FIFTH SEMESTER CIVIL ENGINEERING CORE COURSES

Code	Course Name	Credits	L T P
22CET301	Design of RCC Systems	4	3 1 0
22CET302	Design of Steel Structures	4	3 1 0
22CET303	Environmental Engineering II	3	3 0 0
22CET304	Geotechnical Engineering II	4	3 1 0
22CET305	Hydrology	4	3 1 0
22CEP306	Environmental Engineering Lab	1	0 0 2
22CEP307	Geotechnical Engineering Lab	1	0 0 2
22CEP308	Structural Design & Drawing	1	0 0 2
TOTAL		**22**	**15 4 6**

UG/PG: UG	**Department:** Civil Engineering
Course Code: 22CET301	**Course Name:** Design of RCC Systems
Credit: 4	**L-T-P: 3-1-0**
Pre-requisite Course: 22CET251 Design of RCC Structures	

Syllabus

Design of structures: Design loads on system, wind and earthquake loads; Design of Cantilever and Counterfort Retaining Walls; Design of curved beams and deep beams; Design of Ribbed slab, Flat slabs; Design of Shear Walls, Design of domes for axisymmetric loading, uniformly distributed load, ring load and concentrated load at the crown; Design of overhead and underground water tanks; Prestressed concrete: Principle of Pre-stressed Concrete Design, Advantages and disadvantages, Materials and methods of prestressing, losses in prestress, analysis and design of prestressed concrete beam.

Course Outcomes

1. Be able to design RCC systems for simple structures such as water tanks, retaining walls, etc.
2. Be able to apply recommendations of relevant BIS codes for the design of RC structural systems.
3. Understand and apply the principal of pre-stressed concrete design.

Text Books

1. Pillai & Menon, “Design of RCC Structures (4/e)”, McGraw Hill Education.
2. N. Subramanian, “Design of RC Structures”, Oxford.

References

1. P. Dayaratnam, “Design of Reinforced Concrete Structures (4/e)”, Oxford & IBH Publishing Co.
2. P. C. Varghese, “Limit State Design of Reinforced Concrete (2/e)”, Prentice Hall India Learning Private Limited.
3. P. C. Varghese, “Advanced Reinforced Concrete Design (2/e)”, Prentice Hall India Learning Private Limited.

UG/PG: UG	**Department:** Civil Engineering
Course Code: 22CET302	**Course Name:** Design of Steel Structures
Credit: 4	**L-T-P: 3-1-0**
Pre-requisite Course: 22CET206 Structural Analysis	

Syllabus

Structural steel and properties, Design Philosophy-Working stress and limit state; Introduction to stability and buckling concepts, Bolted and Welded connections (simple and eccentric), design of tension, compression and flexural members (including built-up sections): Column bases, Gantry girders and plate girders; Industrial roof; Roof trusses using latest IS codes; Concept of plastic analysis-beams and frames.

Course Outcomes

1. Understand the behavior and properties of structural steel members.
2. Be able to design bolted and welded connections for tension and compression members and beams.
3. Be able to design and analyze of steel structures like girders, trusses and bridges.
4. Be able to implement the concept of elastic and plastic analysis on beams and frames.

Text Books

1. N. Subramanian, “Design of Steel Structures”, Oxford University Press.
2. S. K. Duggal, “Limit State Design of Steel Structures(3/e)”, Tata McGraw Hill.
3. K. S. Sai Ram, “Design of Steel Structures (3/e)”, Pearson publications.
4. M.R. Shiyekar, “Limit State Design of Steel Structures(3/e)”, PHI publications.

References

1. A. S. Arya and J. L. Ajmani “Design of Steel Structures”, Nem Chand & Bros.
2. N.S. Trahair, M.A. Bradford et al., “The Behavior and Design of Steel Structures to EC3”, Taylor and Francis.

UG/PG: UG	**Department:** Civil Engineering
Course Code: 22CET303	**Course Name:** Environmental Engineering – II
Credit: 3	**L-T-P: 3-0-0**
Pre-requisite Course: 22CET252 Environmental Engineering – I	

Syllabus

Sewage disposal; Layout of Sewerage system; Characteristics of municipal wastewater; Basics of microbiology and biological oxidation. Wastewater Treatment: Treatment scheme; Screening; Grit removal; Sedimentation; Floatation; Activated sludge process; Extended aeration; Trickling filters; RBC, UASB; aerated lagoons; Septic tank; Sludge handling and disposal. Introduction to tertiary treatment. Recycle and reuse of treated sewage. Introduction to natural systems like Stabilization ponds, wetlands etc. Rural wastewater management including introduction to total sanitation campaign.

Course Outcomes

1. To be able to apply the basic concepts of wastewater generation, collection system, waste water quality and standards.
2. To be able to design sewerage system components.
3. To be able to analyze and evaluate the construction methodologies of sewerage systems.

Text Books

1. Wastewater Treatment by Metcalf & Eddy, TMH.
2. Manual of Sewage treatment by CPHEEO, Ministry of Urban Dev., GOI
3. Environmental Engineering by Davis and Cornwell, McGraw Hill
4. Wastewater treatment for pollution control and reuse by Soli J. Arceivala and Shyam R. Asolekar, TMH.

UG/PG: UG	Department: Civil Engineering
Course Code: 22CET304	**Course Name:** Geotechnical Engineering – II
Credit: 4	**L-T-P: 3-1-0**
Pre-requisite Course: 22CET253 Geotechnical Engineering – I	

Syllabus

Stability of infinite and finite slopes, Swedish slip circle method, Bishop's method, Stability of slopes of earth dam, Earth pressures theories; Stability analysis of retaining structures; Application for sheet piles and Braced excavation Shallow foundations, Bearing capacity and settlement analysis, contact stress beneath foundations, Plate load test, Standard penetration test, Dynamic and static cone penetration test; Allowable bearing pressure on soils and rocks, Combined footing and Raft foundation, Soil Exploration and sampling: Site investigation report. Pile foundation: Classification; Bearing capacity of piles – dynamic and static formulae, negative skin friction Pile load test, Group capacity of vertical piles; IS code provisions, pile under lateral loading Well foundation and caissons; Depth of well, Bearing capacity and settlement of well, Lateral stability of well foundations, Sinking of wells, Tilts and shifts, (Machine foundations, Dynamic soil properties, Laboratory techniques, Resonant column test to obtain Young's modulus, Shear modulus and damping characteristics of soils, Cyclic simple shear test, Cyclic triaxial compression test, Field tests: Vertical and horizontal block resonance test, Cyclic plate load test. Reinforced Earth.

Course Outcomes

1. Be able to analyze slope stability for different soil types and loading conditions
2. Be able to Estimate settlements and bearing pressures for given loads and stratigraphy
3. Be able to design piles for different loads and stratigraphy
4. Be able to select appropriate soil exploration methods for a given structure and location.

Text Books

1. T. William Lambe, Robert V. Whitman, "Soil Mechanics", John Wiley and Sons, New York.
2. John N. Cernica, "Geotechnical Engineering: Soil Mechanics", John Wiley and Sons, New York.
3. Rodrigo Salgado, "The Engineering of Foundations", Tata McGraw Hill Education Limited, New Delhi.

UG/PG: UG	**Department:** Civil Engineering
Course Code: 22CET305	**Course Name:** Hydrology
Credit: 4	**L-T-P: 3-1-0**
Pre-requisite Course:	

Syllabus

Hydrological cycle and hydrologic budget; Elements of geomorphology; Precipitation; Measurement and analysis; Hydrology abstraction - interception, evaporation, infiltration; Rainfall–Runoff relationship; Stream flow; Hydrographs & applications; Frequency analysis; Regression and correlation analysis; Flood Routing, Groundwater, Hydraulics of groundwater.

Course Outcomes

1. Be able to develop probability distributions for various hydrologic processes
2. Be able to develop design storms and estimate infiltration and hydrologic losses based on land use and soil type.
3. Be able to estimate peak discharges and develop unit hydrographs and design hydrographs for small-scale watersheds.
4. Be able to apply current software to the hydrologic design of small-scale rural or urban watersheds.

Text Books

1. Applied Hydrology, Ven Tee Chow, D. R. Maidment and Larry W. Mays, Tata McGraw-Hill.
2. Engineering Hydrology, K. Subramana, Tata McGraw-Hill

References

1. Handbook of Hydrology, Ven Tee Chow, D. R. Maidment and Larry W. Mays, Tata McGraw-Hill.
2. Hydrology for Engineers by Linsley, Kohler and Paulhus.

UG/PG: UG	**Department:** Civil Engineering
Course Code: 22CEP306	**Course Name:** Environmental Engineering Lab
Credit: 1	**L-T-P: 0-0-2**
Pre-requisite Course: 22CEP258 PHE Lab	

LIST OF EXPERIMENTS

Lab #	Name of the Experiment
1	Drawing representative samples from Sewage Treatment Plants (STPs)
2-6	Sampling and analysis of MNIT Jaipur STPs in terms following parameters to assess their performance in terms of primary, secondary, and tertiary treatment: • Solids (TSS, TS) • Organics (BOD- both routine and respirometric, COD, TOC) • Nitrogen species (TkN, ammoniacal nitrogen, nitrates) • PO_4^{3-}P • SO_4^{2-}
7-10	Demonstration of air quality monitoring using Respirable dust samplers, continuous monitors, Grimm etc. for the following parameters: • PM and its fractions • NO_x • SO_2 • CO
11	Measurement of ambient noise and derive descriptive parameters

Course Outcomes

1. Be able to draw and analyze samples from STPs to assess their performance in terms of primary, secondary, and tertiary treatment
2. Be able to perform sampling and analysis of ambient/indoor air pollution for various applications
3. Be able to perform sampling and analysis of ambient/indoor noise pollution and its implications

References

1. APHA.(1995). Standard methods for the examination of water and wastewater. 17th edition APHA, Washington DC.
2. Sawyer, C. McCarty, P., Parkin, G. (2017). Chemistry for Environmental Engineering and Science. McGraw Hill Education; 5th edition.

UG/PG: UG	**Department:** Civil Engineering
Course Code: 22CEP307	**Course Name:** Geotechnical Engineering Lab
Credit: 1	**L-T-P: 0-0-2**
Pre-requisite Course: 22CEP260 Soil Mechanics Lab	

LIST OF EXPERIMENTS

Lab #	Name of the Session
1	Determination of shear strength parameters of clay using Triaxial test.
2	Determination of shear strength parameters of sand using Triaxial test.
3	Determination of shear strength parameters using Vane shear test.
4	Determination of shear strength parameters using Direct shear box test.
5	Determination of CBR value of soil.
6	Determination of consolidation parameters.
7	Swelling pressure determination.
8	Determination of differential free swell.
9	Determination of allowable bearing pressure using Standard Penetration test.
10	Determination of in-situ bearing capacity of soil using plate load test

Course Outcomes

1. Able to estimate the shear strength of natural soils as well as fills experimentally.
2. Able to determine the shear strength, relative density / stiffness, and allowable bearing pressures on field.
3. Able to determine settlement and heave characteristics of soils experimentally.

Text Books

1. Head, K.H, “Manual of Soil Laboratory Testing”, John Wiley and Sons, New York.
2. T. William Lambe, “Soil Testing for Engineers”, Wiley Eastern Limited, New Delhi.
3. Joseph E. Bowles, “Engineering Properties of Soil and their Measurement”, McGraw Hill Inc., New York.
4. Shamsher Prakash and P.K. Jain, “Engineering Soil Testing”, Nem Chand & Bros, Roorkee.

UG/PG: UG	**Department:** Civil Engineering
Course Code: 22CEP308	**Course Name:** Structural Design and Drawing
Credit: 1	**L-T-P: 0-0-2**
Pre-requisite Course: Design of RC Systems	

LIST OF SESSIONS

Lab #	Name of the Session
1	Design and detailed drawings of flat slab & grid slab
2	Design and detailed drawings of retaining walls, curved beams
3	Design and detailed drawings of domes, water tanks with foundation
4	Design and detailed drawings of pile & pile foundations, pile caps
5	Ductile detailing of RC structural systems, building frames
6	Ductile detailing of prestressed concrete beams, slab bridge
7	Design and Drawings of Bolted and Welded connections
8	Design and Drawings of Beam Column Connections
9	Design and Drawing of tension, compression and flexural members (including built up members)
10	Design and Drawing of Column bases
11	Design and Drawing of Plate Girder.
12	Design and Drawing of Roof trusses.

Course Outcomes

1. Understand the basics of design of RCC and Steel structural components.
2. Design and prepare drawings of flat slab, retaining walls, domes, curved beams and foundations.
3. Design and prepare drawings of steel structural components of civil engineering structures.

Text Books

1. Design of RCC Structures by Jain & Jaykrishana
2. Design of RCC Structures by Krishnaraju
3. Design of RCC Structures by Menon & Pillai
4. Plastic Analysis & Design Of Steel Structures by Wong
5. Design of Steel Structures: N Subramanium
6. Limit State Design of Steel Structures, S.K.Duggal
7. Design of Steel Structures, P Dayaratnam