# Scheme & Syllabus of B.Tech. (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -V | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUETT1 | L | T | P | CIA | SEA | 100 | 3 | CEUBTE1 CEUCTT1, CEUDTT1 |
| Course Name | Design of Concrete Structures | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- To understand the various philosophies of design of concrete structures using IS Codes.
- To understand the design beam for flexure, shear, bond, and torsion
- To know the design of slabs and staircases and their detailing.
- To learn the design of axially and eccentrically loaded columns.
- To know about different types of footings and their reinforcement detailing.

| Unit | Content | Teaching/ Lecture Hours |
|---|---|---|
| I | Introduction to design of concrete structures-limit state analysis and design of beams for flexure and bond. | 10 |
| II | Shear and Torsion | 8 |
| III | One-way slabs, Staircases, Two-way slabs | 10 |
| IV | Axially and eccentrically loaded columns (Uniaxial only). | 8 |
| V | Footings – different types of footings, Design of isolated footing, synthesis of limit state, and working Stress methods. | 8 |
| | **Total Lecture Hours** | 44 |

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To adopt limit state design philosophy for deign of reinforced concrete.
**CO2** To carry out the design of RC structural elements for flexure, bond, shear, and torsion.
**CO3** To implement the design of slabs and staircases as per LSD.
**CO4** To design RC structural columns subjected to axial and eccentric loads.
**CO5** To propose and design the type of footing for an RC structure.

**Text Books: -**

1 Krishna, R. N. (2007). Reinforced Concrete Design: Principles And Practice. New Age International.
2 Varghese, P. C. (2008). Limit State Design of Reinforced Concrete. PHI Learning Pvt. Ltd.
3 Unnikrishna Pillai,S & Devdas Menon. (2021/4th Ed.), Reinforced Concrete Design. TMH Edu. Pvt. Ltd.

**Reference Books: -**

1 Subramanian, N. (2013). Reinforced Concrete Structures. Oxford University Press.
2 Syal, I. C., & Goel, A. K. (2008). Reinforced Concrete Structure. S. Chand Publishing.
3 Punmia, B. C., Jain, A. K., Jain, A. K., Jain, A. K., & Jain, A. K. (2007). Limit State Design of Reinforced Concrete. Firewall Media.

## Scheme & Syllabus of B.Tech. (Civil Engineering) as Per NEP 2020

**COs, POs, and PSOs Mapping (**Design of Concrete Structures- CEUETT1)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 3 | | 1 | 2 | | | | 2 | | 3 | 1 | 3 |
| CO2 | 3 | 3 | 2 | 2 | 3 | 1 | | | | | | 2 | 3 | 3 | 2 |
| CO3 | 3 | 3 | 2 | 2 | 3 | 1 | | | | | | 2 | 3 | 3 | 2 |
| CO4 | 3 | 3 | 2 | 2 | 3 | 1 | | | | | | 2 | 3 | 3 | 2 |
| CO5 | 3 | 3 | 2 | 2 | 3 | 1 | | | | | | 2 | 3 | 3 | 2 |

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## Scheme & Syllabus of B.Tech. (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -V | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre - requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUETT2 | L | T | P | CIA | SEA | 100 | 3 | CEUDTT1 |
| Course Name | Structural Analysis - II | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- To understand the principles of energy methods and their applications to indeterminate beams and plane frames.
- To know the principles and applications of slope deflection method to the indeterminate beams and rigid frames.
- To study the principles of the moment distribution method and its applications to indeterminate beams and rigid joint plane frames.
- To study the principles of matrix methods and their applications to beams.
- To apply the Muller Breslau Principle for constructing influence lines to indeterminate beams and two-hinged arches.

| Unit | Content | Teaching /Lecture Hours |
|---|---|---|
| I | Analysis of indeterminate beams by consistent deformation methods and analysis of indeterminate rigid plane frames and trusses using the energy method. | 8 |
| II | Slope Deflection Method: Continuous beams and rigid joint plane frames by moment distribution due to loads and yielding of supports. | 8 |
| III | Moment-distribution method. Continuous beams and rigid joint plane frames by moment distribution method due to loads and yielding of supports. | 10 |
| IV | Introduction to Flexibility Matrix and Stiffness Matrix methods: Applications of the methods to simple indeterminate beams. | 10 |
| V | Analysis of symmetrical two hinge arches (parabolic and circular). Influence lines for propped cantilevers and continuous beams using Muller-Breslau's principle. | 9 |
| | **Total Lecture Hours** | 45 |

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To identify the suitable method of analysis for the analysis of indeterminate beams and trusses and analyses the same using consistent deformation method and energy method.

**CO2** To analyze the indeterminate beams and rigid joint plane frames using slope deflection and moment distribution methods.

**CO3** To analyze the mechanisms of slope stability and implement methods like Bishop's method for slope stability analysis.

**CO4** To apply and analyze the indeterminate beams using matrix methods.

**CO5** To construct the influence lines for stress resultants in indeterminate beams and two-hinged arches and analyze the same for moving loads.

**Text Books: -**

**1** Menon, D. (2017). Structural Analysis (2nd ed.). Alpha Science International, Limited.
**2** Wang, C. K. (2017). Intermediate Structural Analysis (1st ed.). McGraw Hill Education.
**3** Leet, K. M. (2007). Fundamentals of Structural Analysis (3rd ed.). McGraw-Hill Higher Education.

**Reference Books: -**

**1** Hibbler, R. C. (2019). Structural Analysis (SI units) (10th ed.). Pearson.
**2** Jain, A. K. (2015). Advanced Structural Analysis (3rd ed.). Nem Chand & Bros.
**3** Negi, L. S., & Jangid, R. S. (1997). Structural Analysis (1st ed.). Tata McGraw Hill.

**COs, POs, and PSOs Mapping (**Structural Analysis – II- CEUETT2)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 8 | PO 7 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | | | | | | | | | | |
| CO2 | 3 | 3 | 3 | 3 | 3 | 2 | | | | 1 | | | | 3 | |
| CO3 | 3 | 3 | 3 | 3 | 3 | 2 | | | | 1 | | | | 3 | |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | | | | 1 | | | | 3 | |
| CO5 | 3 | 3 | 3 | 3 | | 3 | | | | 1 | | | | 3 | |

## Scheme & Syllabus of B.Tech. (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -V | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUETT3 | L | T | P | CIA | SEA | 100 | 3 | Nil |
| Course Name | Highway Engineering | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- To understand the importance of transportation and characteristics of highway transport.
- To study the geometric design of highways
- To understand the traffic characteristics.
- To recognize the pavement materials.
- To understand the design concept of flexible and rigid pavement.

| Unit | Content | Teaching/ Lecture Hours |
|---|---|---|
| I | Introduction: Role of transportation, Modes of transportation, characteristics of highway transport, Road development and planning in India, Road's classification, patterns, Engineering surveys for highway locations. | 6 |
| II | Geometric Design of Highway: Factors controlling the geometric design, Basic consideration for the design of highway, Cross-sectional element, Sight distance, Curve, Design of horizontal alignment, Transition curves, Set back distance, and Design of vertical alignment. | 10 |
| III | Traffic Engineering: Functions of traffic engineering, Traffic characteristics, Traffic studies on flow and speed, Peak hour factor, Accident study, Statistical analysis of traffic data, Microscopic and macroscopic parameters of traffic flow, Fundamental relationships, Traffic signs, Signal design by Webster's method, Types of intersection, Highway capacity, Level of service. | 10 |
| IV | Highway Materials: Subgrade soil, Plate bearing test, California bearing ratio test, Desirable properties of road aggregates, Test for road aggregates, Bitumen, Tar, Mix design, Marshall mix design. | 8 |
| V | Pavement Design: Types of pavement structure, Functions of pavement components, Design factors, Design of flexible pavement, Design of rigid pavement, Design of joint. | 10 |
| | **Total Lecture Hours** | 44 |

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To propose modes of transportation, transportation planning and survey.
**CO2** To design cross-section elements, sight distance, horizontal and vertical alignment
**CO3** To analyze traffic studies, traffic regulations and carryout control and intersection designs.
**CO4** To interpret the properties of pavement materials
**CO5** To design flexible and rigid pavements as per IRC specifications.

**Text Books: -**

1 Kadiyali, L. R., & Lab, N. B. (2012). Principle and Practices of Highway Engineering. Khanna Publishers.
2 Khanna, S. K., & Justo, C. E. G. (2011). Highway Engineering. Khanna Publishers.
3 Rangawala, S. C. (2015). Highway Engineering. Charotar Publishing House Pvt. Ltd.
4 Khisty, C. J., & Lall, B. K. (2002). Transportation Engineering: An Introduction (3rd ed.). Prentice Hall.

**Reference Books: -**

1 Ministry of Road Transport and Highways (MoRTH). (2013). Specifications for Road and Bridge Works. Indian Roads Congress.
2 Indian Roads Congress. (2017). Indian Highway Capacity Manual. Indian Roads Congress.

**COs, POs, and PSOs Mapping (**Transportation Engineering- CEUETT3)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | | 1 | 1 | | | | | | 1 | | |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | | | | | | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | | | | | 3 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 2 | | 1 | | | | | | | 1 | 1 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | | | | | | | 3 | 3 | |

## Scheme & Syllabus of B.Tech. (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -V | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUETT4 | L | T | P | CIA | SEA | 100 | 3 | Nil |
| Course Name | Geotechnical Engineering - I | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- To understand the fundamental principles of soil formation, classification, and properties to assess soil types.
- To develop the ability to analyze soil permeability, apply Darcy's Law, and construct flow nets for various seepage problems
- To understand and apply the principles of effective stress, compaction, and consolidation to predict and mitigate soil deformation and settlement in engineering projects.
- To understand and evaluate the stresses and shear strength characteristics in soil masses to determine the stability and safety of geotechnical structures

| Unit | Content | Teaching/ Lecture Hours |
|---|---|---|
| I | Soil Formation, Soil Types, Composition, Three-Phase System and Phase Relationships, Index Properties; Unified and Indian Standard Soil Classification System; Clay Minerals, Clay Water Relations, Field Identification Tests | 8 |
| II | Darcy's Law, Permeability - One-Dimensional Flow, Determination of Permeability, Equivalent Permeability in Stratified Soils, In-Situ Permeability Test Seepage Through Soils – Two - Dimensional Flow, Flow Nets, Uplift Pressure, Piping, Capillarity, Seepage Force, Confined and Unconfined Flows, Filter Criteria | 9 |
| III | Stresses in Soil Mass: Normal and Shear Stress on Plane, Geostatic Stresses, Stress Caused by point load, line load, and strip load, Vertical Stress due to embankment loading, vertical stresses below uniformly loaded circular area, vertical stress caused by rectangular loaded area, Boussinesq's Theory, Newmark's Influence Chart, Contact pressure | 10 |
| IV | Principle Of Effective Stress and Quicksand Condition; General Principles of Compaction, Compaction Tests, Factors Affecting Compaction, Field Compaction, Compaction Techniques; Fundamentals, 1-D Consolidation, Normally and Over-Consolidated Clays, Void Ratio – Pressure Relationships, Compressibility Characteristics, Time Rate of Consolidation, Coefficient of Consolidation, Settlement, Secondary Consolidation. | 8 |
| V | Shear Strength, Mohr's Circle, Effective and Total Shear Strength Parameters, Stress-Strain Characteristics of Clays and Sand; Mohr-Coulomb Failure Criterion, Direct Shear Test, Unconfined Compression Test, Triaxial Shear Test: Consolidated Drained, Consolidated Undrained, Unconsolidated Undrained, Vane Shear Test, Shear Strength of Clays and Sands, Critical Void Ratio, Stress Path, Pore-Pressure Coefficient. | 8 |
| | **Total Lecture Hours** | 43 |

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**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To identify and classify different types of soils using the Unified and Indian Standard Soil Classification Systems and conduct field identification tests

**CO2** To measure and interpret permeability and seepage through soils, utilizing Darcy's Law, flow nets, and in-situ tests to determine soil filtration and drainage properties.

**CO3** To calculate stresses in soil masses using various theoretical approaches such as Boussinesq's Theory and Newmark's Influence Chart

**CO4** To demonstrate knowledge of compaction principles and consolidation processes to predict the behavior of normally and over-consolidated clays and calculate the settlement of the structure

**CO5** To perform and evaluate shear strength tests, including Direct Shear, Unconfined Compression, and Triaxial Shear Tests, to determine the stress-strain characteristics and failure criteria of clays and sands.

**Text Books: -**

1 Das, B. M. (2018). Principles of Geotechnical Engineering (9th ed.). Cengage Learning.
2 Craig, R. F. (2004). Soil Mechanics (7th ed.). CRC Press.
3 Coduto, D. P., Kitch, W. A., & Yeung, M. R. (2010). Geotechnical Engineering: Principles and Practices (2nd ed.). Pearson.

**Reference Books: -**

1 Holtz, R. D., Kovacs, W. D., & Sheahan, T. C. (2011). An Introduction to Geotechnical Engineering (2nd ed.). Pearson.
2 Terzaghi, K., Peck, R. B., & Mesri, G. (1996). Soil Mechanics in Engineering Practice (3rd ed.). Wiley.
3 Lambe, T. W., & Whitman, R. V. (1969). Soil Mechanics. Wiley.

**COs, POs, and PSOs Mapping (**Geotechnical Engineering – I- CEUETT4)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 11 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | | | | | | | | 3 | 2 | 2 |
| CO2 | 3 | 3 | 3 | 3 | | | | | | | | | 3 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 | | | | | | | | | 3 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 | | | | | | | | | 3 | 2 | 2 |
| CO5 | 3 | 3 | 3 | 3 | | | | | | | | | 3 | 2 | 2 |

## Scheme & Syllabus of B.Tech. (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -V | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUETT5 | L | T | P | CIA | SEA | 100 | 3 | Nil |
| Course Name | Environmental Engineering - I | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- To learn the water sources, demand, and water quantity estimation techniques.
- To know the water characterization and various physical and chemical treatment techniques.
- To learn the basics of water supply, purification, and treatment
- To learn filtration, coagulation, and softening techniques & mechanisms for water treatment.
- To study distribution systems

| Unit | Content | Teaching/ Lecture Hours |
|---|---|---|
| I | Introduction: Necessity and importance of water supply schemes. Water demand: Classification of water demands, Estimation of the quantity of water required by a town, per capita demand, factors affecting per capita demand, design period and population forecasting, and variation in water demand. | 10 |
| II | Sources of water supply: Surface sources and underground sources, Intake works, site selection, type of intake works | 8 |
| III | **Quality of water:** Common impurities, physical, chemical, and biological characteristics of water, and water quality standards for municipal and domestic supplies. | 8 |
| IV | Treatment of water: Object of water processing, flow diagrams of typical ground water system and surface water systems. Sedimentation Theory of sedimentation, sedimentation tanks and its types, design parameters related with sedimentation tanks, sedimentation with coagulations, coagulants and coagulant aids, Jar test for determining coagulant dosage. Filtration: Theory of filtration, slow sand and rapid sand filters, Construction and operation. Disinfection: Methods of disinfection, Chlorination, Types of chlorination, Break Point chlorination. Softening: Methods of Softening, Iron Removal, Fluoridization. | 10 |
| V | Distribution System: Methods of distribution, layout of distribution system, methods of analysis, pressure in the distribution system, distribution reservoirs, functions, and its types, | 8 |
| | **Total Lecture Hours** | 44 |

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To forecast the population and design water supply schemes.
**CO2** To identify the various constituents present in a water sample
**CO3** To demonstrate water quality concepts and their effect on the treatment process selection.
**CO4** To identify different treatment units in a water treatment plant and formulate their design procedures.
**CO5** To design various water distribution network systems.

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**Text Books: -**

1 Garg, S. K. (2010). Water Supply Engineering (8th ed.). Khanna Publishers.
2 Punmia, B. C., Jain, A. K., & Jain, A. K. (2010). Water Supply Engineering. Laxmi Publications.
3 Peavy, H. S., Rowe, D. R., & Tchobanoglous, G. (1985). Environmental Engineering. McGraw-Hill Education.
4 Birdi, G. S. (2005). Water Supply and Sanitary Engineering. Dhanpat Rai Publications
5 Anjaneyulu, Y. (2004). Introduction to Environmental Science. B.S. Publications.
6 Henry, J. G., & Heinke, G. W. (2004). Environmental Science and Engineering (2nd ed.). Pearson Education.

**Reference Books: -**

1 Garg, S. K. (2010). Water Supply Engineering (8th ed.). Khanna Publishers.
2 Birdi, G. S. (2005). Water Supply and Sanitary Engineering. Dhanpat Rai Publications
3 Anjaneyulu, Y. (2004). Introduction to Environmental Science. B.S. Publications.
4 Henry, J. G., & Heinke, G. W. (2004). Environmental Science and Engineering (2nd ed.). Pearson Education.

**COs, POs, and PSOs Mapping (**Environmental Engineering – I- CEUETT5)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | | | | | | | | | 2 | 3 | | 1 |
| CO2 | 2 | 2 | 2 | | | 1 | | | | | | 2 | 3 | | 1 |
| CO3 | 2 | 2 | 2 | | | | | | | | | 2 | 3 | | 1 |
| CO4 | 3 | 2 | 2 | | | | 2 | | | | | 2 | 3 | | 1 |
| CO5 | 3 | 2 | 2 | | | | 2 | 2 | | | | 2 | 3 | | 1 |

## Scheme & Syllabus of B.Tech. (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -V | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUETP1 | L | T | P | CIA | SEA | 100 | 3 | CEUCTT1 |
| Course Name | Advanced Solid Mechanics | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- Understand and apply elasticity principles to analyze three-dimensional stress and strain.
- Analyze beam behavior under unsymmetrical bending and determine shear center and stress distributions.
- Solve problems related to thick-walled cylinders under internal and external pressures.
- Evaluate torsion effects in various non-prismatic and thin-walled sections.
- Apply plastic analysis to determine collapse loads and plastic hinge behavior in beams.

| Unit | Content | Teaching/ Lecture Hours |
|---|---|---|
| I | **Concept of Elasticity:** Stresses in three dimensional bodies, equations of equilibrium, strain displacement relations, stress strain relations, compatibility equations, boundary conditions, plane stress, governing differential equation, Airy stress function(Cartesian co-ordinates). | 8 |
| II | **Unsymmetrical bending:** Properties of beam cross-sections slope of neutral axis, stresses and deflections in unsymmetrical bending. Shear Flow and Shear centre of thin wall beam cross section.<br>**Curved beams:** Bending of beams of large initial curvature, stress distribution in beams with rectangular, circular and trapezoidal cross sections | 9 |
| III | **Thick walled cylinders:** Thick-walled cylinder subjected to internal and external pressures-Lames-problems, Compound cylinders, Sphere with purely radial displacements, rotating disc of uniform thickness, rotating shafts and cylinders. | 9 |
| IV | **Torsion:** Torsion of Non Prismatic Members- Circular, Elliptical, Triangular bars, Torsion of thin-walled tubes and multiple closed sections, center of twist and flexure center.<br>**Column-** Column with eccentric loading, Uniaxial and Bi-axial Bending, Unsymmetrical section as Strut | 9 |
| V | **Plastic Analysis of Beams**: Plastic Modulus, Shape factor, plastic hinge, application to beams, and determination of collapse loads. | 8 |
| | **Total Lecture Hours** | 43 |

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** Model and solve three-dimensional elasticity problems accurately.

**CO2** Calculate stress, deflection and shear center for unsymmetrical bending scenarios.

**CO3** Analyze stress distribution in thick-walled cylinders and other cylindrical structures.
**CO4** Solve torsion problems for various cross-sections and determine twist and flexure center.
**CO5** Perform plastic analysis to find collapse loads and plastic hinge locations in beams

**Text Books: -**

1 L. S. Srinath, Advanced Mechanics of Solids, Tata-McGraw Hill Publishing Co. Ltd., New Delhi.
2 S. P. Timoshenko, Strength of Materials, Part I and II, D. Van Nostrand Company Inc.

**Reference Books: -**

1. P. Boresi, R. J. Schmidth and O. M. Sidebottom, Advanced Mechanics of Materials, John Wiley and Sons.
2. F. B. Seely and J. O. Smith, Advanced Mechanics of Materials, John Wiley and Sons.
3. S. P. Timoshenko and J. N. Goodier, Theories of Elasticity, McGraw Hill Publisher

**COs, POs, and PSOs Mapping (**Advanced Solid Mechanics: CEUETP1)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 3 | 2 | 1 | | | 1 | | | 2 | 3 | 2 | 1 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 1 | | | 1 | | | 2 | 3 | 2 | 1 |
| CO3 | 3 | 3 | 2 | 3 | 2 | 1 | | | 1 | | | 2 | 3 | 2 | 1 |
| CO4 | 3 | 3 | 2 | 3 | 2 | 1 | | | 1 | | | 2 | 3 | 2 | 1 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 1 | | | 1 | | | 3 | 3 | 2 | 1 |

## Scheme & Syllabus of B.Tech. (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -V | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUETP2 | L | T | P | CIA | SEA | 100 | 3 | Nil |
| Course Name | Construction Project Planning and Systems | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- To understand the project management and different scheduling techniques.
- To expertise in PERT network analysis.
- To learn CPM network analysis and compare it with PERT.
- To understand time-cost analysis and resource scheduling.
- To understand the factors for equipment selection, cost of owning and operating, and basic knowledge of different equipment used in the construction industry.

| Unit | Content | Teaching/ Lecture Hours |
|---|---|---|
| I | **Introduction**: Objectives and functions of project management, project feasibility reports, Planning for construction projects: Steps, factors, advantages, and disadvantages for the different stakeholders. Construction Finance and control.<br>**Scheduling**: Scheduling job layout and line of balance, project management through networking, bar chart, linked bar chart, work breakdown structures, and activity-on-arrow diagrams. | 8 |
| II | **PERT**: Network analysis, critical path, probability of project. | 8 |
| III | **CPM:** Network analysis, Critical Path, Difference between CPM and PERT. | 8 |
| IV | **Time-cost relationship**: Direct and Indirect cost.<br>**Resource allocation**: Resource smoothing and Resource leveling<br>**Construction safety management**: Importance, causes of accidents, safety measures, responsibility for safety, and safety benefits to various parties. | 9 |
| V | Classification of construction equipment, Standard and special equipment, factors affecting selection of construction equipment, cost of owning and operating the Construction Equipment, Basics of Excavators, Lifting, Hauling, Converting, and concreting equipment.<br>Time and Motion studies | 9 |
| | **Total Lecture Hours** | 42 |

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To apply the knowledge in managing and handling of different civil engineering project and also able to schedule the project.

**CO2** To do PERT analysis and able to find the project completion time and its probability.

**CO3** To do CPM analysis and able to find the project completion time and compare with PERT analysis.

**CO4** To do cost and time analysis and also resource allocation, scheduling and crashing for different activities of the network.

**CO5** To apply the knowledge in equipment selection and able to find cost of owing and operating, which help in comparisons of different equipment's.

**Text Books: -**

1 Seetharaman, S. (1997). Construction Engineering and Management. Umesh Publications.
2 Punmia, B. C., & Khandelwal, K. K. (1997). PERT & CPM. Laxmi Publications.
3 Sen Gupta, & Guha. (1995). Construction Management and Planning. Tata McGraw Hill

**Reference Books: -**

1 Chitkara, K. K. (1998). Construction Project Management Planning, Scheduling and Control. Tata McGraw-Hill Publishing Co.
2 Srinath, L. S. (2001). PERT and CPM Principles and Applications. Affiliated East-West Press.
3 Hendrickson, C., & Au, T. (2000). Project Management for Construction – Fundamentals Concepts for Owners, Engineers, Architects and Builders. Prentice Hall.
4 Moder, J., Phillips, C., & Davis, E. (1983). Project Management with CPM, PERT and Precedence Diagramming (3rd ed.). Van Nostrand Reinhold Co
5 Halpin, D. W. (1985). *Financial and Cost Concepts for Construction Management*. John Wiley and Sons.

**COs, POs, and PSOs Mapping (**Construction Project Planning and System: CEUETP2)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | | 1 | | | | | | | | 2 | |
| CO2 | 3 | 3 | 2 | 1 | 1 | 1 | | | | | | | | 2 | |
| CO3 | 3 | 3 | 3 | 2 | | 1 | | | | 1 | | | | 2 | |
| CO4 | 3 | 3 | 3 | 2 | | 1 | | | | 1 | | | | 2 | |
| CO5 | 3 | 3 | 3 | 3 | | | | | | | | | 3 | 2 | 2 |

## Scheme & Syllabus of B.Tech. (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -V | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUETP3 | L | T | P | CIA | SEA | 100 | 3 | Nil |
| Course Name | Infrastructure Planning & Management | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- To remember & understand various concepts of infrastructure.
- To understand the involvement of the private sector in infrastructure.
- To learn about challenges in successful infrastructure planning and implementation
- To apply strategies for successful infrastructure project implementation.
- To Understand sustainable development of infrastructure.

| Unit | Content | Teaching/ Lecture Hours |
|---|---|---|
| I | An Overview of Basic Concepts Related to Infrastructure: Introduction to Infrastructure, an overview with regards to Indian sectors(i) Power Sector, (ii) Water Supply and Sanitation Sector in India., (iii) Road, Rail, Air and Port Transportation Sectors, (iv) Telecommunications, (v) Urban Infrastructure (vi) Rural Infrastructure. | 8 |
| II | Private Involvement in Infrastructure: A Historical Overview of Infrastructure Privatization. The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization, Challenges in Privatization of Water Supply, Privatization of Infrastructure in India. | 8 |
| III | Challenges to Successful Infrastructure Planning and Implementation: Mapping and Facing the Landscape of Risks in Infrastructure Projects, Economic and Demand Risks, Socio-Environmental Risks, Cultural Risks in International Infrastructure Projects, Legal and Contractual Issues in Infrastructure, Challenges in Construction and Maintenance of Infrastructure. | 9 |
| IV | Strategies for Successful Infrastructure Project Implementation: Risk Management Framework for Infrastructure Projects, Shaping the Planning Phase of Infrastructure Projects to mitigate risks, Designing Sustainable Contracts, Introduction to Fair Process and Negotiation, Negotiating with multiple Stakeholders on Infrastructure Projects. | 9 |
| V | Sustainable Development of Infrastructure: Information Technology and Systems for Successful Infrastructure Management, - Innovative Design and Maintenance of Infrastructure Facilities, Infrastructure Modeling and Life Cycle Analysis Techniques, Capacity Building and Improving the Governments Role in Infrastructure Implementation, An Integrated Framework for Successful Infrastructure Planning and Management - Infrastructure Management Systems and Future Directions. | 10 |
| | **Total Lecture Hours** | 44 |

## Scheme & Syllabus of B.Tech. (Civil Engineering) as Per NEP 2020

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To remember & understand the basic concepts related to Infrastructure Projects.
**CO2** To understand the role of the private sector in infrastructure growth.
**CO3** To apply the strategies for successful Infrastructure Project implementation.
**CO4** To apply Infrastructure modelling and Life Cycle Analysis Techniques.
**CO5** To Create Sustainable development plans for various Infrastructure projects.

**Text Books: -**

1 Goodman, A. S., & Hastak, M. (2006). Infrastructure Planning Handbook: Planning, Engineering, and Economics. McGraw Hill/ASCE Press.
2 Grigg, N. (1988). Infrastructure Engineering and Management. Wiley.

**Reference Books: -**

1 Hudson, W., & Ralph. (1997). Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation, and Renovation. Tata McGraw Hill.
2 Haas, R., Hudson, W. R., & Zaniewski, J. (1994). Modern Pavement Management. Krieger Publishing Company.
3 Hudson, W. R., Haas, R., & Uddin, W. (1997). Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation, and Renovation. McGraw Hill.

**COs, POs, and PSOs Mapping (**Infrastructure Planning & Management: CEUETP3)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 3 | 1 | | 3 | 2 | 2 | 2 | |
| CO2 | 1 | 2 | 2 | | 2 | 2 | 1 | 2 | 2 | | 3 | 2 | 1 | 2 | |
| CO3 | 1 | | | | 2 | 1 | | 2 | 1 | | 3 | 1 | 1 | 2 | |
| CO4 | 2 | 1 | 2 | 1 | 1 | | 2 | | | | 3 | | 1 | 2 | |
| CO5 | 1 | 1 | 2 | | 1 | 2 | 3 | | | | 1 | | 1 | 2 | |

## Scheme & Syllabus of B.Tech. (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -V | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUETP4 | L | T | P | CIA | SEA | 100 | 3 | Nil |
| Course Name | Disaster Preparedness and Planning Management | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- To understand basic ideas in disaster management
- To know the definitions and terms used in disaster management
- To understand the types and classes of disasters.
- To know the challenges posed by disasters
- To understand the influences of disasters on skills

| Unit | Content | Teaching/ Lecture Hours |
|---|---|---|
| I | **Introduction** - Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation. | 6 |
| II | **Disasters** - Disasters classification: natural disasters, floods, drought, cyclones, volcanoes, earthquakes, tsunamis, landslides, soil erosion, forest fires; manmade disasters; industrial pollution, nuclear disasters, chemical spills, biological disasters, structural failures-buildings, and bridges. Transportation accidents-air, rail & road, war & terrorism. | 10 |
| III | **Disaster Impacts** - Disaster impacts on environmental, physical, social, ecological, economic, political, health, and demographic aspects; hazard locations; global and national disaster trends and urban disasters. addressing the problem of climate change | 8 |
| IV | **Disaster Risk**- Its concept and phases; prevention, mitigation, preparedness, relief, and recovery; structural and non-structural, risk analysis, vulnerability and capacity assessment; disaster risk reduction and planning management, early warning systems, post-disaster environmental response, roles and responsibilities of government and community | 10 |
| V | **Disasters, Environment and Development** - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land use changes, urbanization etc.), sustainable and environment friendly recovery; reconstruction and development methods. | 8 |
| | **Total Lecture Hours** | 42 |

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To apply disaster concepts to management
**CO2** To analyze the relationship between development and disasters
**CO3** To understand Categories of Disasters
**CO4** To the realization of the responsibilities to society
**CO5** To understand the impacts of disasters skills and application of disaster concepts to management.

**Text Books: -**

1 Rai, N., & Singh, A. K. (2021). Disaster Management in India: Perspectives, Issues and Strategies. New Royal Book Company.
2 Bhattacharya, T. (2017). Disaster Science and Management. McGraw Hill Education (India) Private Limited.
3 Sahni, P. (2004). Disaster Risk Reduction in South Asia. Prentice Hall.

**Reference Books: -**

1 Singhal, J. P. (2019). Disaster Management. Laxmi Publications.
2 Singh, J. (2013). Disaster Management: Future Challenges and Opportunities. K W Publishers Private Limited.
3 Pandey, M. (2014). Disaster Management. Wiley India Private Limited.

**COs, POs, and PSOs Mapping (**Disaster Preparedness and Planning Management: CEUETP4)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 2 | | | | | | | | | 3 | | |
| CO2 | 3 | 2 | 1 | 2 | | | | | | | | | 3 | | |
| CO3 | 3 | 2 | 1 | 2 | | | | | | | | | 3 | | |
| CO4 | 3 | 2 | 1 | 2 | 3 | | | | | | | | 3 | | 1 |
| CO5 | 3 | 2 | 1 | 2 | 3 | | | | | | | | 3 | | 1 |

## Scheme & Syllabus of B.Tech. (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -V | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUETP5 | L | T | P | CIA | SEA | 100 | 3 | CEUCTT2, CEUDTT2 |
| Course Name | Basics of Computational Hydraulics | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- To provide knowledge on the application of computational fluid mechanics to different Civil engineering problems.
- To Provide knowledge on conservation law and the numerical approach to solve by converting different forms of partial differential equations.
- To Provide some experience in the software engineering skills associated with the implementation of MATLAB computer programming and use of Computational Fluid Dynamics (CFD)software.
- To study the analysis of Open Channel Flow
- To learn about water surface profiles.

| Unit | Content | Teaching/ Lecture Hours |
|---|---|---|
| I | Introduction, significance of computational hydraulics, discrete forms of mass, momentum, and energy conservation laws, examples of free surface flows. | 8 |
| II | Continuous forms of the conservation laws, lateral inflow's 1-D expansions, and contractions, homogeneous and stratified fluid flows. | 9 |
| III | Introduction to computer programming and computation with MATLAB and using of Computational Fluid Dynamics (CFD)software. | 8 |
| IV | Pipe flow analysis, Open channel flow: Types of Open Channel Flow, Estimation of normal and critical depth, uniform flow computations | 9 |
| V | Computation of water surface profile (WSP) gradually varied flow estimation using direct step methods. | 8 |
| | **Total Lecture Hours** | 42 |

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To evaluate the governing equations based on conservation principles in fluid flow problems
**CO2** To apply the finite difference method to the fluid flow problems
**CO3** To analyze model fluid dynamics using MATLAB and CFD software.
**CO4** To apply the computational methods in open channel flow
**CO5** To apply direct step methods on the water surface profile

**Text Books: -**

1 Jayanti, S. (2018). Computational Fluid Dynamics for Engineers and Scientists. Springer.
2 Hoffman, J. D. (2011). Numerical Methods for Engineers and Scientists. CRC Press, Special Indian Edition.
3 Choudhary, M. H. (1997). Applied Hydraulic Transients. Van Nostrand Reinhold.

**Reference Books: -**

**1** Abbot, M. B., & Minns, A. W. (1994). Computational Hydraulics. Ashgate Publication.
**2** Anderson, J. D. (1995). Computational Fluid Dynamics. McGraw Hill.

**COs, POs, and PSOs Mapping (**Basics of Computational Hydraulics: CEUETP5)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | | 2 | | | | | | | | | 3 | | |
| CO2 | 3 | 3 | | 2 | | | | | | | | | 3 | | |
| CO3 | 3 | 3 | | 2 | 3 | | | | | | | | 3 | 3 | |
| CO4 | 3 | 3 | | 2 | | | | | | | | | 3 | | |
| CO5 | 3 | 3 | | 2 | | | | | | | | | 3 | | |

**Scheme & Syllabus of B.Tech. (Civil Engineering) as Per NEP 2020**

| Syllabus | Semester -V | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUELT1 | L | T | P | CIA | SEA | 50 | 1 | CEUETT3 |
| Course Name | Highway Engineering Lab | 0 | 0 | 2 | 25 | 25 | | | |

**Course Objectives:**

- To study the physical properties of road aggregate & their laboratory test.
- To determine the properties of bitumen and bituminous mix.
- To determine the CBR value for subgrade soil

## List of Experiments (*Minimum 10 experiments to be performed*)

1. To determine the crushing value of the given aggregate sample.
2. To determine the abrasion value of the given aggregate sample by loss angles apparatus.
3. To determine the impact value of the given aggregate sample.
4. To determine the elongation index of the given aggregate sample.
5. To determine the flakiness index of the given aggregate sample.
6. To determine the water absorption of the given coarse aggregate.
7. To determine the specific gravity of the given coarse aggregate.
8. To determine the penetration value of the given bitumen material.
9. To determine the softening point of the given bitumen material.
10. To determine the ductility of the given bitumen material.
11. To determine the viscosity of the given bitumen material
12. To determine the optimum binder content of bituminous mix.
13. To determine the California Bearing Ratio (CBR) value of subgrade soil.

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To recognize the knowledge about different physical properties of aggregates by performing different tests on road aggregates

**CO2** To determine the various properties of bitumen by performing various tests on it.

**CO3** To compute the strength of subgrade soil by CBR test.

**Text Books: -**

**1** Khanna, S.K. & Justo, C.E.G. (2015). Highway Material Testing. Nem Chand and Bros

**2** Khanna, S.K., Justo, A. & Veeraragavan, A. (2013). Highway Materials and Pavement Testing. Nem Chand and Bros.

**Reference Books: -**

**1** Indian Roads Congress, IRC. (2014). Handbook of Quality Control for Construction of Roads and Runways.

**2** Kandhal, P.S. (2017). Bituminous Road Construction in India. PHI Learning Pvt. Limited.

## Scheme & Syllabus of B.Tech. (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -V | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUELT2 | L | T | P | CIA | SEA | 50 | 1 | CEUETT4 |
| Course Name | Geotechnical Engineering Lab | 0 | 0 | 2 | 25 | 25 | | | |

**Course Objectives:**

- To Develop practical skills in conducting soil testing.
- To analyze various soil test results for design and analysis
- To demonstrate proficiency in using laboratory equipment and following standardized testing procedures.

## List of Experiments (*Minimum 10 experiments to be performed*)

1. Visual identification and water content determination
2. To determine the specific gravity of soil solids by using a density bottle and pycnometer method.
3. To determine the particle size of the soil by the dry and wet methods.
4. To determine the particle size of the soil by the hydrometer analysis
5. To determine the Atterberg limit of the test.
6. To determine the compaction characteristics of soil.
7. To determine the maximum and minimum density of sand
8. To determine in-situ density by sand replacement and core cutter method
9. To determine the permeability of the soil by constant head and falling head test.
10. To determine the shear strength of the parameter of coarse-grained soil by direct shear test.
11. To determine the unconfined compressive strength test
12. To demonstrate triaxial UU test.
13. To demonstrate consolidation test.

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To identify and measure the basic soil properties such as visual identification and water content.
**CO2** To determine specific gravity, particle size distribution, and Atterberg limits of soil samples.
**CO3** To evaluate compaction characteristics and in-situ density using standard methods
**CO4** To assess permeability and shear strength parameters of soil through various tests.
**CO5** To perform advanced soil tests, including unconfined compressive strength, triaxial tests, and consolidation tests

**Text Books: -**

**1** Das, B. M. (2013). Soil Mechanics Laboratory Manual (8th ed.). Oxford University Press.
**2** Lambe, T. W. (1967). Soil Testing for Engineers. MIT Press.
**3** Head, K. H. (2006). Manual of Soil Laboratory Testing. Whittles Publishing.

**Reference Books: -**

**1** Bowles, J. E. (1992). Engineering Properties of Soils and Their Measurement (4th ed.). McGraw-Hill.
**2** Germaine, J. T., & Germaine, A. V. (2009). Geotechnical laboratory measurements for engineers. John Wiley & Sons.

## Scheme & Syllabus of B.Tech. (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -V | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUEPF1 | L | T | P | CIA | SEA | 100 | 2 | Nil |
| Course Name | Mini Project-II | | | 4 | 50 | 50 | | | |

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -VI | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUFTT1 | L | T | P | CIA | SEA | 100 | 3 | CEUBTE1 CEUCTT1 |
| Course Name | Design of Steel Structures | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:** The objective of this course is

- To study mechanical properties of structural steel and outline general aspect of design philosophies.
- To classify and design connections in steel structure.
- To determine tensile and compressive strength of structural steel member.
- To understand design examples of Beam, Beam Column, Column Splices and Column Base
- To introduce components of plate girders and its behavior.

| Unit | Content | Teaching/ Lecture Hours |
|---|---|---|
| I | Introduction: General, types of Steel, mechanical behaviour of steel, measures of Yielding, measures of Ductility, types of Structural system, Structural Steel Sections. Methods of Structural design: Introduction- Design Philosophies-Working Stress Method-Ultimate Strength Method-Load and Resistant factor- Limit State Method-Partial safety factor Load Combinations-Classification of Cross sections-General aspects in the design. | 4 |
| II | Design of Steel fasteners: Types of fasteners – Riveted connections- Bolted connections- Assumptions- Failure of bolted joints – Strength of bolted joints – Design examples – Design of Welded connections – Butt weld- fillet weld – Design examples.<br>Design of Eccentric Connections: Design of Brackets- Type-1 and Type 2 – Moment Resistant connections – Design Examples. | 16 |
| III | Design of Tension Members: General – Modes of Failure of Tension member-Analysis of Tension members- Example - Design steps – Design examples – Lug angles – Design.Design of Compression Members: General – Strength of Compression members- Design Compressive strength- Example on analysis of Compression members – Design of Angle struts – Design Examples- Built up Columns- Design of Lacing – Design of Battens- Design Examples- Design of Roof members. | 9 |
| IV | Design of Beams: General- Lateral Stability of Beams- Bending Strength of Beams – Plastic Section Modulus - Design Examples.Design of Beam Columns: Behaviour of members under combined loading – Modes of Failures – Design Examples.Design of Column Splices and Column Base: Design of Column Splice-Design Examples- Design of Column Base- Slab Base- Gusseted Base- Design | 9 |

| | | |
|---|---|---|
| V | Examples.<br>Design of Plate Girder: General- Components of Plate Girder- Optimum depth – Bending Strength – Shear Strength – Shear Buckling- Simple Post critical method- Tension Field method- Stiffeners-Bearing- Transverse stiffeners - Design Examples. | 6 |
| | **Total Lecture Hours** | 44 |

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** Define mechanical properties of structural steel and implement the limit state design philosophy.

**CO2** Design bolted, welded and eccentric connections in steel structure.

**CO3** Design tension and compression members

**CO4** Design Evaluate beam and column element.

**CO5** Evaluate the behaviour of plate girder

**Text Books:-**

1 Duggal, S. K. (2020). *Limit state design of steel structures*. Oxford University Press.
2 Bhavikatti, S. S. (2019). *Design of steel structures: By limit state method*. I.K. International Publishing House.
3 Sai Ram, K. S. (2018). *Design of steel structures*. CBS Publishers & Distributors.
4 Punmia, B. C., Jain, A. K., & Jain, A. K. (2017). *Comprehensive design of steel structures*. Laxmi Publications.
5 Ramamrutham, S. (2016). *Design of steel structures*. Dhanpat Rai Publishing Company.
6 Gambhir, M. L. (2021). *Fundamentals of structural steel design*. Tata McGraw-Hill Education.
7 Bureau of Indian Standards. (2007). *IS-800:2007 - Indian standard - General construction in steel - Code of practice & steel tables*. Bureau of Indian Standards.

**Reference Books: -**

1 Subramanian, N. (2014). *Design of steel structures: Limit states method*. Oxford University Press.
2 Ramchandra. (2013). *Design of steel structure volume I*. Standard Publishers.
3 Ramchandra. (2015). *Design of steel structure volume II*. Standard Publishers.
4 Boracchini, A. (2018). *Design and analysis of connections in steel structures: Fundamentals and examples*.

**COs, POs and PSOs Mapping (**Design of Steel Structures : CEUFTT1)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 1 | 2 | 2 | 2 | | | | | | | | 2 | 1 | 2 |
| CO2 | 3 | 3 | 3 | 2 | 2 | 1 | | | | | | | 3 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 2 | 1 | | | | | | | 3 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 2 | 2 | 1 | | | | | | | 3 | 2 | 2 |
| CO5 | 3 | 3 | 3 | 2 | 2 | 1 | | | | | | | 3 | 2 | 2 |

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -VI | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUFTT2 | L | T | P | CIA | SEA | 100 | 3 | CEUETT5 |
| Course Name | Environmental Engineering - II | 3 | 0 | 0 | 40 | 60 | | | |

Course Objectives:

- To help students develop the ability to apply basic understanding of physical, chemical, and biological characteristics of the sewage.
- To learn about the anaerobic treatment units.
- To Study the various process performed with Municipal Solid Wastes.

| Unit | Content | Teaching/Lecture Hours |
|---|---|---|
| I | **Introduction:** Objective, design period, Physical, Waste water sampling, self-purification of natural streams, Oxygen Sag Curve, sources of sewage. **Design of sewers:** minimum size of sewer, velocities and gradient of sewers. **Sewer appurtenances:** manholes, street inlets, flushing devices, Vent pipes etc. | 10 |
| II | **Treatment of wastewater:** characteristics of wastewater. Effluent discharge standards, **Primary treatment of wastewater:** Types of screens, design of screen chamber, sources of grit, design of grit chamber, disposal of grit, oil and grease removing skimming tanks, | 8 |
| III | **Secondary treatment of wastewater:** Aerobic Treatment UNITs: Biological principle of ASP, SVI, sludge bulking and control; biological principle of Trickling filter, re-circulation, operational troubles; Rotating biological contactor. Low-cost treatment methods: Principle of Oxidation Pond, symbiosis, principle of Aerated Lagoons, aeration method, Principle of Oxidation Ditches, sewage farming, ground water recharge. | 10 |
| IV | **Anaerobic Treatment UNITs:** Septic tanks, biological Principle, method of treatment and disposal of tank effluent. Anaerobic digester, principle of anaerobic digestion, Stages of digestion, bio-gas production. Sludge disposal methods, advantages and disadvantages, Design of STP. | 10 |
| V | **Municipal Solid Wastes:** Characteristics, generation, collection & transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment & disposal), environmental & health implications, disposal of solid waste by land filling, composting and incineration methods. | 6 |
| | **Total Lecture Hours** | **44** |

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To understand the basic terms related to Sewage and sewerage system.

**CO2** To estimate waste water quantity and can design the sewerage system.

**CO3** To understand basic methodology for wastewater treatment (screening, grit chambers, sedimentation, biological treatment and chemical treatment) and to understand various processes of Aerobic & Anaerobic treatment units.

**CO4** To design unit operations specific to wastewater treatment and to control & monitor wastewater treatment facilities.

**CO5** To understand solid wastes management.

**Text Books: -**

**1.** Peavy, H. S., & Rowe, D. R. (1985). *Environmental engineering*. Tata McGraw-Hill.

**2.** Garg, S. K. (2009). *Waste water engineering*. Khanna Publishers.

**3.** Metcalf, L., & Eddy, H. (2014). *Waste water engineering*. Tata McGraw-Hill.

**Reference Books: -**

**1** Central Public Health and Environmental Engineering Organization (CPHEEO). (2000). *Manual on municipal solid waste management*. Ministry of Urban Development.

**2** Venugopala Rao, P. (2015). *Environmental engineering II*. Tata McGraw-Hill.

**3** Hammer, M. J. (2018). *Water and wastewater technology*. PHI Learning.

**4.** Ministry of Urban Development, Government of India. (2014). *Manual on sewerage and sewage treatment*. Ministry of Urban Development.

**COs, POs and PSOs Mapping (**Environmental Engineering - II : CEUFTT2

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 2 | | | | | | | | | 3 | | 1 |
| CO2 | 3 | 3 | 1 | 2 | | | | | | | | | 3 | | 1 |
| CO3 | 3 | 3 | 1 | 2 | | | | | | | | | 3 | | 1 |
| CO4 | 3 | 3 | 1 | 2 | 3 | | | | | | | | 3 | | 1 |
| CO5 | 3 | 3 | 1 | 2 | | | | | | | | | 3 | | 1 |

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -VI | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUFTT3 | L | T | P | CIA | SEA | 100 | 3 | Nil |
| Course Name | Water Resources Engineering -I | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- To understand the need of Irrigation, types of irrigation systems and Methods of Irrigation.
- To understand the Canal Irrigation systems and design of stable channels in alluvium.
- To understand Water Logging and its Control
- To know the river behavior, control and training.
- To know the Reservoir Planning, Hydrograph and Flood Routing and its principle

| Unit | Content | Teaching/ Lecture Hours |
|---|---|---|
| I | **Introduction:** Need for Irrigation, advantages and disadvantages of irrigation, types of irrigation systems – Flow irrigation, lift irrigation. Methods of Irrigation: Introduction, requirement of irrigation methods, surface and sub-surface irrigation. Water Requirement of crops: Introduction, water requirement of crop, crop season and crops of India, crop period and base period, delta, duty of water, relationship between delta, duty and base period, factors affecting duty. | 10 |
| II | **Canal Irrigation:** Classification of canal, parts of canal irrigation system, canal alignment, typical canal cross section, command areas, losses in irrigation systems. Design of stable channels in alluvium. Introduction, Kennedy's silt theory, Lacey's Theory, Lacey's regime equations, Lacey's shock theory, Design of channels by Kennedy's and Lacey's theories, maintenance of irrigation channels. | 8 |
| III | **Water Logging and its Control.** Causes and ill effects of water logging, prevention and control, reclamation of waterlogged lands, surface drainage. Design of Lined Channels. Introduction, benefits of lining, types of lining, economics of lining, procedure and design of lined canals. | 8 |
| IV | **River behaviour, control and training.** Objects, river characteristics, classification of river training works, methods of river training embankments, bank protection, cut-offs, meandering causes and parameters. Flood Control; Introduction, channel improvement, flood ways evacuation and flood plain zoning. | 8 |
| V | **Reservoir Planning:** Introduction, type of reservoirs, investigation for reservoir planning, site selection criteria for reservoir, basic terms and definitions of reservoir, storage zones of a reservoir, mass curve and demand curve, determination of reservoir capacity, reservoir losses, reservoir sedimentation, factors affecting sedimentation, type of sediment load, life of reservoir, safe field. Applications of GIS in Reservoir Planning. | 8 |
| | **Total Lecture Hours** | **42** |

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To describe about the types of Irrigation systems, and methods of irrigation.
**CO2** To design irrigation canals and canal network
**CO3** To propose solutions regarding water logging and drainage.
**CO4** To plan and design river training works and flood control of river.
**CO5** To evaluate the capacity of reservoir and use Flood Routing principle for Reservoir Planning.

**Text Books: -**

1 Peavy, H. S., & Rowe, D. R. (1985). *Environmental engineering*. Tata McGraw-Hill.
2 Garg, S. K. (2009). *Waste water engineering*. Khanna Publishers.
3 Metcalf, L., & Eddy, H. (2014). *Waste water engineering*. Tata McGraw-Hill.

**Reference Books: -**

**1** Bharat Singh (2005), Fundamentals of Irrigation Engineering, *Nem Chand & Bros, Roorkee*
**2** G.L Asawa (2008), Irrigation and Water resources Engineering, *New Age International Publishers, New Delhi*
**3** R.S. Varshney, S.C. Gupta, R.L. Gupta (2009), Theory and Design of Irrigation Structures (Volume I), *Nem Chand & Bros, Roorkee*

**COs, POs, and PSOs Mapping (**Water Resources Engineering –I : CEUFTT3)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 1 | 0 | 1 | 3 | 0 | 0 | 1 | 0 | 0 | 3 | 0 | 0 |
| CO2 | 3 | 3 | 3 | 3 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 |
| CO3 | 3 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 |
| CO4 | 3 | 1 | 1 | 1 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 |
| CO5 | 3 | 1 | 1 | 1 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 |

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -V | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUFTT4 | L | T | P | CIA | SEA | 100 | 3 | CEUETT4 |
| Course Name | Geotechnical Engineering - II | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- To understand the role of civil engineers in selecting, designing, and constructing foundations for civil engineering structures.
- To apply methods of soil exploration to determine soil design parameters and their correlations.
- To understand and compare earth pressure theories and their applications in designing stable retaining walls.
- To assess and design shallow and deep foundations using various bearing capacity theories and analyze settlement in different soil types

| Unit | Content | Teaching/ Lecture Hours |
|---|---|---|
| I | Role of civil engineer in the selection, design, and construction of the foundation of civil engineering structures. Soil Exploration: Methods of soil exploration include boring, sampling, penetration tests, and correlations between penetration resistance and soil design parameters. | 8 |
| II | Earth pressure at rest, active and passive earth pressure, Rankine and Coulomb's earth pressure theories, earth pressure due to surcharge, retaining walls, and stability analysis of retaining walls. | 7 |
| III | Mode of failure – mechanism, Stability of slopes – Finite and infinite slopes, methods of slices, Bishop's method. | 6 |
| IV | Shallow foundations – Terzaghi's and Meyerhoff's bearing capacity theories, the effect of the water table, Combined footing and raft foundation, Contact pressure; Settlement analysis in sands and clays | 10 |
| V | Deep foundations – dynamic and static formulae, Axial load capacity of piles in sands and clays, pile load test, pile under lateral loading, pile group efficiency, negative skin friction. Well, foundations: Methods of construction, tilt and shift, remedial measures, lateral stability of the well foundation. | 12 |
| | **Total Lecture Hours** | 43 |

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To identify and describe the methods of soil exploration and their importance in foundation engineering

**CO2** To evaluate earth pressure theories and apply them in designing retaining walls and stability analysis.

**CO3** To analyze the mechanisms of slope stability and implement methods like Bishop's method for slope stability analysis.

**CO4** To calculate the bearing capacity of shallow foundations and assess the impact of water tables

**CO5** To determine the axial load capacity of piles and evaluate the efficiency and stability of deep foundation systems, including well foundations.

**Text Books: -**

1 Das, B. M. (2018). Principles of Foundation Engineering (9th ed.). Cengage Learning.
2 Bell, F. G. (1991). Foundation Engineering in Difficult Ground (2nd ed.). Butterworth-Heinemann.
3 Poulos, H. G., & Davis, E. H. (1980). Pile Foundation Analysis and Design. John Wiley & Sons.

**Reference Books: -**

1 Fang, H.-Y. (Ed.). (1990). Foundation Engineering Handbook (2nd ed.). Springer
2 Bowles, J. E. (1996). Foundation Analysis and Design (5th ed.). McGraw-Hill.
3 Coduto, D. P., Kitch, W. A., & Yeung, M. R. (2016). Foundation Design: Principles and Practices (3rd ed.). Pearson.

**COs, POs, and PSOs Mapping (**Geotechnical Engineering – II: CEUFTT4)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | | | | | | | | 3 | 2 | 2 |
| CO2 | 3 | 3 | 3 | 3 | | | | | | | | | 3 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 | | | | | | | | | 3 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 | | | | | | | | | 3 | 2 | 2 |
| CO5 | 3 | 3 | 3 | 3 | | | | | | | | | 3 | 2 | 2 |

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -VI | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUFTP1 | L | T | P | CIA | SEA | 100 | 3 | CEUBTE1<br>CEUCTT1<br>CEUDTT1 |
| Course Name | Advanced Concrete Design | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- To understand the design procedures for combined footings.
- To study the design of retaining walls
- To know the design of different types of water tanks
- To learn the design of flat slabs
- To know the design of RCC chimneys

| Unit | Content | Teaching/Lecture Hours |
|---|---|---|
| I | Combined Footings: Simple Rectangular, trapezoidal footings (with and without central beam); Strap footing; raft foundation. | 10 |
| II | Types of retaining walls; Cantilever Retaining wall design; Counterfort retaining wall (demonstration only) | 8 |
| III | Water tanks resting on ground; Intze type water tank design. | 8 |
| IV | Large span concrete roofs, Introduction– classification- behaviour of flat slabs - direct design and equivalent frame method- Codal provisions - waffle slabs. | 10 |
| V | Chimneys, analysis of stresses in concrete chimneys- uncracked and cracked sections- Codal provisions- design of chimney. | 8 |
| | **Total Lecture Hours** | 44 |

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To adopt limit state design philosophy for deign of reinforced concrete.
**CO2** To carry out the design of RC structural elements for flexure, bond, shear and torsion.
**CO3** To implement the design slabs and staircases as per LSD.
**CO4** To do the design of RC structural columns subjected to axial and eccentric loads.
**CO5** To propose and design the type of footing for a RC structure.

**Text Books: -**

1 Advanced Reinforced Concrete Design by N Krishna Raju
2 Reinforced Concrete Design by Devdas Menon and S U Pillai,
3 Ashok K Jain, Reinforced Concrete –Nem Chand Bros. Roorkee , 1998
4 Purushothaman, P., Reinforced Concrete Structural Elements-, Tata McGraw Hill, 1986

**Reference Books: -**

1 Mallick and Gupta, Reinforced Concrete, - Oxford and IBH, 1982
2 Jain and Jaikrishna, Plain and Reinforced Concrete – Vol I and II Nem Chand Bros., Roorkee, 2000.
3 Taylor C Pere, Reinforced Concrete Chimneys, Concrete publications, 1960
4 Design of deep girders, Concrete Association of India, 1960
5 BIS codes ( IS 456 , IS 2210, IS 4998, IS 3370, SP 16, SP 24, SP 34).
6 IRC Codes (IRC 5, IRC 6, IRC 21)

**COs, POs, and PSOs Mapping (**Advanced Concrete Design : CEUFTP1)

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 | | | | | | | | | 3 | | |
| CO2 | 3 | 3 | 3 | 3 | 3 | 2 | | | 1 | | 2 | 2 | 3 | 1 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 2 | | | 1 | | 2 | 2 | 3 | 1 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | | | 1 | | 2 | 2 | 3 | 1 | 2 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 2 | | | 1 | | 2 | 2 | 3 | 1 | 2 |

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -VI | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUFTP2 | L | T | P | CIA | SEA | 100 | 3 | CEUETT4 |
| Course Name | Ground Improvement Techniques | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:** At the end of the course completion, a student is able

- To impart knowledge of various types of soils and need of ground improvement
- To make familiar with the various techniques to improve the characteristics of soil.
- To impart knowledge of dynamics methods as well as chemical additives requirement foe the ground improvement.
- To introduce about reinforced earth mechanism in ground improvement techniques.
- To understand the use of Geo-Synthetics in present construction era.

| Unit | Content | Teaching/ Lecture Hours |
|---|---|---|
| I | **Introduction**: Necessity of Ground Improvement, Selection of Ground Improvement Techniques, Stabilization of Expansive Soil, Current Status and Scope in the Profession. | 6 |
| II | **Methods of Ground Improvement:** Dewatering, Well Points-Vacuum / Electro Osmotic Methods, Analysis of Seepage, Two-Dimensional Flow, Heat Treatment, Ground Freezing., Analysis and Design of Dewatering Systems. Grouting Types, Properties, Method of Grouting, Ground Selection and Control | 9 |
| III | **Dynamic Methods of Ground Improvement**: Compaction, Methods of Compaction, Engineering Properties of Compacted Soil, Field Compaction and its Control, Dynamic Compaction- Vibro-Flotation, Compaction Piles, Consolidation, Sand Drains, Preloading, Stone Columns, Construction Methods, Merits and Demerits Of Various Techniques.<br>Soil stabilization by Use of chemical additives | 9 |
| IV | **Reinforced Earth:** Basic Mechanism, Choice of Soil and Reinforcement, Strength Characteristics of Reinforced Earth, Principles of Design of Reinforced Earth Wall. | 9 |
| V | **Geosynthetics:** Raw Materials, Durability and Aging, Manufacturing Methods, Geotextiles-Testing and Evaluation, Geotextile as Separators and as Reinforcement, Geotextile in Filtration, Drainage and Erosion Control, Bearing Capacity Improvement by Geotextiles. | 9 |
| | **Total Lecture Hours** | 42 |

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To understand of ground improvement techniques and future prospects.
**CO2** To execute various methods/techniques of ground improvement.
**CO3** To apply the dynamics methods as well as chemical additives as per field conditions.

**CO4** To implements reinforced earth method in the field.

**CO5** To apply the various types of geo synthetics in roads/ highways or other various construction works.

**Text Books: -**

1 Gopal Ranjan and A. S. R. Rao, Basic and Applied Soil Mechanics; *New Age International Publishers New Delhi*

2 Nihar Ranjan Patra (First Edition (1 January 2012); Ground Improvement Techniques, Vikas *Publishing House New Delhi -110044*

**Reference Books: -**

1. V.N. S. Murthy (2010), **Geotechnical Engineering: Principles and Practices of Soil Mechanics And Foundation Engineering**, Crc Press

2. Robert M. Koerner (Vol-I & II/6th Edition), **Designing with Geosynthetics;** Xlibris US

**COs, POs, and PSOs Mapping (**Ground Improvement Techniques : CEUFTP2)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | | 3 | | 1 | 3 | 2 | 3 | 2 | 3 | 3 | 2 |
| CO2 | 1 | 1 | 3 | 2 | | 2 | 1 | | 2 | | 2 | 1 | 3 | 3 | 2 |
| CO3 | 1 | 3 | 3 | 3 | | 2 | | 3 | 1 | 2 | 2 | 1 | 3 | 3 | 3 |
| CO4 | 1 | 1 | 3 | 3 | | 2 | 3 | 1 | 2 | 2 | 2 | 1 | 3 | 3 | 3 |
| CO5 | 3 | | 3 | 3 | 3 | 2 | 3 | | 1 | 3 | 3 | 1 | 3 | 3 | |

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -VI | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUFTP3 | L | T | P | CIA | SEA | 100 | 3 | Nil |
| Course Name | Sustainable Urban Transportation Planning | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- To introduce concepts of different types of mode of transportation and associated facilities.
- To understand the concept of urban transport scenario, traffic characteristics and transport development.
- To study the Intelligence Transport System
- To understand ITS user services and its components.
- To understand the approach and utility of Environmental Impact Assessment for the urban infrastructural measures.

| Unit | Content | Teaching/Lecture Hours |
|---|---|---|
| I | **Modes of Transportation:** Transportation parameters- Traffic and Transport Problems of a city, Mass transport system, Modes of transportation & characteristics, Public transport system, public private transport system, Advantages and disadvantages of Public transport system. Role of transportation in mass transportation, advanced modes. **Transportation Infrastructure-** Green bays, control stations, mitigation buildings, separator lanes and safety islands. | 9 |
| II | **Urban Public Transport System Rapid transit systems:** BRTS, Bus Lane system, Advantages and limitations in Indian Scenario, Rail System. Types of rail system, advantages and disadvantages of rail system, sky walk and under bridge and its advantages. Advances in infrastructure. **Urban Pedestrian Safety-** Skyways, Intersection subways, halt stations, crossing measures, flexibility in accessibility. | 9 |
| III | **ITS Background and Telemetric systems:** Definitions, features and objectives of ITS, History of ITS and its development over the world, telemetric concept, transport telemetric, telemetric structure, ITS taxonomy, ITS application areas, uses, and application overview, ITS implication through AI, ITS based regression models. | 8 |
| IV | **ITS components, tools and strategies:** Components of user services; advanced traffic management system, advanced traveller information systems, advanced vehicle control system, commercial vehicle operational management, advanced public transportation system, electronic payment | 8 |

| | | |
|---|---|---|
| | system, advanced rural transportation, security and safety systems, urban traffic control, benefits and limitations, traffic calming systems, freight management by ITS. | |
| V | **Environmental Impact Assessment:** Description of proposed activity, structural audits, analysis of site selection procedure, baseline conditions / major concerns, green building and its advantages, description of potential positive and negative environmental, social, economic and cultural impacts including cumulative, regional, temporal and spatial considerations, significance of mitigation plans and monitoring plans (impacts and mitigation efforts) | 8 |
| | **Total Lecture Hours** | 42 |

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To implement the concept of urban transport scenario, traffic characteristics and transport development.
**CO2** To adopt the concepts of different mode of transportation and associated facilities with advanced system.
**CO3** To Identify and differentiate ITS user services and its components.
**CO4** To plan and design appropriate ITS technology to solve real-life traffic problems.
**CO5** To propose the mitigation plan for the EIA for the urban infrastructure.

**Text Books: -**

1 Chowdhury, M. A., & Sadek, A. (2003). *Fundamentals of intelligent transportation systems planning*. Artech House.
2 Bekiaris, E., & Nakanishi, Y. J. (2004). *Economic impacts of intelligent transportation systems: Innovations and case studies*. Elsevier/JAI.

**Reference Books: -**

1 Chowdhury, M. A., & Sadek, A. (2010). *Fundamentals of intelligent transport systems planning*. Artech House.
2 Stough, R. (2001). *Intelligent transport systems: Cases and policies*. Edward Elgar.
3 National Research Council. (2010). *Artificial intelligence and intelligent transportation systems*. National Academy Press.
4 Jain, A. K. (2007). *Fundamentals of digital image processing*. Prentice Hall.

**COs, POs and PSOs Mapping (**Sustainable Urban Transportation System : CEUFTP3)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | | | | | | | | | 3 | 1 | 3 |
| CO2 | 3 | 3 | 3 | 2 | | | | | | | | | 3 | 1 | 3 |
| CO3 | 3 | 3 | 3 | 2 | | | | | | | | | 3 | 1 | 3 |
| CO4 | 3 | 3 | 3 | 2 | | | | | | | | | 3 | 1 | 3 |
| CO5 | 3 | 3 | 2 | 2 | | | | | | | | | 3 | 1 | 3 |

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -VI | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUFTP4 | L | T | P | CIA | SEA | 100 | 3 | CEUCTT2 CEUDTT2 |
| Course Name | Open Channel Flow | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- To introduce the concepts of channel hydraulics, used in design of inland waterways for irrigation and hydraulic structures.
- To understand the Canal Irrigation systems and design of stable channels in alluvium.
- To develop a basic knowledge of open channel flow relationships by the conservation equations for mass, momentum, and energy.
- To develop a basic knowledge in open channel flow Measurement
- To develop a basic knowledge of Unsteady Flow in open channel flow

| Unit | Content | Teaching/ Lecture Hours |
|---|---|---|
| I | **Introduction to Free Surface Flows:** Comparison between pipe and channel flows, classification of channels and basic equations of flow.<br>**Concepts of Specific Energy:** Specific energy, critical, subcritical and super critical flows, critical depth computations, transitions and introduction to hydraulic jump | 10 |
| II | **Uniform Flow:** Shear stress and velocity distribution, resistance relationships, normal depth, and its computation design of channels, most efficient cross-section in rigid boundary channels. | 8 |
| III | **Gradually Varied Flow:** Governing equations, characteristics and classification of water surface profiles, control sections, computations of GVF profiles in prismatic and non-prismatic channels. | 8 |
| IV | **Hydraulic Jump:** Types of jumps, hydraulic jump in horizontal rectangular channels, forced jump, stilling basins.<br>**Flow Measurement in Open Channels:** Broad and sharp-crested weirs, free overall, flow over spillways, sluice gates. | 8 |
| V | **Fluvial Hydraulics:** Incipient motion, shields diagram, regimes of flow and resistance to flow in mobile bed channels regime channels and design aggradation and degradation of alluvial streams, bridge and abutment scour<br>**Unsteady Flow:** Wave celerity, surges, positive and negative surges | 8 |
| | **Total Lecture Hours** | 42 |

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** Ability to explain the terms of the open channel flow equations and explain the interactions among the terms.
**CO2** Understanding of the concepts of free flow and its applications.
**CO3** Ability to explain and apply mathematical relationships for gradually Varied Flow.
**CO4** Ability to explain the physical mechanisms of hydraulic jumps, surges, and Flow measurement.
**CO5** Ability to solve open channel flow problems through the selection and use of appropriate equations.

**Text Books: -**

1 Chow, V.T. (1959) "Open Channel Hydraulics", McGraw Hill.
2 Subramanya, K. (1997) "Flow in Open Channels", Tata McGraw-Hill.
3 Ranga Raju, K.G. (2003) "Flow through Open Channels", Tata McGraw-Hill.

**Reference Books: -**

1 Chanson, H. (2004) "The Hydraulics of Open Channel Flow: An Introduction", Elsevier Scientific.
2 Chaudhry, M.H. (1993) "Open Channel Flow", Prentice-Hall, New Jersey, USA

**COs, POs and PSOs Mapping (**Open Channel Flow : CEUFTP4)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | | 2 | | | | 1 | | | 3 | | |
| CO2 | 3 | 2 | 3 | 2 | 3 | 1 | | | | 1 | | | 3 | 1 | |
| CO3 | 3 | 3 | 2 | 2 | 3 | 2 | | | | 1 | | | 3 | 1 | |
| CO4 | 3 | 2 | 3 | 3 | 3 | 2 | | | | 1 | | | 3 | 1 | |
| CO5 | 3 | 2 | 3 | 2 | | 2 | | | | 1 | | | 3 | | |

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -VI | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUFTP5 | L | T | P | CIA | SEA | 100 | 3 | Nil |
| Course Name | Solid and Hazardous Waste Management | 3 | 0 | 0 | 40 | 60 | | | |

**Course Objectives:**

- To define and characterize municipal solid wastes from technical and regulatory points of view.
- To provide comprehensive ways of collection, transportation and management of different types of solid wastes.
- To classify the waste and remove hazardous wastes; apply different methods of management.
- To introduce the most common techniques for hazardous waste disposal.
- To use laboratorial tests in sampling & characterization of solid wastes**.**

| Unit | Content | Teaching/ Lecture Hours |
|---|---|---|
| I | **Municipal Solid Waste Management:** Legal and Organizational foundation: Definition of Solid Waste, Waste Generation Technological Society, Major Legislation, Monitoring Responsibilities, Sources and Types of Solid Waste, Sampling and Characterization – Determination of Composition of MSW, Storage and Handling of Solid Waste, Future Changes in Waste Composition. | 8 |
| II | **Incinerators Transfer and Transport:** Need for Transfer Operation, Transport Means and Methods, Transfer Station Types and Design Requirements, Landfills, Site Selection, Design and Operation, drainage and Leachate Collection Systems, Requirements and Technical solution, Designated Waste Landfill Remediation, Integrated Waste Management Facilities. | 8 |
| III | **Hazardous Waste Treatment:** Technologies, Design and Operation, Facilities for Physical, Chemical and Thermal Treatment of Hazardous Waste –, Solidification, Chemical Fixation and Encapsulation, Incineration, Hazardous Waste landfills: Site Selection, Design and Operation, Remediation of Hazardous Waste Disposal Sites. | 10 |
| IV | **Hazardous Waste:** Definition and episodes, Sources and types, Classification and testing-EP Toxicity Test, TCLP, Future endeavors. Physical and chemical properties: Solubility, Vapor pressure, diffusion, portioning: Octanol-water, soil-water, bio-concentration factor. | 10 |
| V | **Laboratory Practice:** Sampling and Characterization of Solid Wastes; TCLP Tests and Leachate Studies. | 6 |
| | **Total Lecture Hours** | 42 |

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To plan waste minimization and design storage, collection, transport, processing and disposal of municipal solid waste

**CO2** To design all units of solid waste management.

**CO3** To compute the quantities of waste generated.

**CO4** To find the type of waste generated and its end use.

**CO5** To utilize the waste by material recovery sheets.

**Text Books: -**

**1** Environmental Engineering - H.S. Peavy, D.R. Rowe and G. Tchobanoglous (McGraw-Hill)

**2** Evans and Environmental Resources Management, Hazardous Waste Management- M.D. LaGrega, P.L. Buckinghum, J.C (McGraw-Hill)

**3** Environmental Pollution and Control in Chemical Process Industries- S.C. Bhatia (Khanna Publishers)

**4.** Integrated Solid Waste Management by George Techobanoglous et al, McGraw-Hill Publication, 1993

**5.** Hazardous Waste Management by Charles A. Wentz, McGraw Hill Publication, 1995.

**Reference Books: -**

**1** Environmental Engineering - H.S.Peavy, D.R.Rowe and G. Tchobanoglous (McGraw-Hill)

**2** Evans and Environmental Resources Management, Hazardous Waste Management- M.D. LaGrega, P.L.Buckinghum, J.C (McGraw-Hill)

**3** Environmental Pollution and Control in Chemical Process Industries- S.C. Bhatia (Khanna Publishers)

**COs, POs, and PSOs Mapping (**Solid and Hazardous Waste Management : CEUFTP5)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | | | | | 2 | | 2 | | 1 | 2 | 3 | | 1 |
| CO2 | 3 | | 2 | | 1 | | 2 | 2 | 1 | | | 2 | 3 | | 1 |
| CO3 | 2 | 1 | 2 | 2 | | 2 | 3 | | 2 | | 1 | 2 | 3 | | 1 |
| CO4 | 3 | | 2 | | 1 | | 2 | 2 | 1 | | 1 | 2 | 3 | | 1 |
| CO5 | 2 | | | | | | 3 | | 2 | | 1 | 2 | 3 | | 1 |

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -VI | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUFMO1 | L | T | P | CIA | SEA | 100 | 3 | Nil |
| Course Name | MOOCs-I | 3 | 0 | 0 | 40 | 60 | | | |

***NOTE:***

****The students should be opted the MOOC(s) offered by NPTEL/SWAYAM of 03 credits only and that needs to be approved by the BoS.***

*****Student shall take MOOCs based on availability of courses at SWAYAM portal during that academic year.***

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -VI | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUFLT1 | L | T | P | CIA | SEA | 50 | 1 | CEUETT5 |
| Course Name | Environmental Engineering Lab | 0 | 0 | 2 | 25 | 25 | | | |

**Course Objectives:**

- To understand about the equipment used to conduct the test procedures and perform the experiments in the lab.
- To determine the physical, chemical and biological characteristics of water and waste water through practical tests.
- To determine optimum dosage of coagulant and other critical tests to find the quality of water.
- To examine and Estimate water, waste water and create Develop a report on the quality aspect of the environment.
- To compare the water with prescribed standards set by the local governments

**Course Content:**

1. Determination of turbidity for a given sample of water.
2. Determination of electrical conductivity for a given sample of water.
3. Determination of Total Solids, Suspended Solids, Dissolved Solids and Volatile Solids in a given sample of water.
4. Determination of pH for a given sample of water.
5. Determination of carbonate, bi-carbonate and hydroxide alkalinity for a given sample of water.
6. Determination of hardness for a given sample of water.
7. Determination of concentration of Iron in a given sample of water.
8. Determination of concentration of Chlorides in a given sample of water.
9. Determination of the Optimum Alum Dose for a given sample of water through Jar Test.
10. Determination of the Chlorine Demand and Break-Point Chlorination for a given sample of water.
11. Determination of amount of Dissolved Oxygen (DO) in a given sample of water.
12. Determination of the Biochemical Oxygen Demand (BOD) for a given sample of wastewater.
13. Determination of the Chemical Oxygen Demand (COD) for a given sample of wastewater.
14. Determination of Coliform Bacteria: presumptive test, Confirmative test and Determination of MPN.

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To develop a working knowledge about the laboratory test used for the determination of physical properties of water and waste water.

**CO2** To develop a working knowledge about the laboratory test used for the determination of chemical properties of water and wastewater

**CO3** To develop a working knowledge about the laboratory test used for the determination of

biological properties of water and wastewater

**CO4** To evaluate the behavior based on lab results and classify water and wastewater as per IS specifications

**CO5** To assess the quality of water and wastewater for various purposes.

**COs, POs, and PSOs Mapping (**Environmental Engineering Lab: CEUFLT1)

| PO / CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | | | | 1 | 3 | | | 2 | 2 | | 2 | 1 | | 1 |
| CO2 | 2 | | | | 1 | 3 | 2 | | 2 | 2 | | 2 | 1 | | 1 |
| CO3 | 1 | | | | | 3 | | | 2 | 3 | | 2 | 1 | | 1 |
| CO4 | 1 | 1 | 1 | | | | | | 2 | 2 | | 2 | 2 | | 1 |
| CO5 | 2 | 1 | 2 | 2 | | | | 2 | 2 | 2 | | 2 | 2 | | 1 |

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -VI | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUFLT2 | L | T | P | CIA | SEA | 50 | 1 | CEUDTT1, CEUETT1, CEUETT2 |
| Course Name | Computer Applications in Civil Engineering Lab | 0 | 0 | 2 | 25 | 25 | | | |

**Course Objectives:**

- To understand the need for software tools for analysis and design of Civil Engineering Structures.
- To use MS Excel tools for Analysis and Design of Civil Engineering Structures
- To use STAAD Pro for Modelling, Analysis and Design of Civil Engineering Structures
- To understand the need for software tools for analysis and design of Civil Engineering Structures.

**Course Content:**

Minimum 10 problems to be solved either by using STAAD Pro/Excel Programming

**USING MS EXCEL Programs**

1. Analysis of simple beams
2. Design of simply supported RCC beams
3. Design of columns
4. Design of isolated footing (Flat, stepped and sloped)
5. Design of combined footings
6. Design of cantilever retaining walls
7. Design of slabs (One way and Two way)

**USING STAAD Pro**

1. Analysis of simple beams and Frames (2-D)
2. Analysis of multi storey frames for DL and LL
3. Analysis of multi storey frames for DL, LL, WL/EQL
4. Design of structural elements
5. Analysis and design of combined footing
6. Analysis and design of roof truss
7. Analysis of simple beams for rolling loads

**Course Outcomes:** At the end of the course completion, a student is able

**CO1** To analyse 2D and 3D frames using MS EXCEL
**CO2** To design RCC beams, columns, footing, cantilever retaining walls and slabs using MS EXCEL
**CO3** To analyse beams and frames (2-D), multi-storey frames for DL, LL, WL/EQL using STAAD Pro
**CO4** To design various RCC components of buildings using STAAD Pro
**CO5** To analyse and design roof truss and simple beams for rolling loads using STAAD Pro

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

**COs, POs, and PSOs Mapping (**Computer Applications in Civil Engineering Lab : CEUFLT2)

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 3 | | | | 3 | | | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 2 | 2 | 3 | | | | 3 | | | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 2 | 2 | 3 | | | | 3 | | | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 2 | 3 | | | | 3 | | | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 2 | 2 | 3 | | | | 3 | | | 3 | 3 | 3 | 3 |

## Scheme & Syllabus of B.Tech (Civil Engineering) as Per NEP 2020

| Syllabus | Semester -VI | Teaching Hours/ Week | | | Continuous Internal Assessment | Semester Examination Assessment | Total Marks | Credits | Pre-requisite Course(s) |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | CEUFPF1 | L | T | P | CIA | SEA | 100 | 2 | Nil |
| Course Name | Mini Project-III | 0 | 0 | 4 | 50 | 50 | | | |