of bridge components. Design of reinforced concrete deck slab for two lane and four lane bridges, Pigeaud's theory, beam and slab and T-beam, Courbon's theory.

## SECTION – II

**Unit 4:** (8)

Design of sub structure, abutments, Piers, approach slab, well foundation

**Unit 5:** (7)

Bearing and expansion joints, forces on bearings, Types of bearings, design of elastomeric bearings, expansion joints.

**Unit 6:** (6)

Erection method for bridge deck construction by cantilever method, Inspection maintenance and repair of bridges

### INTERNAL CONTINUOUS ASSESSMENT (ICA) & ORAL EXAMINATION

1. Internal Continuous Assessment (ICA) shall consist of minimum six assignments based on each topic of syllabus.
2. Oral examination shall be based on the assignment and the knowledge of student in the topics mentioned in the syllabus.
3. The visit of Bridge site should be carried out to understand the various components of bridge, its construction, repair and maintenance

### TEXT BOOKS

1. Essentials of Bridge Engg. by D. Johnsons Victor, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Design of RCC Bridges- Jagdish Jayaram
3. Reinforced Concrete Structures – Vol. II by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications.

### REFERENCE BOOKS

1. Concrete Bridge Practice by Dr. V. K. Raina, Tata McGraw Hill
2. Bridge Engg. by S. Ponnuswamy, Tata McGraw Hill
3. K. S. Rakshit, Design and Construction of Highway Bridges, New Central Book agency

## **IRC CODES**

1. IRC 6 (2000), Section II: Loads and stresses.
2. IRC 16 (1989), Section for priming of base course with bituminous primers
3. IRC 18 (2000), Design criteria for PC road bridges (post tensioned concrete)
4. IRC 21(2000), Section III: Cement concrete (Plain and reinforced)
5. IRC 78 (2000), Section VII: Foundations and substructures
6. IRC 83 (1982), Section IX: Bearings, Part I: Metallic bearings (1994)
7. IRC 83 (1987), Section IX: Bearings, Part II: Elastomeric bearings (1994)
8. IRC 83 (1987), Section IX: Bearings, Part III: POT and PTFE bearings (1994)

## **WEBSITES:**

1. [www.mahapwd.com](http://www.mahapwd.com)
2. [www.irc.org.in](http://www.irc.org.in)







**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part II**

**CE63E- PROFESSIONAL ELECTIVE COURSE-I**

**DESIGN OF PRE STRESSED CONCRETE STRUCTURES**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

**Course Outcomes:**

After successful completion of the course, students will be able to

1. Study of different prestressing techniques
2. Design of PSC beams for shear and torsion
3. Design of Anchor block
4. Analyse of complex structural systems (Indeterminate structures) and composite materials
5. Analysis and design of prestressed concrete pipes

**SECTION I: PRESTRESSED CONCRETE**

**Unit 1: Introduction to pre-stressed concrete (7)**

Types of prestressing, systems and devices, materials, losses in prestress. Analysis of PSC flexural members: basic concepts, stresses at transfer and service loads, ultimate strength in flexure, code provisions

**Unit 2: Statically determinate PSC beams (9)**

Design for ultimate and serviceability limit states for flexure, analysis and design for shear and torsion, code provisions.

**Unit 3: Design of Anchor Blocks (6)**

Design of Anchor Blocks using Magnel's Method, Guyon's Method and IS Code Method

**SECTION – II**

**Unit 4: Statically indeterminate structures (8)**

Analysis and design - continuous beams and frames, choice of cable profile, linear transformation and concordance.

**Unit 5: Composite construction** (9)

Precast PSC beams and cast in-situ RC slab - Analysis and design, creep and shrinkage effects.

Partial prestressing - principles, analysis and design concepts, crack width calculations

**Unit 6: Prestressed concrete pipes** (6)

Analysis and design of prestressed concrete pipes, columns with moments

**INTERNAL CONTINUOUS ASSESSMENT (ICA)**

Assignments on each topic of above syllabus.

**TEXT BOOKS**

1. Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Reinforced Concrete Structures, Vol. II, Laxmi Publications.
2. Prestressed Concrete, Krishnaraju N., Tata McGraw Hill, New Delhi, 1981.

**REFERENCE BOOKS**

1. Design of Prestressed Concrete Structures, Lin T.Y., Asia Publishing House, 1955.
2. Dr. V.K. Raina, Concrete Bridge Practice: Analysis, Design and Economics, Shroff Publishers & Distributors Pvt Ltd.,
3. Jagadish & Jayaram, Design of Concrete Bridges, Tata McGraw Hill Victor, Design of Concrete Bridges, Tata McGraw Hill.
4. IS: 1343- Code of Practice for Prestressed Concrete



**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part II**

**CE63E- PROFESSIONAL ELECTIVE COURSE-I**

**AIRPORT PLANNING AND DESIGN**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

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**Course outcome:**

After successful completion of the course, students will be able to

1. Elaborate various components of an airport and aircraft characteristics affecting the design of airports.
2. Design the runway and taxiway geometrics based on the likely aircrafts using the airport.
3. Plan the requirements of terminal area and suggest an optimum layout for the terminal area based on passenger and baggage volume.
4. Suggest a suitable method of grading and leveling work involved in the area along with drainage provisions for surface and subsurface water flows.
5. Explain various air traffic control aids required for safe landing and take-off of aircrafts at the airport.

**SECTION-I**

**Unit 1: Introduction to Air Port and Air Craft Characteristics**

**(8)**

Growth of air transport, airport organization and associations, classifications of airports, airfield components, airport traffic zones and approach areas Components, size, turning radius, speed, aircraft characteristics, Capacity and Delay: Factors affecting capacity, determination of runway capacity related to delay, gate capacity, taxiway capacity.

**Unit 2: Airport Planning and Surveys**

**(8)**

Runway length and width, sight distances, longitudinal and transverse grades, runway intersections, taxiways, clearances, aprons, numbering, holding apron

**Unit 3: Structural Design of Airport Pavements**

**(7)**

Introduction- Various Design Factors- Design Methods for Flexible Pavement- Design Methods for Rigid Pavement- LCN System of Pavement Design- Joints in Cement Concrete Pavement- Airport Pavement Overlays- Design of an Overlay

## SECTION-II

### **Unit 4: Planning and design of the Terminal area (8)**

Operational concepts, space relationships and area requirements, noise control, vehicular traffic and parking at airports

### **Unit 5: Airport Grading and Drainage (8)**

Grading of airport area, hydrology, design of drainage systems, construction methods, layout of surface drainage and sub-surface drainage system

### **Unit 6: Air Traffic Control and Aids (6)**

Runways and taxiways markings, day and night landing aids, airport lighting and other associated aids

#### **FILED VISITS**

The visit of Airport site should be carried out to understand the various structures, its construction and operations.

#### **TEXT BOOKS:**

1. "Planning and Design of Airports" - Robert Horenjeff, 2nd edition, McGraw Hill Book Co.
2. "Airport Engineering" - G. Glushkov, V. Babkov, Mir Publishers, Moscow.
3. "Airport Planning and Design"- Khanna, Arora and Jain, Nem Chand and Bros., Roorkee

#### **REFERENCES:**

1. Planning and design of Airports by Robert Horenjeff, 2nd Edition, McGraw Hill Book Co.
2. Airport Engineering by G. Glushkov, V. Babkov, Mir Publishers, Moscow
3. Airport Planning and Design by Khanna, Arora and Jain, Nem Chand and Bros., Roorkee
4. Harry, R. Cedergern, `Drainage of Highway and Airfield Pavements`, John Wiley and Sons.
5. Virender Kumar and Satish Chandra, `Airport Planning and Design`, Galgotia Publication Press



**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part II**

**CE63E- PROFESSIONAL ELECTIVE COURSE-I**

**PAVEMENT DESIGN**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

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**Course outcome:**

After successful completion of the course, students will be able to

1. List and explain the various factors affecting design and performance of pavements.
2. Calculate ESWL and analyze various traffic parameters
3. Calculate the stresses and deflection in flexible and rigid pavements.
4. Design flexible and rigid pavements.
5. Design the overlay thickness for existing pavement as per IRC standards

**SECTION-I**

**Unit 1: Factors Affecting Pavement Design (8)**

Variables considered in pavement design, types of pavements, functions of individual layers, classification of axle types of rigid chassis and articulated commercial vehicles, legal axle and gross weights on single and multiple units, tire pressure, contact pressure, EAL and ESWL concepts, traffic analysis: ADT, AADT, truck factor, growth factor, lane distributions & vehicle damage factors, effect of transient & moving loads.

**Unit 2: Stresses In flexible Pavement (8)**

Vehicle-pavement interaction: transient, random & damping vibrations, steady state of vibration, experiments on vibration, stress inducing factors in flexible and rigid pavements; stress in flexible pavements: Visco-elastic theory and assumptions, layered systems concepts, stress solutions for one, two- and three-layered systems, fundamental design concepts.

**Unit 3: Stresses in Rigid Pavements (8)**

Westergaard's theory and assumptions, Stresses due to curling, stresses and deflections due to loading, frictional stresses, and stresses in dowel bars & tie bars.

## SECTION-II

### **Unit 4: Design of Flexible Pavements**

**(10)**

Factors effecting design. deflection studies in flexible pavements. present serviceability index. IRC guidelines for flexible pavements. pavement performance and methods- AASHTO and Asphalt Institute method. need for overlays, overlays design methods for flexible and rigid pavements.

### **Unit 5: Design of Rigid Pavements**

**(10)**

Factors effecting Design - Wheel load & its repetition, subgrade strength & proportion, strength of concrete - modulus of elasticity. reinforcement in slab. design of joints. design of dowel bars. design of tie bars. IRC and AASHTO methods of Rigid Pavement design

### **TEXT BOOKS**

1. Principles of Pavement Design, Yoder, E.J., and Witczak, 2nd ed. John Wiley and Sons, 1975.
2. `Design of Functional Pavements', Yang, , McGraw Hill Book Co.
3. `Test Book of Highway Engineering', Khanna and Justo, `Nemchand brothers, Roorke- 2004.  
Huang, 'Pavement Analysis', Elsevier Publications



**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part II**

**CE63E- PROFESSIONAL ELECTIVE COURSE-I  
CONSTRUCTION ENGINEERING MATERIALS**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

### **Course Outcomes:**

After successful completion of the course, students will be able to

1. Examine the properties of common construction materials along with their behaviors under different environments, short- or long-term.
2. Assess material properties, mechanical tests and quality control tests for, concrete, masonry, glass, plastics, iron and steel, paints and protective coatings, bituminous products, gypsum products, resilient flooring, and carpeting.
3. Appraise appropriateness and sustainability of materials for construction projects.
4. Select the sustainable materials based on the international standard practices and certification.
5. Explain about innovative sustainable construction materials and their uses in construction.

### **SECTION I**

#### **Unit 1: Ceramic Products**

**(7)**

- Clay for Ceramics, Floor Tiles, Ceiling tiles, Terracing Tiles, Vitrified tiles, Porcelain Tiles, Mangalore pattern, Spanish and Italian (Allahabad) Tiles, Sanitary Appliances, Stoneware Pipes and Fittings
- Fly ash bricks, Cement blocks, Calcium silicate bricks, Refractory bricks, Concrete blocks, Lightweight concrete blocks, Autoclaved Aerated Concrete Blocks
- Glass: Manufacture and Classification, Uses, Characteristics and Performance, Glass wool

#### **Unit 2: Timber and Metals**

**(7)**

- Industrial timber products: Plywood, Veneer, Panels of laminates, Particle Board, Hard Board, Fiber Board, Block board
- Ferrous Alloys: Steel and Properties of Steels, Cast Irons, Stainless Steels and its advantages of new alloy steels.

- Non-Ferrous Metals and Alloys: Copper, Zinc, Aluminum, and other metal Properties and its uses.
- Composite Panels

**Unit 3: Concrete Products (8)**

- Ingredients and their Properties, Various construction chemicals/admixtures , Fly ash and its use in concrete, Silica fume concrete, Precast concrete: Flooring, Roofing and Walling
- Waterproofing Materials, Polymer Floor Finishes, Anchors

**SECTION II**

**Unit 4: Geosynthetics (7)**

- Introduction, types of Geosynthetics and Polymers used in Geosynthetics like Geotextiles, Geogrids, Geonets, Geomembranes, Geocells Geomats and others.
- Function and Engineering application like reinforcement, separation, filtration, Drainage, Containment and Erosion Controls.

**Unit 5: Adhesives, Sealants, Joint Fillers, Asphalt, Bitumen and Tar (7)**

- Tile adhesives :Introduction and Specifications, Comparison and Uses
- Sealants: Specifications, Comparison and Uses
- Joint Fillers: Specifications, Comparison and Uses
- Asphalt, Bitumen and Tar : comparison

**Unit 6: Modern Finishing Materials (8)**

- Paints, Varnishes, and Distempers
- Rubber : Natural and synthetic rubber, Vulcanization, Uses
- Plastics: Polymerization, Classification, properties, Fabrication, Reinforced plastics, Thermocol, PVC, Laminated plastic, Uses, Polythene water Tanks

**TEXT BOOKS**

1. Varghese P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2015.
2. Rajput R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
3. Gambhir M.L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 2004
4. Duggal S.K., "Building Materials", 4th Edition, New Age International, 2008.



5. William P Spence," Construction Materials, Methods & Techniques", Yesdee Publication 2012, Pvt. Ltd., Chennai, India
6. Mehta P.K & Mantreio," Concrete Structure properties & Materials", P.J.M, Prentice hall.
7. Nagaratnam Sivakugan, Carthigesu T. G, Rabin Tuladhar and M. Bobby Kannan," Civil Engineering Materials", MindTap from Cengage.

### **REFERENCE BOOKS**

1. Jagadish K.S, "Alternative Building Materials Technology", New Age International, 2007.
2. Gambhir. M.L., & Neha Jamwal., "Building Materials, products, properties and systems",
3. Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.
4. IS456 - 2000: Indian Standard specification for plain and reinforced concrete, 2011
5. IS4926 - 2003: Indian Standard specification for ready-mixed concrete, 2012
6. IS383 - 1970: Indian Standard specification for coarse and fine aggregate from natural Sources for concrete, 2011
7. IS1542-1992: Indian standard specification for sand for plaster, 2009.
8. IS 10262-2009: Indian Standard Concrete Mix Proportioning –Guidelines, 2009.
9. New Building Materials and Construction World magazine



**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part II**

**CE63E- PROFESSIONAL ELECTIVE COURSE-I**

**SYSTEMS ENGINEERING & ECONOMICS**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

### **Course Outcomes:**

After successful completion of the course, students will be able to

1. Analyze the Systems in Engineering planning, design and management
2. Build the model of system in Planning and Engineering
3. Carry out 'Economic Evaluation' of Engineering system
4. Explain Microeconomics for Engineers and Planners

### **SECTION – I**

#### **Unit 1:**

**(12)**

Mapping the Terrain of the Systems Approach- Introduction, The Nature of Science, Engineering Planning, Design, and Management, The Systems Approach, Steps in Systems Analysis, Classification of Systems, Systems Characteristics, Systems Analysis and Decision Making Models and Model-Building

#### **Unit 2:**

**(10)**

Problem Solving and Designing in Engineering and Planning, Introduction, Problem Solving and Designing Hierarchy: Problem-space, Trees, and Semi-lattices, Measurement and Scaling Sources of Data Measurement Scales of Measurement, System Model Types and Model-building Model Types, Models Used in Planning and Engineering.

### **SECTION – II**

#### **Unit 3:**

**(8)**

Basic Engineering Economics and Evaluation, Introduction, Notations, Simple Interest Compound Interest, Uniform Series of Payments, Compound Amount Factor (CAF), Sinking Fund Factor (SFF), Present Worth Factor (PWF), Capital Recovery Factor (CRF), Uniform Gradient Series, Discrete Compound Interest Factors, Uniform Continuous Cash Flow and Capitalized Cost Evaluation, Feasibility Issues, Evaluation Issues, The Evaluation Process Values,

Goals, Objectives, Criteria, and Standards, Estimation of Costs, Impacts, and Performance Levels, Capital, Operating, and Maintenance Costs, User Costs, Impacts Performance Levels.

**Unit 4:** (6)

Evaluation of Alternatives Economic and Financial Concepts, Analysis Techniques Economic Evaluation Methods (Efficiency Analysis), Cost-effectiveness Analysis, Multi-criteria Evaluation, Method Benefit-Cost Analysis, The Willingness-to-pay Concept, Depreciation and Taxes, Reporting Results.

**Unit 5: Modern Finishing Materials** (8)

Basic Microeconomics for Engineers and Planners, The Scope of Economics and Microeconomics, Some Basic Issues of Economics, Demand for Goods and Services, Contents, Demand, Supply, and Equilibrium Sensitivity of Demand; Factors Affecting Elasticities Income, Elasticities Price, Elasticities Elasticity and Total Revenue Price Elasticity of Supply, Kraft Demand Model, Direct and Cross Elasticities, Consumer Surplus Costs, Laws Related to Costs, Average Cost, Marginal Cost, Consumer Choice.

**INTERNAL CONTINUOUS ASSESSMENT (ICA)**

Internal Continuous Assessment (ICA) shall consist of minimum six assignments based on the entire curriculum.

**TEXT BOOKS:**

1. Systems Engineering With Economics, Probability, And Statistics, Second Edition, C. Jotin Khisty Jamshid Mohammadi Adjo A. Amekudzi J. Ross Publishing
2. Principles of Engineering Economy- E. L. Grant, W. G. Ireson, R. S. Leavenworth, Wiley International Education, 7th Ed.

**REFERENCE BOOKS**

1. Systems Engineering and Analysis, 4th edition. Prentice-Hall, Upper Saddle River, NJ. Bowman, M. (2003)
2. NASA Systems Engineering Handbook, NASA/SP-2007-6105 Rev 1. Military Bookshop, 2007. ISBN: 9781780391380.
3. Systems Engineering Handbook: A Guide for System Life Cycle Processes and Activities. 4th ed. Wiley, 2015. p. 304. ISBN: 9781118999400.

4. Engineering Economics - L.P. DeGarmo, W. G. Sullivan, J. A. Bantadelli, McMillan India Co. New Delhi, 8th Ed. 1984.





**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part II**

**CE63E- PROFESSIONAL ELECTIVE COURSE-I**

**ADVANCED CONCRETE TECHNOLOGY**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

**Course Outcomes:**

After successful completion of the course, students will be able to

1. Select proper admixtures to obtain concrete of desired properties
2. Use of additions in concrete to enhanced properties
3. Adopt appropriate type of special concrete for desired results
4. Design a concrete mix of required strength and workability properties
5. Adopt appropriate method for repairs and rehabilitation of concrete structures

**SECTION-I**

**Unit 1:** (4)

Review of cements including blended cement, chemical and physical process of hydration. Aggregates-Coarse aggregates, Natural sand, Crushed sand.

**Unit 2:** (6)

Addition to Concrete:- Review of types covering pulverized fuel ash, ground granulated blast furnaces slag and silica fume, Rice husk Ash, manufacture, physical characteristics, effects on properties of concretes. Admixtures: - Plasticizers, Super plasticizers, retarder, accelerators, Curing compounds and their effects on properties of concrete.

**Unit 3:** (6)

Properties of Fresh Concrete: Workability setting, bleeding and segregation. Theory and application principles governing in concrete placing and compaction of concrete Durability & impermeability, microstructure and carbonation of concrete, fire resistance

**Unit 4:** (6)

Special Concretes: - High performance concrete, High Strength concrete, fiber reinforced concrete,

Light weight concrete, High density and radiation shielding concrete, High volume fly ash concrete, Self compacting concrete, Recycled concrete.

## SECTION-II

**Unit 5:** (6)

Special Processes & technology for particular types of structures: Mass concrete, Sprayed concrete, Ferro-cement concrete, pumped concrete, Roller compacted concrete, Sustainability of concrete industry.

**Unit 6:** (3)

Ready mixed Concrete: Types of plants, Concrete specification, Process adopted for central RMC plant, Distribution & transport, Code recommendations, quality control.

**Unit 7:** (6)

Mix design: Review of methods & philosophies, mix design for special purpose (High grade concrete), variability of results.

**Unit 8:** (3)

Quality concepts: Definitions, principles & standards, quality control in concrete Construction, tools for quality management.

**Unit 9:** (5)

Repair & rehabilitation: Visual inspection of concrete structure, distress in concrete, Non-destructive test, crack repair techniques, damage assessment procedure, deterioration- causes & prevention, strengthening techniques.

## TEXT BOOK

1. Concrete Technology, Theory and Practice by M.S. Shetty, S, Chand Publications, NewDelhi
2. Concrete Mix Design- N. Krishna Raju - Sehgal Publishers

## REFERENCE BOOKS

1. High performance concrete by P.C. Aitkin , Taylor and Francis, New York NY 10016
2. Concrete Technology by A.R. Santhakumar, Oxford university press, New Delhi
3. Concrete Technology by Neville, Pearson education limited, London

4. Advanced Concrete Technology Constituent materials- John Newman, Ban SengChoo- London Press.
5. Concrete- P.K. Mehta, P J M Monteiro,- Prentice Hall, New Jersey





**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part II**

**CE63E- PROFESSIONAL ELECTIVE COURSE-I**

**OPEN CHANNEL FLOW & RIVER HYDRAULICS**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

**Course Outcomes:**

After successful completion of the course, students will be able to

1. Demonstrate basic principles of the open channel flow.
2. Analyze the various types of flows viz. uniform and non-uniform flow, gradually varied flow, rapidly varied flow etc.
3. Explain the mechanics of sediment transport
4. Apply the knowledge of open channel hydraulics to river engineering.
5. Apply the knowledge of dimensional analysis to develop different hydraulic models

**SECTION-I**

**Unit 1:**

**(5)**

Basic fluid flow concepts, Classification of open channel flow, Velocity and pressure distribution. Energy and Momentum Equation applied to open channel flow, Energy and momentum coefficients, Channel Geometry and geometrical elements.

**Unit 2:**

**(5)**

Uniform and critical flow computations: Energy depth relationships, Resistance formulae, Concepts of first and Second hydraulic exponent, Determination of critical and normal depth, hydraulically most efficient channel sections, Channel transitions and its analysis.

**Unit 3:**

**(6)**

Gradually varied flow: Different equation governing GVF, Classification analysis and control sections of profiles, Computation of GVF profiles by different methods.



**Unit 4:** (6)  
Rapid varied flow: Type, Analysis and characteristics of Hydraulic jump in rectangular channels, Location of jump, Introduction to jump in non-rectangular channel and on sloping floor, Use of jump as Energy dissipater. Flow Measurement –Weir, spillways, critical depth flumes.

## SECTION-II

**Unit 5:** (5)  
River gauging: Dominant discharge, Methods of gauging, current meter rating curve, automatic water level recorder, stage discharge relationship of a river.

**Unit 6:** (7)  
Fluvial Hydraulics- Sediment transport, Mode of sediment motion and formation, Threshold movement, Total sediment load, Suspended and bed load Theories, Reservoir Sedimentation.

**Unit 7:** (6)  
River Management and Training: Type of river, river morphology, meandering and braiding of River training work- Classification Types-Guide banks, Groynes, Deflectors, Embankments, Cut-offs, Bank Protection Stable channel nature river training works, river morphology.

**Unit 8:** (5)  
Similitude and model analysis: Basic principles, fixed bed and models, distorted models.

### Internal Continuous Assessment (ICA)

Internal Continuous Assessment (ICA) shall consist of minimum eight assignments based on the entire curriculum.

### TEXT BOOKS

1. Open channel Hydraulics – Ven Te Chaw, McGraw Hill book Co. New York.
2. Flow through open channel – Ranga Raju
3. Flow in open channel –K. Subramanya, Tata McGraw Hill Publications
4. Mechanics of Sediment transport and alluvial river problems-R. J. Garde New Age Publications New Delhi.

## REFERENCE BOOKS

1. Open Channel Flow-F. M. Henderson.
2. River Gauging –Chitale and Hiranandani
3. River Mechanics-Vol. I &II, Hsieh Wen Shen.





**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part II**

**CE63E- PROFESSIONAL ELECTIVE COURSE-I**

**SOLID AND HAZARDOUS WASTE MANAGEMENT**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

### **Course Outcomes:**

After successful completion of the course, students will be able to

1. Develop solid waste management systems with respect to its physical properties, and associated critical considerations in view of emerging technologies.
2. Select and adopt the appropriate methods for solid waste collection, transportation, redistribution and disposal.
3. Identify the types of hazards and describe methods of disposal of hazardous solid waste.
4. Implement legal, political and administrative considerations in design and operation of solid and hazardous waste management.

### **SECTION-I**

### **SOLID WASTE MANAGEMENT**

#### **Unit 1:**

**(6)**

Solid Waste management: Functional outlines of refuse, storage, transportation of refuse, analysis, composition and quantity of refuse, various aspects of refuse collection and transport, Solid waste in industries, common types of solid waste, classification, collection and transportation. Concept of biomedical & Hazardous waste management, Introduction to integrated solid waste management.

#### **Unit2:**

**(5)**

Solid waste handling and Processing methods, Segregation and salvage recovery of bye-products, Use of solid waste as raw material in industries, Recycling of solid waste.

#### **Unit 3:**

**(4)**

Composting: Theory of composting, types of composting, factors governing composting, processing before composting, mechanical composting plant, and recovery of biogas energy from organic solid

waste.

**Unit 4:** (6)

Incineration: Theory and types of incinerators, location, planning aspects, effects of feed, composition, rate and temperature, air supply, design of incineration plant, proximate analysis and ultimate analysis of refuse. Solid waste management rules, status of solid waste management in India.

**SECTION-II**  
**HAZARDOUS WASTE MANAGEMENT**

**Unit 5:** (6)

Definition of Hazardous waste, Characteristics and nature of hazards, natural and man-made hazards, classification of hazards.

**Unit 6:** (4)

Qualitative estimation of damages, risk assessment and management.

**Unit 7:** (6)

Types of hazardous waste, characteristics, Site assessment waste minimization resource recovery. Strategy for minimization of damage due to natural and manmade hazards.

**Unit 8:** (6)

Storage and handling of hazardous waste, Site Selection, Transportation of hazardous wastes. Case Studies of hazards, episodes. Sanitary landfill site selection, types of land filling, maintenance and precaution, leachate and its control, control of contamination of ground water.

**INTERNAL CONTINUOUS ASSESSMENT (ICA)**

The ICA shall consist of:

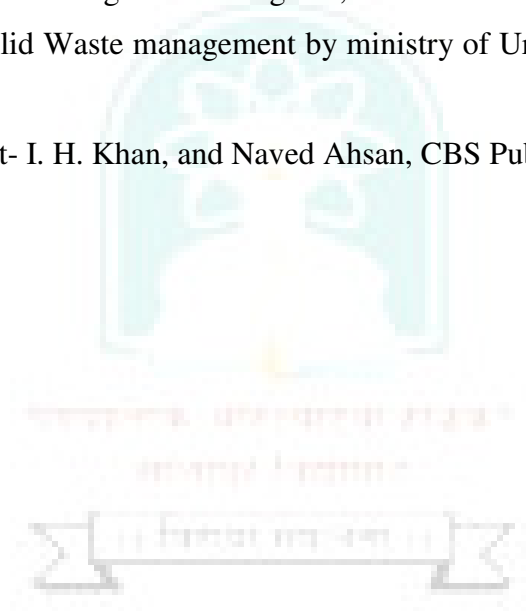
1. Analysis of solid waste
2. Project on Design of Refuse collection & Disposal System for medium size town or a part of city.
3. Case study of Hazards and Episodes (Any Two).
4. Assignments (One Assignment on each unit)

## **TEXT BOOKS**

1. Solid Waste Management – Dr. A.D. Bhide
2. Hazardous Waste Management – C. A., Wentz McGraw Hill International Edition
3. Management of Municipal Solid Waste- T. V. Ramchandra, Capital Publishing company, New Delhi
4. Solid and Hazardous Waste Management- M. N. Rao and Razia Sultana, B. S. Publication
5. Elements of Land/Soil Pollution, O.P. Gupta, Khanna Publishing House
6. Air Pollution Control Engineering, Keshav Kant, Khanna Publishing House

## **REFERENCE BOOKS**

1. Solid Waste Management – George Tchobanoglous, McGraw Publication
2. Manual on Municipal Solid Waste management by ministry of Urban Development of Govt. of India.
3. Solid Waste Management- I. H. Khan, and Naved Ahsan, CBS Publishers and Distributors, New Delhi.





**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part II**

**CE63E- PROFESSIONAL ELECTIVE COURSE-I**

**URBAN HYDROLOGY AND HYDRAULICS**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

**Course Outcomes:**

After successful completion of the course, students will be able to

1. Develop intensity duration frequency curves for urban drainage systems.
2. Develop design storms to size the various components of drainage systems.
3. Apply best management practices to manage urban flooding.
4. Prepare master drainage plan for an urbanized area.

**SECTION – I**

**Unit 1: Introduction**

**(6)**

Urbanization and its effect on water cycle, Urban hydrologic cycle, Trends in urbanization Effect of urbanization on hydrology.

**Unit 2: Precipitation Analysis**

**(8)**

Importance of short duration of rainfall and runoff data, Methods of estimation of time of concentration for design of urban drainage systems, Intensity-Duration -Frequency (IDF) curves, Design storms for urban drainage systems.

**Unit 3:**

**(8)**

Time of concentration, Peak flow estimation approaches, Rational method, NRCS curve number approach, Runoff quantity and quality, Waste- water and stormwater reuse, Major and minor systems.

**SECTION – II**

**Unit 4: Elements of drainage systems**

**(6)**

Open channel, underground drains, appurtenances, pumping, and source control.

**Unit 5:** (8)

Storm water drainage structures, Design of storm water network, Best Management Practices– Detention and retention facilities, swales, constructed wetlands, models available for storm water management.

**Unit 6: Master drainage plans** (8)

Issues to be concentrated upon – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes, planning objectives, comprehensive planning, use of models in planning.

**INTERNAL CONTINUOUS ASSESSMENT (ICA)**

Internal Continuous Assessment (ICA) shall consist of minimum six assignments based on the entire curriculum.

**TEXT BOOKS**

1. 'Manual on Drainage in Urbanized area' by Geiger W. F., J Marsalek, W. J. Rawls and F. C. Zuidema, (1987 – 2 volumes), UNESCO,
2. 'Urban Hydrology' by Hall M J (1984), Elsevier Applied Science Publisher.
3. 'Hydrology – Quantity and Quality Analysis' by Wanielista M P and Eaglin (1997), Wiley and Sons.
4. 'Urban Hydrology, Hydraulics and Stormwater Quality: Engineering Applications and Computer Modelling' by Akan A.O and R.L. Houghtalen (2006), Wiley International.

**REFERENCE BOOKS**

1. 'Stormwater Detention for Drainage' by Stahre P and Urbonas B (1990), Water Quality and CSO Management, Prentice Hall.
2. 'Urban water cycle processes and interactions' by Marsalek et al (2006), Publication No. 78, UNESCO, Paris (<http://www.bvsde.paho.org/bvsacd/cd63/149460E.pdf>)
3. 'Frontiers in Urban Water Management – Deadlock or Hope' by Maksimovic C and J A Tejada-Guibert (2001), IWA Publishing.



Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part II

CE64C DESIGN OF CONCRETE STRUCTURES-II

**Teaching Scheme**

**Lectures:-**3Hrs/Week, 3 Credits

**Examination Scheme**

**ISE:** 30 Marks

**ESE:** 70 Marks

### Course Outcomes:

After successful completion of the course, students will be able to

1. Analyze and Design of RCC Stairs and Column Footings.
2. Analyze and Design of RCC Retaining walls and Water tanks.
3. Analyze Pre stress concrete sections.
4. Determine Loss of Pre stress and Design of Pre stress Beams.
5. Analyze and Design the End Block of post tensioned PSC girder.

### SECTION I

**Unit 1: Analysis and design of stairs. (Limit state method) (6)**

Design of Stairs, types of stairs, design of simply supported and Dog-legged stairs, Open well stairs with solid waist slab

**Unit 2: Analysis and design of Column Footings (5)**

Design of isolated square and rectangular column footing, column footings subjected to eccentric load.

**Unit 3: Analysis and design of retaining wall (5)**

Analysis and Design of cantilever and counter fort retaining walls

**Unit 4: Design of water tank (6)**

Design criteria, permissible stresses, Design of circular, rectangular GSR by IS code method



**SECTION II:**  
**PRESTRESSED CONCRETE**

**Unit 5: Analysis of Symmetrical and unsymmetrical sections** (8)

Introduction, concepts, systems and methods of pre-stressing. Analysis of Symmetrical and unsymmetrical sections, thrust line, cable profiles.

**Unit 6: Losses in prestress** (5)

Losses in prestress. - Pre & Post tensioned members.

**Unit 7: Design of Prestressed concrete beam** (5)

Design of rectangular and Symmetrical I section.

**Unit 8: End Block** (5)

Analysis and design of end blocks by various methods, Stress concentration.

**NOTE:**

Only IS: 456-2000 IS: 3370 –Part-IV shall be allowed in University Exam.

**TEXT BOOKS**

- 1 Reinforced Cement Concrete - B.C. Punmia
2. Reinforced Cement concrete - Jain Vol.I & II
- 3 Prestressed Concrete – N. Krishnaraju.
4. Prestressed Concrete – P. Dayaratnam
5. Prestressed Concrete – S. Ramamrutham

**REFERENCE BOOKS**

1. IS: 456-2000, IS:3370 & IS:1343
2. Fundamentals of Reinforced Concrete- Sinha & Roy
3. Limit State Design of Reinforced Concrete - P.C. Varghese, Prentice Hall of India, New Delhi.
4. Reinforced Cement Concrete Design by Neelam Sharma, Katson Books
5. Design of Prestressed Concrete Structures by T. Y. Lin , Wiley Publication



Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part II

**CE65C PRINCIPLES OF MANAGEMENT AND QUANTITATIVE  
TECHNIQUES**

**Teaching Scheme**

**Lectures:-**3Hrs/Week, 3 Credits

**Practical:-**2 Hr/Week, 1 Credit

**Examination Scheme**

**ISE:** 30 Marks

**ESE:** 70 Marks

**OE-**25 Marks

**ICA:-** 25 Marks

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**Course Outcomes:**

After successful completion of the course, students will be able to

1. Demonstrate decision making and communication as a member of a team as well as Lead a team for effective management of construction projects.
2. Apply the Optimization techniques for decision making in construction industry.
3. Explain the lean construction technique and its use in construction industry
4. Carry out ABC analysis, Break even analysis and calculate EOQ and Inventory costs for construction project.
5. List the various types of master libraries in the ERP system.
6. Use Statistical Methods and Control charts (X, R, p, c charts) for quality control of materials and workmanship in Civil Engineering projects.

**SECTION – I**

**Unit 1:**

**(4)**

Definition and Functions of Management; Planning: Process of planning, Management by objectives; Organizing: Formal and informal organization, centralization, decentralization, line, line and staff, functional organization; Leading, directing, controlling and coordination; Communication process, motivation.

**Unit 2:**

**(10)**

Importance of Decision Making, steps in decision making.

Decision under certainty: Linear Programming, Formulation of simple L-P model, Graphical method, Simplex method, Duality.

Application of Linear Programming in 'Transportation Problems': North-West corner method, Least cost method, Vogel's Approximation method (Only Initial Basic Feasible Solution) and Application of Linear Programming in 'Assignment problems'.

**Unit 3:** (4)

Decision under uncertainty: Wald's, Savage, Hurvitz and Laplace criterion of optimism and regret, expected monetary value, Theory of games (dominance pure and mixed strategy). Decision under risk: Decision tree.

**Unit 4:** (4)

Introduction to Lean Construction. Need for Productivity Measurement and improvement; Productivity Measurement System (PMS).

Introduction to Sampling/ Work Sampling; Survey/ Foreman delay survey; Value Stream/ Process Mapping.



**SECTION – II**

**Unit 5:** (6)

Inventory control: Introduction, inventory cost, EOQ analysis, ABC analysis, safety stocks. Break even analysis.

**Unit 6:** (8)

**Construction ERP**

Benefits, best practices: ISO Documents, Responsibilities, Document Directory Structures, Safety Measures, Approval system for Purchase, Work Orders and Billing, User permissions, The master libraries in the ERP system – Resources Master Library, Construction Activity Specifications Master Library.

**Unit 7:** (6)

Quality control: Concept, Statistical Methods, Control charts (X, R, p, c charts)

**Internal Continuous Assessment (ICA)**

Internal Continuous Assessment (ICA) shall consist of minimum six assignments based on the entire curriculum.

## **TEXT BOOKS**

1. A Textbook of Organizational Behaviour, CB Gupta, S. Chand Publications
2. Construction Engineering & Management, S.C. Sharma & S.V. Deodhar, Khanna Book Publishing
3. Optimization Techniques, S.S. Rao, Wiley Eastern India
4. Operation Research, Hamdy A. Taha, Operation Research, Prentice Hall of India, New Delhi, 8th Ed.2011
5. Store Management, Menon K. S., Store Management, McMillan Co. New Delhi, 2nd Ed. 1998.
6. Statistical Quality Control, E. L. Grant, Statistical Quality Control, Wiley International Education, 6th Ed.
7. Udo Linden, Mrunalini Kulkarni, Hit-Office Construction ERP technical manual, Engineering Design Software and Services Pvt. Ltd., Pune, April 2018 Edition.

## **REFERENCE BOOKS**

1. Total Quality Management, Ponia & Sharma, Khanna Publishing House, Delhi
2. Engineering Management: Industrial Engineering & Management, S.C. Sharma, Khanna Publishing House, Delhi
3. Principles and Practice of Management, Prasad, L.M, Sultan Chand
4. Organizational Behaviour, L.M. Prasad, Sutan Chand and Sons.
5. Handbook of Construction Management, Joy PK, Macmillan
6. Construction Project Management, Jha, Pearson
7. Total Quality Management, Gopal, PHI Publications
8. Industrial Engineering & Operations Management, S.K. Sharma. S.K. Kataria & Sons
9. Principles of Operation Research: Prentice Hall of India, 2nd Ed.1925, Wagner H. M.
10. Operation Research: Shaum's outline series, Richard Bronson Govindsami N., Tata McGraw Hill , 2nd Ed.2004
11. Material Management, Gopal Krishnan, Sudeshan,
12. Handbook of Quality Control, Juran J. M., A. B. Godfrey, Mc Graw- Hill International,5<sup>th</sup> Ed.
13. Lean Construction Management by Shang Gao · Sui Pheng Low, Spinger.



**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**  
**T.Y. B. Tech Civil – Part II**  
**CE66C-RAILWAY, AIRPORT & HARBOUR ENGINEERING**

**Teaching Scheme**

**Lectures:-3Hrs/Week, 3 Credits**

**Examination Scheme**

**ISE: 30 Marks**

**ESE: 70 Marks**

**Course outcomes:**

After successful completion of the course, students will be able to

1. Identify various components of Permanentway and know the construction process of railway track.
2. Acquires capability of choosing alignment and also design geometric aspects of railway system.
3. Illustrate different types of signals, explain the working principles of railway interlocking system.
4. Analyze and design the elements for orientation of runways, taxiways and passenger facility systems.
5. Understand the various features in Harbours and Ports, their construction and coastal protection works.

**SECTION-I**

**RAILWAY ENGINEERING**

**Unit 1: Introduction**

**(14)**

General Introduction: Role of transportation in Society, objectives of transportation system, different types of modes, planning coordination of different modes for Indian conditions

1. Railways for urban transportation-Engineering surveys for track alignment-Obligatory Points- Conventional and modern methods (eg. Remote sensing, GIS)
2. Permanent way-track components their functions, sleeper – functions types, sleeper density, ballast functions different ballast materials.
3. Rails: coning of wheels, tilting of rails, rail cross sections, wear, creep of rails, rail fastenings.
4. Yards: details of different types of railway yards their functions.
5. Construction and maintenance of railway track, methods of construction, material requirements,

maintenance of tracks, traffic operations.

6. Modernization of track and railway station for high-speed trains, Mono rails and Metro rails.

**Unit 2: Geometric Design of Railway Track and Traffic Control (10)**

1. Geometrics: Superelevation, Cant deficiency, Cant excess, negative cant, safe permissible speed, gradients, transition curves, widening of gauge on curves,
2. Points crossing: design of turnouts, description of track junctions, different types of track junctions.
3. Signaling interlocking: classification of signals, interlocking of signals points, Route Relay Interlocking system, control of train movement.

**SECTION- II**

**AIRPORT ENGINEERING**

**Unit 3: Airport Planning (5)**

Air transport characteristics-airport classification-airport planning: objectives, components, layout characteristics, socio-economic characteristics of the Catchment area, criteria for airport site selection and ICAO stipulations, Typical airport layouts, Parking and circulation area.

**Unit 4: Airport Design (8)**

Runway Design: Orientation, Wind Rose Diagram - Runway length - Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles – Elements of Taxiway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings, lighting and Air Traffic Control (ATC).

**SECTION- II**

**HARBOUR ENGINEERING**

**Unit 5: Dock and Harbour Engineering (8)**

Definition of Basic Terms: Harbor, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours: Requirements, Classification, Location and Design Principles – Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Dredging – Maintenance of Ports and Harbours – Navigational aids.

## **TERM WORK**

1. The visit of Railway and Airport site should be carried out to understand the various structures, its construction and operations.
2. Assignment on each chapter and field visit report shall be submitted by the students.

## **TEXT BOOKS**

1. Railway Engineering by Satish Chandra and Agarwal M.M., Oxford University Press, New Delhi
2. Airport Engineering by Khanna & Arora – Nemchand Bros, New Delhi.
3. Docks and Harbour Engineering by Bindra S.P. – Dhanpathi Rai & Sons, New Delhi.
4. RDSO Codes

## **REFERENCES**

1. 'Railway Engineering' by Saxena & Arora – Dhanpat Rai, New Delhi.
2. 'Transportation Engineering Planning Design' by Wright P.H. & Ashfort N.J. – John Wiley & Sons.
3. 'Airport Engineering' by Virendra Kumar, Dhanpat Rai Publishers, New Delhi.
4. 'Transportation Engineering' by Srinivasa Kumar R, University Press, Hyderabad
5. Railway and track Engineering- by Mundrey J.S.- Tata McGraw-Hill Education
6. Docks and Harbour Engineering Oza, Charotar Publication House





**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**T.Y. B. Tech Civil – Part II**

**CE67L PROJECT ON STEEL STRUCTURES**

**Teaching Scheme**

**Drawing:-2Hrs/Week, 1 Credit**

**Examination Scheme**

**OE: 25 Marks**

**ICA:- 25 Marks**

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### **Course Outcomes:**

After successful completion of the course, students will be able to

1. Selection of roof truss / Portal frame. Decide various parameters to complete Geometry of truss / Portal frame
2. Analyze the steel structure using standard structural engineering application software
3. Design of various components of Industrial shed with roof truss or portal frame or gable Frame using relevant software and prepare their detailed computer aided drawing
4. Design the various components of Building frame/Foot bridge/Welded plate girder and prepare their detailed computer aided drawing
5. Create report for the structure as per Analysis and Design.

### **PROJECT ON STEEL STRUCTURES (Laboratory)**

#### **INTERNAL CONTINUOUS ASSESSMENT (ICA)**

It shall consist of detailed structural design and drawing of the following steel structure along with necessary drawings.

#### **1. INDUSTRIAL SHED**

Design of industrial shed including roof truss / Portal frame, purlin, gantry girder, columns, bracing system, column bases along with their connections and concrete pedestal. Prepare the detailed drawing of the truss / Portal frame with their connections

#### **2. ANY ONE from the following:**

##### **A. Welded Plate Girder:**

Design of welded plate girder, design of cross section, curtailment of flange plates, stiffeners and their connections.



## **B. Foot Bridge**

Influence lines, cross beam, main truss, Raker, joint Details, support details

## **C. Building Frames**

Building with Secondary and main beams, column and column bases, beam-to beam connection, column-beam-connection, design of typical members.

## **D. Offshore Structures**

Offshore structures containing elements like jackets, topside platforms, equipment foundations etc. Further, these components can be designed using circular and hollow square sections etc.

## **E. Pre-Engineered Buildings**

Design of PEB frame under the influence of Dead, Live, Collateral, Wind, Seismic and Other applicable Loads.

### **NOTE**

1. Sample verification of analysis results shall be made by using software for any one problem.
2. Maximum number of students in a group not more than three to five for design.

### **SITE VISITS**

Report should contain structural details with sketches.

### **TEXT BOOKS**

1. Design of Steel Structures, N. Subramanian, Oxford, 2008
2. Limit State Design of Steel Structures, S.K. Duggal.
3. Design of steel structure by Limit State Method as per IS: 800- 2007 by Bhavikatti S. S,I K International Publishing House, New Delhi
4. Limit state design in Structural Steel by Dr. M. R. Shiyekar

### **REFERENCE BOOKS**

1. Limit state design of Steel Structure by V. L. Shah & Gore, Structures Publication, Pune
2. Limit State Design of Steel Structures by D. Ramchandra & Virendra Gehlot, Scientific Publishers

3. Design of Steel Structures by K. S. Sai Ram, published by Dorling Kindersley (India) Pvt. Ltd.
4. Structural Design and Drawing Reinforced Concrete and Steel by N. Krishnaraju,
5. Universities Press (India) Pvt. Ltd. Hyderabad.
6. Teaching Resource Material by INSDAG
7. Indian Standard Codes: IS 800-2007, IS 875-1987 Bureau of Indian Standards.
8. Steel Tables SP: 6(1) and SP: 6(6)
9. Dynamic Analysis and Design of Offshore Structures, Srinivasan Chandrasekaran
10. Offshore Structures: Design, Construction and Maintenance by Mohamed A. EI-Reedy
11. K. S. Vivek & P. Vaishavi – Pre-Engineered Steel Buildings, Lambert Academic Publishing.
12. Alexander Newman, Metal Building Systems Design and Specifications, 2nd Edition





**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**  
**T.Y. B. Tech Civil – Part II**  
**CE69L MINI PROJECT USING APPLICATION SOFTWARE**

**Teaching Scheme**

**Practical:-**2Hrs/Week, 1 Credit

**Examination Scheme**

**ICA:-** 25 Marks

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**Course Outcomes:**

After successful completion of the course, students will be able to

1. Identification and Selection of problems.
2. Define aims and objectives of selected problem
3. Decide various relevant parameters
4. Find appropriate solution
5. Generate technical report

Student/s shall carry out 'Mini Project' in any one of the following subjects: Structural Engineering, Geotechnical Engineering, Environmental Engineering, or Engineering Management, by preferably employing relevant application software.

The project shall consist of Civil Engineering / interdisciplinary.

Prototype design, working models, Laboratory experiments, Process modification/development, Simulation, Software development, Data analysis, Survey etc.

The student is required to submit a 'Project Report' based on the work. The Mini project shall be assessed by the domain subject teachers for ICA.