



ख्वाजा मुईनुद्दीन चिश्ती भाषा विश्वविद्यालय, लखनऊ, उत्तर प्रदेश (भारत)
Khwaja Moinuddin Chishti Language University, Lucknow, U.P. (India)

U.P. STATE GOVERNMENT UNIVERSITY,
(Recognised Under Section 2(f) & 12(B) of the UGC Act, 1956 & B.Tech. Approved by (AICTE))

FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

Bachelor of Technology (B. Tech)

Curriculum Structure

(Applicable from Session 2024-25 for New Entrants)



THIRD YEAR

V- Semester

Effective From Session

2024-2025



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STRUCTURAL ANALYSIS-II

SUBJECT CODE: CE 501

L-T-P: 3-1-0

Credit: 4

COURSE OBJECTIVES

1. To give the ability to analysis of indeterminate structure
2. To give an ability to calculate shear force and bending moment of objects under external loadings.
3. To give an ability to apply the knowledge of structure analysis on engineering applications and design problems.

COURSE OUTCOMES

After studying this course, students will be able to:

CO-1	To know the two hinge and three hinge arches, analysis of arches problem
CO-2	To understand the concept and analysis of truss
CO-3	Apply the concept of suspension bridge
CO-4	To understand about plastic analysis and shape factor
CO-5	To understand the concept of different types of matrix method



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STRUCTURAL ANALYSIS - II

SUBJECT CODE: CE-501

Unit	Topic
I	Arches: Types of Arches, Analysis of three hinged parabolic and circular Arches. Two hinged arch, Linear arch, Eddy's theorem, spandrel braced arch, moving load & influence lines for three hinged parabolic arch.
II	Analysis of Trusses: Classification of trusses, assumption, Analysis of determinate plane trusses (compound and complex). Method of Substitution, Method of tension coefficient for analysis of plane trusses.
III	Suspension Bridges: Analysis of cables with concentrated and continuous loadings, Basics of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders. Analysis of two and three hinge stiffening girder
IV	Plastic Analysis: Basics of Plastic Analysis, Plastic moment of resistance, Plastic section modulus, Shape factor, Load factor, Plastic hinge and mechanism, Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems.
V	Stiffness Matrix method: Stiffness matrix for beam element- analysis of continuous beams - plane frames & pin jointed plane trusses. Flexibility Matrix method: Concept of flexibility matrix-analysis of continuous beams -plane frames and pin jointed plane trusses.

Text/ Reference Books:

1. V.N. Vazirani & M.M. Ratwani (2000), Analysis of Structures, Khanna Publishers, New Delhi.
2. G.S. Pandit & Gupta S.P (1998), Structural Analysis (A matrix approach), Tata McGraw Hill Publishing Ltd
3. 3.Negi.L.S (2002), Theory & Problems in Structural Analysis, Tata McGraw Hill Publishing House



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DEPARTMENT OF CIVIL ENGINEERING

DESIGN OF CONCRETE STRUCTURE-II

SUBJECT CODE: CE 502

L-T-P: 3-1-0

Credit: 4

COURSE OBJECTIVES

1. To impart the basic knowledge, skills and attitudes to analyze and design flat slab floor system;
2. To analyze and design retaining walls, counter-fort retaining walls and culverts
3. To designing water tanks; pre-stress concrete concepts

COURSE OUTCOMES

After studying this course, students will be able to:

CO-1	To know the analysis and design of slabs using yield line theory. To learn the technique for design of flat slabs
CO-2	Analysis and design of beam curved in plan, structural behavior of footings, column
CO-3	Design a water head tank as per I.S. code provision
CO-4	Design and analyze the earth retaining structures
CO-5	Analyze the pre-stress structure



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DESIGN OF CONCRETE STRUCTURE - II (CE-502)

Unit	Topic
I	Flat Slab: Nature of Stresses in flat slabs, flat slabs with and without drops, co-efficient for design of flat slabs, reinforcement in flat slabs (IS code method), circular slab with various edges and loading conditions, design of circular slab.
II	Torsion: Failure of beam under torsion, interaction between torsion and shear and between moment and torsion, concept of equivalent shear and moments. Footing: Analysis and design of beam curved in plan, structural behavior of footings, design of footing for walls and a single column combined and trapezoidal footing, design of strap footing.
III	Water Tank: Design criteria, material specifications and permissible stress for tanks, design of circular and rectangular tanks situated on the ground, underground under hoop stresses, design concept of overhead tanks.
IV	Retaining Wall: Structural behaviors of retaining wall stability of retaining wall against overturning, sliding, and pressure developed under the base design of T-shaped retaining wall, concept of counter fort retaining wall, loads, forces, and I.R.C bridge loadings.
V	Pre-stressed Concrete: Advantages of pre-stressing, methods of pre-stressing, losses in pre-stress, Pre-tension, post-tension, analysis of simple pre-stressed rectangular and T-sections.

Text/ Reference Books:

1. Jain A.K. : Reinforced concrete design, limit state method.
2. S.Ramamrutham & R.Narayanan (2004), Design of reinforced concrete structures, Dhanpat Rai Publishing.
3. Varghese (2005), Advanced Reinforced Concrete Design, Prentice-Hall of India. Gurcharan Singh (2005),
4. Design of R.C.C. Structures in S.I.Units, Standard Publishers Distributors.
5. B.C.Punmia (2003), Design of reinforced concrete structures, Lakshmi Publishers



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DEPARTMENT OF CIVIL ENGINEERING

GEOTECHNICAL ENGINEERING

SUBJECT CODE: CE 503

L-T-P: 3-1-0

Credit: 4

COURSE OBJECTIVES

1. To know the basic properties of soil and origin of soil
2. To give an ability to calculate shear strength and bearing capacity of soil
3. To give an ability to apply the knowledge of soil test and soil related problems.

COURSE OUTCOMES

After studying this course, students will be able to:

CO-1	Understand the different types of soil based on their formation mechanism
CO-2	Classification of soils based on their particle size distribution and index properties and to understand the concept of seepage analysis
CO-3	Determine the compactive effort required to obtain necessary degree of compaction in-situ;
CO-4	Understand the concept of consolidation and shear strength;
CO-5	To understand the concept of stability of slopes and their failure mechanism



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GEOTECHNICAL ENGINEERING

SUBJECT CODE: CE-503

Unit	Topic
I	Introduction —Types of soils, their formation and deposition. Basic Definitions and Relationships—Soil as three-phase system in terms of weight, volume, voids ratio, and porosity. Definitions: moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity, mass specific gravity, etc. Relationship between volume weight, voids ratio- moisture content, unit weight- percent air voids, saturation moisture content, moisture content- specific gravity etc. Determination of various parameters such as: Moisture content by oven dry method, pycnometer, sand bath method, torsional balance method, nuclear method, alcohol method and sensors. Specific gravity by density bottle method, pycnometer method, measuring flask method. Unit weight by water displacement method, submerged weight method, core-cutter method, sand-replacement method.
II	Plasticity Characteristics of Soil - Introduction to definitions of: plasticity of soil, consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices, definitions of activity and sensitivity. Determination of: liquid limit, plastic limit and shrinkage limit. Use of consistency limits. Classification of Soils -Introduction, particle size classification, textural classification, unified soil classification system, Indian standard soil classification system. Permeability of Soil - Darcy's law, validity of Darcy's law. Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method. Field method: pumping- in test, pumping- out test. Permeability aspects: permeability of stratified soils, factors affecting permeability of soil. Seepage Analysis - Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets.
III	Effective Stress Principle - Introduction, effective stress principle, nature of effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition Compaction of Soil -Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Compaction in field, compaction specifications and field control. Stresses in soils – Introduction, stresses due to point load, line load, strip load, uniformly loaded circular area, rectangular loaded area. Influence factors, Isobars, Boussinesq's equation, Newmark Influence Chart. Contact pressure under rigid and flexible area, computation of displacements from elastic theory.
IV	Consolidation of Soil - Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, Terzaghi's theory of consolidation, final settlement of soil deposits, computation of consolidation settlement and secondary consolidation. Shear Strength - Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, Triaxial compression tests, test behaviour of UU, CU and CD tests, pore pressure measurement, computation of effective shear strength parameters. unconfined compression test, vane shear test
V	Stability of Slopes - Introduction, types of slopes and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, wedge failure Swedish circle method, friction circle method, stability numbers and charts. Soil Exploration - Introduction, methods of site exploration and soil investigation, methods of boring, soil samplers, sampling procedures, trial pits, borings, penetrometer tests, analysis of borehole logs, geophysical and advance soil exploration methods.

Text/ Reference Books:

1. Soil Mechanics and Foundation by Punmia, Jain and Jain; Laxmi Publications (P) Ltd.
2. Engineering Properties of Soils by S K Gulati, Tata McGrawhill.
1. Dr.K.R.Arora (2001), Soil Mechanics and Foundation Engineering, Standard Publishers, Delhi – 110 006.
2. Donald P Coduto (2002), Geotechnical Engineering Principles and practices, Pearson Education Ltd.



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DEPARTMENT OF CIVIL ENGINEERING

TRANSPORTATION ENGINEERING-I

SUBJECT CODE: CE 504

L-T-P: 3-0-0

Credit: 3

COURSE OBJECTIVES

1. To impart the basic knowledge, skills and attitudes of planning highway networks
2. Designing highway geometrics; design intersection and prepare traffic management plans
3. Designing flexible and rigid pavements; understanding the principles of construction and maintenance of highways.

COURSE OUTCOMES

After studying this course, students will be able to:

CO-1	Understand the history of road development, their alignment & Survey, Design the various geometric parameters of road.
CO-2	Study the traffic characteristics & design of road intersections & signals.
CO-3	Examine the properties of highway materials & their implementation in design of pavements.
CO-4	Learn methods to construct various types of roads
CO-5	Learn methods to construct the hill roads and maintenance



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TRANSPORTATION ENGINEERING - I

SUBJECT CODE: CE-504

Unit	Topic
I	Introduction: Role of Transportation, Modes of Transportation, History of road development, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan, Road types and pattern. Geometric Design: Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves.
II	Traffic Engineering: Traffic characteristic, volume studies, speed studies, capacity, density, traffic control devices, signs, signals, design of signals, Island, Intersection at grade and grade separated intersections, design of rotary intersection.
III	Design of Highway Pavement: Types of Pavements, Design factors, Design of Flexible Pavement by CBR method (IRC: 37-2001), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design. (IRC : 58 – 2002).
IV	Road Construction Methods: WBM, Surface dressing, Bituminous carpeting, Bituminous Bound Macadam and Asphaltic Concrete, Cement Concrete road construction. Pavement Materials: Introduction, subgrade soil, Road aggregates and their testing, Binders, Bitumen, Emulsion and their testing, I.S. and IRC codes related to testing of materials. Bituminous mix design using Marshall method
V	Hill roads: General consideration, alignment of hill roads, geometrics of hill roads, design and construction of hill roads, drainage in hill roads, maintenance problems in hill roads. Highway economic and finance: Introduction, highway user benefits, highway cost, economic analysis.

Text/ Reference Books:

1. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros, 2017.
2. Kadiyalai, L.R., ' Traffic Engineering and Transport Planning', Khanna Publishers.
3. Partha Chakraborty, ' Principles Of Transportation Engineering, PHI Learning,
4. Paul H. Wright and Karen K. Dixon, Highway Engineering, 7th Edition, Wiley Student Edition, 2009



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Department Elective-I

DEPARTMENT OF CIVIL ENGINEERING

MAINTENANCE AND REHABILITATION OF STRUCTURES

SUBJECT CODE: CE 051

L-T-P: 2-0-0

Credit: 2

COURSE OBJECTIVES

1. To impart the basic knowledge, skills and attitudes of understanding weathering and mass movements
2. To distinguish different geological formations; of identifying sub-surface information and groundwater potential sites
3. To apply geological principles for mitigation of natural hazards and select sites for dams and tunnels

COURSE OUTCOMES

After studying this course, students will be able to:

CO-1	Understand the fundamentals of maintenance and repair strategies
CO-2	Identify for serviceability and durability aspects of concrete.
CO-3	Know the materials of corrosion resistance
CO-4	Decide the appropriate repair and retrofitting techniques.
CO-5	Know the materials and techniques used for repair of structures.



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Department Elective-I

MAINTENANCE AND REHABILITATION OF STRUCTURES

SUBJECT CODE: CE-051

Unit	Topic
I	Maintenance: Repair and rehabilitation, facts of maintenance, importance of maintenance various aspects of inspection, assessment procedure for evaluating damaged structure, causes of deterioration. Repair Strategies: Causes of distress in concrete structures, construction and design failures, condition assessment and distress-diagnostic techniques, assessment procedure for inspection and evaluating a damaged structure
II	Serviceability and Durability of Concrete: Quality assurance for concrete construction, concrete properties – strength, permeability, thermal properties and cracking. effects due to climate, temperature, chemicals, corrosion
III	Materials and Techniques for Repair: Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, fibre reinforced concrete, bacterial concrete, rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, gunite and shotcrete, epoxy injection, mortar repair for cracks, shoring and underpinning.
IV	Repair, Rehabilitation and Retrofitting Techniques: Repairs to overcome low member strength, deflection, cracking, chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure. Repair of structure: Common types of repairs, repair in concrete structures, repairs in under water structures. Strengthening of Structures: Strengthening Methods, retrofitting, jacketing
V	Health Monitoring and Demolition Techniques: Long term health monitoring techniques, engineered demolition techniques for dilapidated structures, use of sensors for building instrumentation

Text/ Reference Books:

1. Maintenance of engineering and management by K Venkataraman.
2. Maintenance of building by A.C. Panchdhari.
3. References 1. Concrete Technology by A.R. Santakumar, Oxford University press
4. 2. Defects and Deterioration in Buildings, E F & N Spon, London
5. Non-Destructive Evaluation of Concrete Structures by Bungey - Surrey University
6. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.
7. Concrete Repair and Maintenance Illustrated, RS Means Company Inc W. H. Ranso, (1981)
8. Mehta, P.K and Montevic. P.J., Concrete- Microstructure, Properties and Materials, ICI, 1997.,



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Department Elective-I

REMOTE SENSING AND GIS APPLICATION

Subject Code: CE-052

L-T-P: 2-0-0

Credit:2

Unit	Topic
I	Remote Sensing: Introduction, sources of energy for remote sensing, active and passive sources, electromagnetic radiation, and their characteristics, thermal emission, Interaction of EMR with atmosphere, spectral reflection curves.
II	Multi concept of remote sensing, sensors and orbital characteristics, various sensing platforms for remote sensing, characteristics of various satellite, remote sensing data products and their uses. Data capture for simulation of land surface, geomorphology, land use classification, flood plain mapping, application to snow cover studies,
III	Geographic Information system: Introduction, concept and terminology, components of GIS, Raster and Vector formats, scanners and digitizers, methods of digitization, data Preprocessing, form conversion, data reduction, and generalization. Data bases and DBMS, Spatial databases, co-ordinate systems and geo-referencing.
IV	Data merging, edge matching, registration and re-sampling, data manipulation and analysis representation of real-world problems, problem solving and spatial modeling, classification, aggregation, overlay, buffers and digital elevation models.
V	Applications in planning of utility lines, flood studies, ground water recharge, erosion modeling, case studies on use of GIS related to land use, water, environment and transportation. Integrated use of remote sensing and GIS, introduction to arc view, arc info, map info and MODFLOW software.

Text Books/ Reference Book:

1. Thomas Lillesand, Ralph W. Kiefer, Jonathan Chipman., Remote Sensing and Image Interpretation. Wiley
2. B. Bhatta, Remote Sensing and GIS, Oxford University Press
3. Lillesand and Kiefer, Remote Sensing and Image Interpretation, John Wiley & Sons Ltd.
4. Ian Haywood, Dorling, An Introduction to GIS, Kindersley Pvt. Ltd
5. Satheesh, G., Sathikumar, R., and Madhu, N., Advanced Surveying, Pearsons Educations.
6. Curran, Paul J., Principles of Remote sensing Longman
7. Campbell, J.B., Introduction of Remote Sensing Taylor and Francis,
8. Sabins, F.F., Remote Sensing: Principles and Interpretations Worth Publishers



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Department Elective-I

GROUND IMPROVEMENT TECHNIQUES

Subject Code: CE-053

L-T-P: 2-0-0

Credit:2

Unit	Topic
I	Introduction, Review of compaction theory, effect of compaction on surface behavior, Field methods of compaction, Quality Control, Design of soil lime, soil cement, soil bitumen and soil lime fly ash mixes
II	In situ densification methods in granular soils, Deep compaction: Introduction, Terra Probe, Vibro-flotation techniques, Ground Suitability for Vibro-flotation, Advantages, Mueller Resonance Compaction, Dynamic Compaction, Depth of Improvement.
III	In-situ densification methods in cohesive soil: Introduction, Pre-loading and de-watering, Vertical drains, Electrical method, Thermal method.
IV	Grouting: introduction, suspension grout, solution grout, grouting equipments and methods, Grouting design and layout Granular Piles: Ultimate bearing capacity and settlement, method of construction, load test.
V	Underpinning of foundations: importance and situations for underpinning, methodology, typical examples. Geotextiles: types, functions, specifications, precaution in transportation & storage.

Text Books/ Reference Books:

- 1 PurshothamRaj , “Ground Improvement”, Laxmi Publication Pvt. Ltd.
- 2 S. K. Garg, “Soil Mechanics & Foundation Engineering”.Khanna Publication
- 3 A. K. Samadhiya, “ Ground Improvement Techniques”.
- 4 GopalRanjan and A. S. R. Rao, “Basic and Applied Soil Mechanics”, New Age International Pvt. Ltd.
- 5 J. N. Mandal, “ Geosynthetics World”. New Age International Private Limited
- 6 Bergadoet. al., “Soft Ground Improvement”. America Society of Civil Engineers
- 7 Koerner, R. M., “Designing with Geosynthetics”.Xlibris Publication



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Department Elective-I

GEOSYNTHETICS AND REINFORCED SOIL STRUCTURES

Subject Code: CE-054

L-T-P: 2-0-0

Credit:2

Unit	Topic
I	Introduction to Geosynthetics, types of geosynthetics, artificial and natural geosynthetics and their applications, manufacture of geosynthetics, strength of reinforced soils, testing of geosynthetics.
II	Drainage application of geosynthetics, filtration applications of geosynthetics, erosion control using geosynthetics geosynthetics in flexible pavement, introduction to geosynthetics in landfills, geosynthetics for construction of landfills.
III	Sustainable infrastructure development, different types of soil retaining structures, design codes for reinforced soil retaining walls, construction aspects of geosynthetics reinforced soil retaining wall, testing requirements for reinforced soil retaining walls, geosynthetics reinforced soil embankments.
IV	Design of reinforced soil retaining walls – simple geometry, design of reinforced soil retaining walls – sloped backfill soil, soil embankments supported on geocell mattresses, geosynthetics reinforced pile systems for high embankments
V	Reinforced soil for supporting shallow foundations, response of footings resting on reinforced foundation soils, bearing capacity analysis of footings resting on reinforced foundation soils, carbon footprint analysis

Text Books/ Reference Book:

1. Koerner, R.M. "Designing with Geosynthetics", Prentice Hall, New Jersey, USA, 4th edition, 1999.
2. Sanjay Kumar Shukla, Erol Guler "Advances in Reinforced Soil Structures," pringer International Pub.
3. Jewell, R.A., "Soil Reinforcement with Geotextiles", Special Publication No. 123, CIRIA, Thomas Telford. London, UK, 1996.
4. Geosynthetics - New Horizons, Eds. G.V. Rao, PK Banerjee, J.T. Shahu, G.V. Ramana, Asian Books Private Ltd., New Delhi, 2004.



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STRUCTURE ANALYSIS LAB

SUBJECT CODE: CE-551

L-T-P: 0-0-2

Credit: 1

Note: A minimum of 8 experiments are to be performed from the list of Experiments.

1. To Verify the moment area theorem regarding the slopes and deflection of the beam
2. To determine Flexural Rigidity (EI) of a given beam
3. To verify Maxwell's Reciprocal theorem.
4. To find horizontal thrust in a three-hinged arch and to draw influence line diagrams for Horizontal Thrust and Bending moment.
5. To find horizontal thrust in a arch and to draw influence line diagrams for horizontal Thrust and bending moment.
6. To find deflection of curved members.
7. To find bar forces in a three members structural frames with pin jointed bar.
8. To find Critical load in Struts with different End conditions.
9. To find deflection in Beam having unsymmetrical bending



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TRANSPORTATION ENGINEERING LAB

SUBJECT CODE: CE-552

L-T-P: 0-0-2

Credit: 1

Note: A minimum of 8 experiments are to be performed from the list of Experiments.

1. To Determine the Crushing Value of Coarse Aggregates.
2. To Determine the Impact Value of Coarse Aggregates.
3. To determine the Flakiness Index and Elongation Index of Coarse Aggregates.
4. To determine the Los Angeles Abrasion Value of Coarse Aggregates.
5. To determine the Stripping Value of Coarse Aggregates.
6. To determine the penetration Value of Bitumen.
7. To determine the Softening Point of Bituminous material.
8. To determine the Ductility Value of Bituminous material.
9. To determine the Flash and Fire Point of Bituminous material.
10. To determine the Stripping Value of Bituminous material.
11. Classified both directional Traffic Volume Study.
12. Traffic Speed Study. (Using Radar Speedometer or Enoscope).
13. Determination of CBR Value of soil sample in the Lab or in Field.



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GEOTECHNOLOGY LAB

SUBJECT CODE: CE – 553

L-T-P: 0-0-2

Credit: 1

Note :-At least **Eight** experiments are to be conducted from the following list.

1. To determine the Field Density using Core Cutter method & sand replacement method.
2. To determine the Natural moisture content using Oven Drying method and pycnometer method
3. To determine the Specific gravity of Soils by pycnometer method
4. To determine the Grain size distribution by Sieve Analysis & Hydrometer Analysis.
5. To determine the Consistency limits by Liquid limit apparatus, Plastic limit apparatus and Shrinkage limit apparatus
6. To determine the Compaction test by Standard Proctor and Modified Proctor apparatus
7. Determination of shear strength of soil by Direct shear test.
8. Determination of shear strength of soil by Vane shear test
9. Determination of compaction characteristics (OMC & MDD) of a given soil sample.
10. Determination of permeability of a remoulded soil sample by constant head method & falling head method
11. Determination of consolidation characteristics of a remoulded soil sample by an odometer test.
12. Determination of shear strength characteristics of a given soil sample by U/U test from Triaxial Compression Machine.



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FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

Bachelor of Technology (B. Tech)

Curriculum Structure

(Applicable from Session 2024-25 for New Entrants)



THIRD YEAR

VI- Semester

Effective From Session

2024-2025



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ENVIRONMENTAL ENGINEERING-I

SUBJECT CODE: CE 601

L-T-P: 3-1-0

Credit: 4

COURSE OBJECTIVES

1. To impart the basic knowledge, skills and attitudes of analyzing the characteristics of water and wastewater
2. To estimating the quantity of drinking water and domestic wastewater generated
3. To design the components of water supply systems; designing of sewerage system.

COURSE OUTCOMES

After studying this course, students will be able to:

CO-1	Assess water demand and optimal size of water and to know the concept of intakes and reservoir.
CO-2	Understand the quality and examination of water and to understand the concept of various types of conduits
CO-3	Layout the distribution of water and their requirements
CO-4	To know the concept of aeration and coagulation.
CO-5	Discussion of disinfectioning and water softeneing.



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ENVIRONMENTAL ENGINEERING - I

SUBJECT CODE: CE - 601

Unit	Topic
I	Public Water supply: Beneficial uses of water, water demands, variations in demands; population forecasting; basic needs and factors affecting consumption; design period. Sources of water: Surface and underground sources, relation and development of source in r/o quality and quantity of water, Development of wells, Intake systems: Types of intakes, factors governing the location of intake; Reservoirs: types of reservoirs, capacity of reservoir;
II	Quality and Examination of Water: Necessity for examination of impurities in water, sampling of water, physical, chemical and bacteriological quality for domestic water supply. Drinking water quality standards and criteria. Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control; water hammer and its control measures. pipes for transporting water, pipe appurtenances.
III	Storage and distribution of water: requirements of a good distribution system, methods of distribution, layout and design of water supply systems, pressure and gravity distribution systems, general design guidelines for distribution systems, Hardy – Cross methods of pipe network analysis. Water supply and plumbing systems in buildings and houses.
IV	Aeration: Mechanics of gas transfer, types of aerators, applications of aeration; Sedimentation: theory of sedimentation, design of sedimentation tank, types of sedimentation tanks; Coagulation: theory of coagulation, types of coagulants and coagulant aids, and flocculation, design of flocculation tank.
V	Water softening: Chemical precipitation, ion exchange; reverse osmosis; Filtration: theory of filtration, types of filters and their classification, filter operations; Disinfectioning: types of disinfectants, chlorination; Site selection for treatment plant; layout considerations for treatment plant; Operation and maintenance of treatment plants.

Text/ Reference Books:

1. Water Supply Engineering, Garg Khanna Publishers.
2. CPHEEO, Manual on Water Supply and Treatment, Min. of Urban Dev., Govt. of India.
3. BIS, SP 35: Handbook on Water Supply and Drainage, Bureau of Indian Standards.
4. Droste R.L., (1997)., Theory and Practice of water wastewater treatment, John Wiley & sons



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DEPARTMENT OF CIVIL ENGINEERING

WATER RESOURCE ENGINEERING

SUBJECT CODE: CE 602

L-T-P: 3-1-0

Credit: 4

COURSE OBJECTIVES

To impart the basic knowledge, skills and attitudes of system approach to water resource system development; of application of system engineering in reservoir operation and optimal crop water allocation

COURSE OUTCOMES

After studying this course, students will be able to:

CO-1	Basic understanding of the water requirement of crops, methods of irrigation and irrigation water quality
CO-2	Understand the role of different Canal irrigation system and sediment transport
CO-3	Understanding the lining of irrigation canal and water logging
CO-4	Know the methods of irrigation outlets and objective of river training
CO-5	To understand the concept of spillways/ classification of dams



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WATER RESOURCE ENGINEERING

SUBJECT CODE: CE-602

Unit	Topic
I	Irrigation Techniques: Definition of Irrigation, Necessity of Irrigation in India, Advantages of Irrigation, Disadvantages and ill-Effects of Irrigation, Types of Irrigation, Techniques of water Distribution in the farms, Quality of Irrigation water. Water requirements of crops: Crop period and Base period, duty and delta of a crop, relation between duty and delta, crop seasons and Kharif-rabi ratio, Paleo irrigation, kor-watering, crash crops, crops rotation, irrigation efficiencies, Consumptive use or evapotranspiration, transpiration, potential and actual evapo-transpiration, effective rainfall, CIR, NIR, factors effecting consumptive use, soil moisture irrigation relationship, field capacity, readily available moisture, equivalent moisture, estimating depth and frequency of irrigation on the basis of soil moisture regime concept.
II	Canal Irrigation system: alluvial and non-alluvial canals, alignment of canals, distribution system for canal irrigation, gross command area, culturable or cultivable command area, intensity of irrigation, net and gross sown areas, area to be irrigated, time factor, capacity factor, full supply coefficient, normal duty, Sediment transport and design of irrigation channels: Importance of sediment transport, sediment load, bed formation, mechanics of sediment transport, Shield's entrainment method for design of non-scouring stable channels, suspended load and its measurement, bed load and its measurement.
III	Irrigation channels: Types: lined and unlined, silt theories: Kennedys and Lacey's Design procedure for irrigation channels, longitudinal cross section, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains.
IV	Regulation and control of canal system: Purpose, Types of canal regulation works and their functional a Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge.
V	Spillways: Spillway capacity, types of spillways, Design of ogee spillway, Energy dissipation below spillway, Design criteria for Hydraulic Jump type stilling basins with horizontal and sloping aprons, spillway gates. Dams: classification and selection criteria. Investigation and planning of dams, Gravity dams: Forces method of analysis, modes of failure and factor of safety, Elementary profile, stability analysis, galleries, joints, control of cracks. Earth Dams: Classification, causes of failure Phreatic line, and its determination Introduction to stability analysis

Text/ Reference Books:

1. Mays L.W. (2001), Water Resources Engineering, first edition, John Wiley Publications, Singapore.
2. Sharma, S.K. (1996), Irrigation Engineering, S. Chand & Co. Pvt. Ltd.
3. Punmia. B.C. (1997), Irrigation and Water Power Engineering, Laxmi Publications
4. Santosh Kumar, Irrigation Engineering, Khanna Book Publishing Co.
5. G L Asawa, Irrigation Engineering, Wiley Eastern
6. L W Mays, Water Resources Engineering, Wiley.
7. J D Zimmerman, Irrigation, John Wiley & Sons



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DEPARTMENT OF CIVIL ENGINEERING

TRANSPORTATION ENGINEERING-II

SUBJECT CODE: CE 603

L-T-P: 3-1-0

Credit: 4

COURSE OBJECTIVES

1. To impart the basic knowledge, skills and attitudes of various systems of railway, airport and water transportation;
2. Understanding the components of railway tracks and designing of railway track, runway, taxiway etc.
3. Understanding the signaling systems for railway and air traffic control.

COURSE OUTCOMES

After studying this course, students will be able to:

CO-1	Understanding the basic concept of railway alignment, sleeper, rail and ballast
CO-2	Design the track geometry, point and crossing
CO-3	Understanding the different type of signaling, yards & station
CO-4	To know the concepts of geometric design and airports traffic control aids
CO-5	Design the layout of dock and harbor



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TRANSPORTATION ENGINEERING - II

SUBJECT CODE: CE-603

Unit	Topic
I	Introduction: Indian railways, permanent ways planning of railway, capacity of railway track, cross-section sub grade, formation, embankment and cutting track drainage, track defects, rolling stock. Rail gauges: types of rails, defects in rails, rail failures, rail flaw detection, creep of rails, wear of rails. Rail fastening: Fish plates specks, chairkeys, bearing plates. Sleeper: functions and types, concrete sleepers, manufacturing of concrete sleepers, sleeper density. Ballast: specifications and test on ballast, recommended, depth of blast.
II	Geometry Design: Track geometry, gradient horizontal curve, super elevation and safe speed on curve, cant deficiency, negative super elevation and compensation for curvature on gradients, tractive power. Point and crossing: element of turn out, detail of a switch and crossing numbers and angles of crossings, design of a turnout, metro-Railways system, sub –urban system.
III	Signaling: Signaling and interlocking, classifications of signals, methods of train working: absolute block system, automatic block system, mechanical interlocking of a two line railway system. Maintenance of track, Yards and stations: site selection for railway station, layout of different types of yards, function of marshalling yards, underground railway and tunneling
IV	Airport: Introduction, Aircraft characteristics and airport selection, selection of site for airport, airport obstruction, imaginary surfaces, runway orientation, calm period and wind coverage. Geometric Designs: Runway and taxiway geometric designs, exit taxiway, its design and fillet curves, runway configuration, separation clearance, design of aprons and their layouts. Airport Traffic Control Aids: Visual aids, marking and lightening of runway and apron area, wind and landing direction indicator.
V	Docks and Harbour: Planning and layout of Docks and Harbour: Harbour planning principles, terminology, layout of a harbour, classification of harbour, Docks: Classification of Docks, transit sheds and Warehouses. Construction and Maintenance of Docks and Harbours: Introduction, Construction of Quay walls, Construction of Breakwaters.

Text/ Reference Books:

1. Khanna, S.K., Justo, C.E.G 'Highway Engineering' Nem Chand & Bros, 2017.
2. Kadiyalai, L.R., ' Traffic Engineering and Transport Planning', Publishers.
3. Partha Chakraborty, ' Principles Of Transportation Engineering, PHI Learning,
4. Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski,'Principles of Highway Engineering and Traffic Analysis', 4th Edition, John Wiley
5. Srinivasa Kumar, R, Textbook of Highway Engineering, Universities Press, 2011.
6. Paul H. Wright and Karen K. Dixon, Highway Engineering, 7th Edition, Wiley Student



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Program Elective-II

DEPARTMENT OF CIVIL ENGINEERING

FOUNDATION ENGINEERING

SUBJECT CODE: CE 061

L-T-P: 3-0-0

Credit: 3

COURSE OBJECTIVES

1. To impart the basic knowledge, skills and attitudes of analyzing the shallow and pile foundation
2. To estimating the improvement of bearing capacity
3. To design the components of earth retaining structures

COURSE OUTCOMES

After studying this course, students will be able to:

CO-1	To understand the basic concepts of earth pressure theory
CO-2	Analyze bearing capacity and settlement of soil for shallow foundation
CO-3	Design the various types of pile foundation and understand the basics of pile foundation
CO-4	understand the concepts of testing on pile foundation
CO-5	Understand the design concept of machine foundation and soil dynamic



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FOUNDATION ENGINEERING

SUBJECT CODE: CE -061

Unit	Topic
I	Earth pressure theory: Introduction to Coulomb's earth pressure theory for cohesive and granular soil, graphical methods. Classification of earth retaining structures (Rigid and Flexible). Analysis & Design of Sheet pile wall, bulk head anchored sheet pile (by free earth support method & fixed earth support method).
II	Shallow Foundation: Types and general requirements of shallow foundation, Bearing capacity consideration, effect of ground water table, modes of failure, settlements of foundations, I.S. Code recommendations. (I.S. 6403, 8009). Design aspects of shallow foundation. Improvement of bearing capacity (sand drains, compaction and dewatering of soils).
III	Pile Foundations : Types, purpose and classification of pile foundations, Construction of piles, pile load test, load capacity and settlement of piles, design of under reamed piles; (individual pile & group of piles); Design of Pile foundation, use of relevant I.S. Code (I.S. 2911: Part I- IV); Well foundation: Types, element and construction well foundation, principles of design.
IV	Pile Foundations: selection of piles – Static and dynamic formulae for single pile capacity – Efficiency and capacity of pile groups – Design of Pile group – Settlement of Pile Groups– Load test on piles
V	Machine foundation: Classification, definitions, design principle in brief, Barken's method. Soil dynamic: Definitions, spring mass system, single degree of freedom system, free and forced vibration of damped and undamped systems; Analysis and design of block foundation; Vibration isolation (active and passive method).

Text/ Reference Books:

1. Soil Mechanics and Foundation by Punmia, Jain and Jain; Laxmi Publications (P) Ltd.
2. Engineering Properties of Soils by S K Gulati, Tata McGrawhill.
3. Dr.K.R.Arora (2001), Soil Mechanics and Foundation Engineering, Standard Publishers, Delhi – 110 006.
4. Donald P Coduto (2002), Geotechnical Engineering Principles and practices, Pearson Education Ltd.
5. An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ
6. Principles of Geotechnical Engineering, by Braja M. Das, Cengage Learning
7. Principles of Foundation Engineering, by Braja M. Das, Cengage Learning
8. Essentials of Soil Mechanics and Foundations: Basic Geotechnics by David F. McCarthy
9. Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph B. Peck, and Gholamreza Mesri.



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Program Elective-II

DEPARTMENT OF CIVIL ENGINEERING

ESTIMATION, EVALUATION AND COSTING

SUBJECT CODE: CE 062

L-T-P: 3-0-0

Credit: 3

COURSE OBJECTIVES

1. To impart the basic knowledge, skills and attitudes of analyzing materials required for civil engineering works
2. To estimating the RCC works and steel works
3. Understanding the Rate analysis, valuation, tender, contract of work

COURSE OUTCOMES

After studying this course, students will be able to:

CO-1	Evaluate and estimate the cost of expenditure and prepare a detailed of building
CO-2	Understand the specifications and specification of PWD-CPWD
CO-3	Evaluate and estimate the rate analysis of labour and materials of works
CO-4	Understand the valuation and method of valuation in construction projects
CO-5	Understand the contracts and tender documents in construction projects



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ESTIMATION, EVALUATION & CONSTRUCTION MANAGEMENT
SUBJECT CODE: CE 062

Unit	Topic
I	Introduction: General, units of measurement, requirements of estimating, method of estimating, main item works- deduction for opening etc., Principle of estimate Estimate of Building: method, estimate of single storey buildings. Estimate of building works
II	Specifications: Aim of specifications, types, method of preparation, specification of different items, schedule rates of PWD-CPWD Type of estimate, contingencies, administrative approval, sanction of project etc.
III	Rate Analysis: purpose of rate analysis, importance of rate analysis, factor affecting, procedure of rate analysis, estimate quantities of materials and labour for different works
IV	Valuation: objects of valuation, free hold property, lease hold property, market value, book value, scrap value, factors affecting, municipal taxes, annuity, capital cost, depreciation, method of depreciation, valuation of property etc
V	Contract: principle of contracts, types of contracts, contract documents, termination of contracts, earnest money, security deposits etc. Tenders: types of tender, acceptance of tender, tender notice etc.

Text/ Reference Books:

1. Estimating and Costing by B N Datta , S S Dutta and Co.
2. Estimating and Costing for Civil Engineering by G S Birdie.
3. Building Drawing by Shah, Kale and Patki .
4. Pareek Saroj (2003), *Textbook of Business Economics*, Sunrise Publishers
5. M Chakravarty, Estimating, Costing Specifications & Valuation
6. Joy P K, Handbook of Construction Management, Macmillan
7. B.S. Patil, Building & Engineering Contracts
8. Relevant Indian Standard Specifications.
9. UBS Publishers & Distributors, Estimating and Costing in Civil Engineering: Theory and Practice including Specification and Valuations,2016
- 10.Pareek Saroj (2003), *Textbook of Business Economics*, Sunrise Publishers
11. M Chakravarty, Estimating, Costing Specifications & Valuation



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Program Elective-II

DEPARTMENT OF CIVIL ENGINEERING

EARTH RETAINING STRUCTURES

SUBJECT CODE: CE 063

L-T-P: 3-0-0

Credit: 3

COURSE OBJECTIVES

1. To impart the basic knowledge, skills and attitudes of designing the earth retaining walls
2. To various ground improvement techniques; of analyzing the bearing capacity of soil.

COURSE OUTCOMES

After studying this course, students will be able to:

CO-1	Design and analysis of earth dam
CO-2	Different type of method for stabilized earth retaining walls
CO-3	Understanding the methods of soil nailing
CO-4	Understanding the basic concept of soil reinforcement technique
CO-5	Analysis of footing and bearing capacity of soil



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EARTH RETAINING STRUCTURES

SUBJECT CODE: CE 063

Unit	Topic
I	Earth and rock fill dam: choice of types, materials, foundation and requirement of safety of earth dam, seepage analysis.
II	Stabilized: Mechanically stabilized earth retaining walls, general considerations, Backfill and reinforced materials, construction details, stability reinforced earth wall: construction procedure, drainage.
III	Soil nailing: applications, advantages, limitations, methods of soil nailing, case histories.
IV	Reinforced soil: introduction, basic components, strength characteristics, soil reinforcement interface friction. Foundation on reinforced soil bed: pressure ratio.
V	Footing: Analysis of strip, isolated, rectangular, square footing on soil bed, ultimate bearing capacity of footing on reinforced earth slab, fiber reinforced soil.

Text/ Reference Books:

1. Soil mechanics and foundation engineering by VNS Murthy.
2. Reinforced Soil and its engineering applications by Swami Saran.
3. Analysis and design foundation by J.E. Bowles.



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Program Elective-II

RIVER ENGINEERING

SUBJECT CODE: CE 064

L-T-P: 3-0-0

Credit: 3

Unit	Topic
I	Introduction: classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes.
II	Behavior of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control
III	Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration.
IV	Bio-engineering Techniques, Classification review, Natural Channel Design Analysis, Time Series, Analysis of flow, Sediment and channel geometry data.
V	River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/ dampners and other river/ flood protection works.

Text/ Reference Books:

1. River Behavior Management and Training (Vol. I & II), CBI&P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.
3. River Engineering by Margeret Peterson
4. Principles of River Engineering by (the non tidel alluvial) PH Jameen



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Open Elective-I

AUTOMOBILE ENGINEERING

SUBJECT CODE: OE 062

L-T-P: 2-0-0

Credit: 2

Unit	Topic
I	History of automobiles; Classification of automobiles; Power plant classification; Engine terminology; Types of cycles; Working principle of an IC engine; Advanced classification of engines and multi-cylinder engines; Engine balance and firing order.
II	Spark Ignition engines – fuel tank, fuel filter, fuel pump, air filter, carburetor, direct injection of petrol engines; Compression Ignition engines – fuel injection (air and solid), pressure charging, supercharging and turbocharging; Ignition systems – components, battery ignition, magneto ignition, electronic ignition and ignition timing; Main electrical circuits – generating & starting circuit, lighting, indicating devices.
III	Lubricating System and Cooling System: Functions & properties of lubricants, methods of lubrication; Oil filters, oil pumps, oil coolers; Characteristics of an effective cooling system; types of cooling systems; Radiator, thermostat, air cooling & water cooling. Chassis & Transmission: Parts of automobile body; Automobile frames – functions, constructions, subframes, materials, and defects; Transmission – axles, clutches, propeller shafts,
IV	Steering, Braking, and Suspension: Steering mechanism, steering gearbox types, wheel geometry; Brakes – principle, functions, types, construction, operation, and parking brake; Suspension - types of spring shock absorbers, objectives and types of suspension system, rear axle suspension, electronic control, and proactive suspension system
V	Automotive Air Conditioning: Ventilation, heating, air conditioning, refrigerant, compressor, and evaporator. Wheels and Tyres: Wheel quality, assembly, types of wheels, wheel rims. Construction of tires and tire specifications. Recent Trends: E-vehicles; Satellite-based navigation; Automated steering; Environment effect and mitigation.

Text /Reference Books:

1. "Automotive Engineering: Lightweight, Functional, and Novel Materials" by Brian Cantor, Patrick Grant, and Colin Johnson - Published by Taylor & Francis in 2018.
2. "Fundamentals of Vehicle Dynamics" by Thomas D. Gillespie - Published by SAE International in 2019.
3. "Automotive Engineering: Powertrain, Chassis System and Vehicle Body" by Hong Sun - Published by Academic Press in 2020.
4. "Automotive Engineering: Lightweight, Functional, and Novel Materials" by Brian Cantor, Patrick Grant, and Colin Johnson - Published by Woodhead Publishing in 2018.



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Open Elective-I

ENVIRONMENTAL POLLUTION CONTROL

SUBJECT CODE: OE 061

L-T-P: 2-0-0

Credit: 2

Unit	Topic
I	Impact of man on environment: Biosphere, biogeochemical cycles, ecosystem, limiting and regulatory factors, consequence of population growth, Population ecology, population growth models, competition, predation, succession Global environmental issues: energy problem, ozone layer depletion, acid rain, land degradation.
II	Water pollution: Sources and classification of water pollutants, water quality standards, wastewater sampling and analysis, Eutrophication of lakes, Control strategies: self purification capacity of streams, waste load allocation, recent treatment technologies-phyto-remediation, bio-remediation, river bank filtration, zero valent iron etc., Thermal pollution: Sources, effects and control measures
III	Air pollution: Sources and effects, meteorological aspects, air pollution sampling and measurement, control methods and equipments, control of specific air pollutants, air quality standards, Indoor air quality control, statistical analysis of air quality data.
IV	Solid waste management: solid waste characteristics, collection and transport-hauled and stationary container systems, processing and recovery, disposal of waste- landfills, basic aspects of landfill design, leachate transfer through landfills. Hazardous waste management and risk assessment- types of hazardous waste, health effects, treatment methods, final disposal, risk assessment
V	Noise pollution: Sources, effects, sound pressure, power and intensity, measure of noise, loudness, outdoor noise propagation, preventive and control measures, standards/limits. Environmental impact assessment and audit. Environmental legislation at National and international level.

Text Books/ Reference Books:

1. Principles of environmental studies (Ecology, economics, management and law) by C. Manoharachary and P. Jayarama Reddy, B.S. Publications.
2. Text of Environmental Engineering by P.V. Rao, Prentice Hall pvt ltd., Delhi
3. Environmental Engineering: A Design Approach II by Sincero Sr, A.P. and Sincero, G.A., Prentice Hall of India Private limited, New Delhi, 1996
4. Ecology II, E.P. Odum. (Second edition), Oxford and IBH publishing Co. Pvt. Ltd, 1975.
5. Environmental Engineering by Peavy and Rowe, Tata McGraw Hill Education
6. Metcalf & Eddy
7. Environmental Pollution Control Engineering by C.S. Rao, New Age International Publisher



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BIOTERRORISM AND NATIONAL SECURITY

SUBJECT CODE: OE 063

L-T-P: 2-0-0

Credit: 2

Unit	Topic
I	Terrorism and Bioterrorism Definition-Traditional Terrorists-New Terrorists-Nuclear, chemical, and radiological weapons-Thepsychology of Bioterrorism-Historical perspective.
II	Microbes and Immune System Primary classes of Microbes-bacteria, virus, and other Agents-Immune system Interaction betweenmicrobes and the immune system.
III	Bioterrorism Weapons and Techniques Characteristics of microbes and the reasons for their Use, Symptoms, Pathogenicity, Epidemiology-natural and targeted release, The biological techniques of dispersal, and case studiesof Anthrax, Plague-Botulism, Smallpox, and Tularemia and VHF.
IV	Prevention and Control of Bioterrorism Surveillance and detection- Detection equipment and sensors, Diagnosis-Treatment Vaccinations, Supplies- Effectiveness, Liability, Public Resistance, Response, First Responders, Infectious Control by hospital and Prevention, Protection, Decontamination Notification, Role of Law Enforcement-Economic impact.
V	Bioterrorism Management Ethical issues: personal, national, the need to inform the public without creating fear, cost-benefitRations-Information Management-Government control and industry Support-Microbial forensics.

Text Books/ Reference Books:

1. Bioterrorism: Guidelines for Medical and Public Health Management, Henderson, Donald, American Medical Association, 1st Edition, 2002.
2. Biological Weapons: Limiting the Threat (BCSIA Studies in International Security), Lederberg, Joshua (Editor), MIT Press ,1999.
3. Bioterrorism and Infectious Agents: A New Dilemma for the 21st Century (Emerging Infectious Diseases of the 21st Century), I.W. Fong and Kenneth Alibek, Springer, 2005.
4. The Demon in the Freezer: A True Story, Preston, Richard, Fawcett Books, 2003.
5. The Anthrax Letters: A Medical Detective Story, Cole, Leonard A., Joseph Henry Press, 2003.
6. Biotechnology research in an age of terrorism: confronting the dual use dilemma, National Academies of Science, 2003.



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MOOCS COURSES

SUBJECT CODE: OE 064

L-T-P: 2-0-0

Credit: 2

S.N.	NPTEL / SWAYAM /AICTE COURSE NAME	INSTRUCTOR	HOST INSTITUTE
1	Principles of Construction Management	By Prof. Sudhir Misra	IIT Kanpur
2	Structural Geology	Prof. Santanu Misra	IIT Kanpur
3	Wastewater Treatment and Recycling	Prof. Manoj Kumar Tiwari	IIT Kharagpur
4	Reliability-Based Structural Design	Prof. Arunasis Chakarborty	IIT Guwahati
5	Advanced Concrete Technology	Prof. Manu Santhanam	IIT Madras
6	Advanced Geomatics Engineering	Prof. Pradeep Kumar Garg	IIT Roorkee
7	Bridge Engineering	Prof. Piyali Sengupta	IIT (ISM) Dhanbad
8	Dynamics of Structures	Prof. Manish Kumar	IIT Bombay
9	Environmental Geomechanics	Prof. D. N. Singh	IIT Bombay
10	Underground Space Technology	By Prof. Priti Maheshwari	IIT Roorkee
11	Other Course (Subject) Choose by Students and course duration must be atleast 12 weeks		

Note: Any one from list



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COMPUTER NETWORKS
SUBJECT CODE: OE 065

L-T-P: 2-0-0

Credit: 2

Objective: Students should be able to gain a solid grasp of basic computer networking concepts and become familiar with different network models and their applications. They should be capable of analysing basic protocols and independently researching literature related to computer networks.

Course Outcomes: Upon completing this course, students will be able to:

1. Understand fundamental concepts of computer network technology.
2. Comprehend various network topologies and protocols.
3. Examine the roles and functions of different network devices.
4. Analyze the architecture and principles underlying contemporary computer networks.
5. Understand future Internet requirements and their implications for computer network architecture.

Unit	Topic
I	Computer Networks and The Internet: Networks, Internet, Network Components, Network Categories, network edge, Network Core , Delay, Loss and throughput in Packet-Switched Networks, Protocol Layers and their Service Models
II	Data Link Layer: Introduction to the link layer; Error Detection and Correction Techniques; Multiple Access links and Protocols; Switched local area networks.
III	Network Layer: Introduction; Virtual circuit and datagram networks; Router, Internet Protocol (IP): Forwarding and Addressing in the Internet, Routing Algorithms; Routing in the Internet, Broadcast and Multicast Routing.
IV	Transport Layer: Introduction and Transport-Layer Services; Multiplexing and Demultiplexing; Connectionless Transport: UDP; Principles of Reliable of Data
V	Application Layer: Principles of Network Applications, WWW and HTTP, Non-Persistent and Persistent Connections, Cookies, Web Caching, File Transfer, Remote Logging, Electronic Mail in the Internet, Domain Name System, Security: Introduction, Cryptography and Cryptanalysis, Public Key Cryptography Algorithms, RSA Algorithm, DES, Authentication and Authorization

1. A.S. Tanenbaum, DJ Wetherall, Computer Networks, Prentice-Hall, 2010. .
2. LL Peterson, BS Davie, Computer Networks: A Systems Approach, Morgan-Kau
3. G. Keiser, "Local Area Networks", 2nd Edition, TMH 2002
4. D. Bertsekas and R. Gallager, "Data Networks", 2nd Edition, PHI 2000
5. William Stallings, "Data & Computer Communication", PHI, 10th Edition 2013
6. B.A. Forouzan, "Data communications and networking", TMH, 5th Edition 2012
7. B.A. Forouzan, "Local Area Networks", TMH. 2002
8. B.A. Forouzan, "TCP/IP Protocol Suite", TMH. 2004



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QUANTITY SURVEYING AND VALUATION LAB
SUBJECT CODE: CE 651

L-T-P: 0-0-2
Credit: 1

Note :-At least **Eight** experiments are to be conducted from the following list.

1. Estimation of building by Centre Line method.
2. Estimation of building by Long & Short wall method.
3. Analysis of rates for concrete work
4. Analysis of rates for brick work
5. Analysis of rates for plaster work
6. Estimation quantity of reinforcement details of slab
7. Preparation for approximate estimate for road project
8. Estimating cost of building on plinth area method
9. Preparation of BOQ.
10. Introduction to MS Project /Primavera Software.
11. Study of Tender Documents.
12. Concrete Mix Design (IS 10262).



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STRUCTURE DETAILING LAB

SUBJECT CODE: CE – 652

L-T-P: 0-0-2

Credit: 1

Preparation of working drawings for the following:

1. Study of SP34/IS13920/IS456:2000 for detailing of structural elements.
2. Preparation of working hand sketches and Auto CAD drawings for the following-
 - RC Beams- Simply supported, Continuous, Cantilever
 - T – beam / L-beam floor
 - Slabs – Simply supported, Continuous, One way and two way slabs.
 - Columns – Tied Columns and Spirally reinforced columns.
 - Isolated footings for RC Columns.
 - Combined rectangular and trapezoidal footings.
 - Stair case- circular, channel etc
3. Preparation of bar bending schedule
4. Detailing of Buildings with respect to Earthquake Resistant Design
5. Study of full set of structural drawing of a building as made available by Institute

SEMINAR-I

SUBJECT CODE: CE – 653

L-T-P: 0-0-2

Credit: 1

Individuals have to select topic of current interest, Review and Evaluate available Literature & present the content in own Language and style