

COURSE STRUCTURE & DETAILED SYLLABUS

ACE - R22

DEPARTMENT OF CIVIL ENGINEERING

IV B.Tech I Sem (2022 Batch)

Course Structure & Syllabus



ACE

Engineering College

Ankushapur(V), Ghatkesar(M), Medchal Dist - 501 301

(An Autonomous Institution, Affiliated to JNTUH, Hyderabad)

Department of CIVIL ENGINEERING

B.Tech. in CIVIL ENGINEERING

COURSE STRUCTURE & SYLLABUS (ACE-R22 Regulations)

Applicable from AY 2022-23 Batch



ACE Engineering College

Ankushapur(V), Ghatkesar(M), Medchal Dist - 501 301

(An Autonomous Institution)

B.TECH. FOUR YEAR DEGREE COURSE

CIVIL ENGINEERING

COURSE STRUCTURE & SYLLABUS

IV YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	CE701PC	Quantity Survey & Valuation	2	0	0	2
2.	CE702PC	Project Management	2	0	0	2
3.		Professional Elective – II	3	0	0	3
4.		Professional Elective – III	3	0	0	3
5.		Professional Elective - IV	3	0	0	3
6.		Open Elective - II	3	0	0	3
7.	CE703PC	Civil Engineering Software Laboratory	0	0	2	1
8.	CE704PC	Project Stage - I	0	0	6	3
		Total Credits	16	0	8	20

Professional Elective – I
1. Green Building Technologies
2. Geomatic Applications in Civil Engineering
3. Smart Cities Planning & Management
Professional Elective – II
1.Prestressed Concrete
2.Elements of Earthquake Engineering
3.Advanced Structural Analysis
Professional Elective – III
1.Earth Retaining Structures
2.Ground Improvement Techniques
3.Stability Analysis of Slopes
Professional Elective – IV
1.Design of Hydraulic Structures
2.Advanced Water Resources Engineering
3.Ground Water Hydrology
Professional Elective – V
1.Solid Waste Management
2.Environmental Impact Assessment
3.Air Pollution
Professional Elective – VI
1.Airport, Railways, and waterways
2. Pavement Asset Management
3.Pavement Analysis & Design
Open Electives -I
1. Disaster Preparedness & Planning Management
2. Building Management System
3. Environmental Impact Assessment
Open Electives -II
1.Geographical Information systems
2.Sustainable Infrastructure Development
3.Professional Practice, Law & Ethics
Open Electives -III
1.Energy Efficient Buildings
2.Multi Criterion Decision Making
3.Environmental Pollution and Control

CE701PC: QUANTITY SURVEY & VALUATION

B.Tech. IV Year I Sem.

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Course Objectives: The subject provide process of estimations required for various work in construction. To have knowledge of using SOR &SSR for analysis of rates on various works and basics of planning tools for a construction projects.

Course Outcomes: On completion of the course, the students will be able to:

- Understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.
- Quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.
- Understand how competitive bidding works and how to submit a competitive bid proposal.

UNIT – I

General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating.

UNIT – II

Detailed estimation of single and multi storied building.

UNIT – III

Reinforcement bar bending and bar requirement schedules Earthwork for roads and canals.

UNIT – IV

Rate Analysis – Working out data for various items of work over head and contingent charges.

UNIT-V

Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation - Standards specifications for different items of building construction.

NOTE: NUMBER OF EXERCISES PROPOSED:

1. Three in flat Roof & one in Sloped Roof
2. Exercises on Data – three Nos.

TEXT BOOKS:

1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Estimating and Costing by G.S. Birdie
3. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016
4. Chitkara, K. K. Construction Project Management. Tata McGraw-Hill Education, 2014

REFERENCE BOOKS:

1. Standard Schedule of rates and standard data book by public works department.
2. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)
3. Estimation, Costing and Specifications by M. Chakraborti; Laxmi publications.
4. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
6. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015

CE702PC: PROJECT MANAGEMENT

B.Tech. IV Year I Sem.

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Course Objective: The Objective of this course is to lay on important foundation to student in managing projects with a special focus on every phase such as project planning, execution, monitoring and evaluation.

Course Outcome: Students will be able to understand

- Importance of Project Management.
- Project Planning, Execution and implementation.
- Significance of teams in projects.
- Project evaluation techniques.

UNIT- I:

Introduction: Introduction to Project management — Project Characteristics-Project Life cycle-Project Identification. Formulation and implementation. Project management in different sectors: Construction, Services Sector, Public sector and Government Projects. Systems approach to project management.

UNIT- II:

Project Planning and Appraisal: Project Planning – Project Appraisal-Feasibility Study-Technical, Commercial, Economic, Financial, Management, Social Cost Benefit Analysis-Project Risk Analysis.

UNIT- III:

Project Finance: Project Cost Estimation, Project Financing-Investment Criteria. Project Evaluation Techniques - Pay Back Period, Accounting rate of return. Net present value, Internal Rate of return, Profitability Index, Cash Flows Estimation for new and replacement projects-Cost of Capital, Risk Analysis.

UNIT- IV:

Project Planning and Control: Planning Steps-Scheduling- Network Diagrams. Network Analysis, Critical Path, Quality Management, Project Execution, Monitoring and control, Agile project Management, Scrum, Lean Production and project management.

UNIT- V:

Organizational Behavior and Project Management: Organizational Structure and Integration, Role of Project manager, Roles in the project team, Project stakeholder engagement. Leadership in project management, participative management, team building approach. Conflict Management in Projects, Stress Management.

SUGGESTED READING:

1. Join M. Nicholas and Herman Steyn, Project Management for Engineering. Business and Technology, 5e, Routledge, 2017
2. Prasanna Chandra, Projects. Planning, Analysis. Selection. Financing Implementation and review, 6e, TATA Mc Gaw Hill 2008.
3. K. Nagrajan, Project Management, New Age International publishers, 7e 2015.
4. Jack Gido, Jim Clements Rose Baker. Successful Project Management. Cengage Learning, 7e 2015.
5. R Pancerselvam. P. Senthil Kumar, Project Management. PHI, 2009.

CE721PE: PRESTRESSED CONCRETE (Professional Elective – II)

B.Tech. IV Year I Sem.

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Pre-Requisites: Reinforced Concrete Design

Course Objectives: The objectives of the course are to

- Understand the principles & necessity of prestressed concrete structures.
- Know different techniques of prestressing.
- Get the knowledge on various losses of prestress.
- Understand Analysis and design of prestressed concrete members.

Course Outcomes: After the completion of the course student should be able to

- Acquire the knowledge of evolution of process of prestressing.
- Acquire the knowledge of various prestressing techniques.
- Develop skills in analysis design of prestressed structural elements as per the IS codal provisions.

UNIT - I:

Introduction: Historic development- General principles of prestressing pre-tensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC- Classification and types of prestressing- Materials- high strength concrete and high tensile steel their characteristics.

UNIT - II:

Methods and Systems of prestressing: Pre-tensioning and Posttensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall System- Lee McCall system. **Losses of Prestress:** Loss of prestress in pretensioned and posttensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, slip in anchorage, frictional losses.

UNIT - III:

Flexure: Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams- Elastic design of PSC slabs and beams of rectangular and I sections- Kern line – Cable profile and cable layout.

Shear: General Considerations- Principal tension and compression- Improving shear resistance of concrete by horizontal and vertical prestressing and by using inclined or parabolic cables- Analysis of rectangular and I beams for shear – Design of shear reinforcements- IS Code provisions.

UNIT - IV:

Transfer of Prestress in Pretensioned Members: Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses in post tensioned members – stress distribution in End block – Analysis by Guyon, Magnel, Zienlinski and Rowe's methods – Anchorage zone reinforcement- IS Provisions

UNIT - V:

Composite Beams: Different Types- Propped and Unpropped- stress distribution- Differential

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shrinkage- Analysis of composite beams- General design considerations.

Deflections: Importance of control of deflections- Factors influencing deflections — Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.

REFERENCE BOOKS:

1. Prestressed concrete by Krishna Raju, Tata Mc Graw Hill Book – Co. New Delhi.
2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
3. Prestressed concrete by S. Ramamrutham Dhanpat Rai & Sons, Delhi.
4. Prestressed Concrete by N. Rajagopalan Narosa Publishing House

Reference Codes: IS 1343:2016

CE722PE: ELEMENTS OF EARTHQUAKE ENGINEERING (Professional Elective – II)

B.Tech. IV Year I Sem.

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Pre-Requisites: Structural Engineering –II & RC Design.

Course Objectives: The objectives of the course are to

- Understand Engineering Seismology.
- Explain and discuss single degree of freedom systems subjected to free and forced vibrations.
- Acquire the knowledge of the conceptual design and principles of earthquake resistant designs as per IS codes.
- understand importance of ductile detailing of RC structures.

Course Outcomes: After the completion of the course student should be able to

- Explain and derive fundamental equations in structural dynamics.
- Discuss and explain causes and Theories on earthquake, seismic waves, measurement of earthquakes.
- Evaluate base shear using IS methods.
- Design and Detail the reinforcement for earthquake forces.

UNIT - I

Engineering Seismology: Earthquake phenomenon - cause of earthquakes-Faults- Plate tectonics- Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales- Energy Released- Earthquake measuring instruments seismogram -Seismoscope, Seismograph, - strong ground motions- Seismic zones of India.

Theory of Vibrations: Elements of a vibratory system- Degrees of Freedom-Continuous system- Lumped mass idealization-Oscillatory motion-Simple Harmonic Motion-Free vibration of single degree of freedom (SDOF) system- undamped and damped-critical damping-Logarithmic decrement- Forced vibrations-Harmonic excitation- Dynamic magnification factor-Excitation by rigid based translation for SDOF system-Earthquake ground motion.

UNIT - II

Conceptual design: Introduction-Functional Planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical Members- Twisting of buildings- Ductility-definition-ductility relationships-flexible buildings-framing systems-choice of construction materials- unconfined concrete-confined concrete-masonry-reinforcing steel.

Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations- basic assumptions-design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method.

UNIT - III

Reinforced Concrete Buildings: Principles of earthquake resistant design of RC members- Structural models for frame buildings- Seismic methods of analysis- IS code based methods for

seismic design- Vertical irregularities- Plan configuration problems- Lateral load resisting systems- Determination of design lateral forces as per IS 1893 (Part-1):2016- Equivalent lateral force procedure- Lateral distribution of base shear.

UNIT - IV

Masonry Buildings: Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings- Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.

UNIT - V

Ductility: Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920-2016 -Behaviour of beams, columns and joints in RC buildings during earthquakes

TEXT BOOKS:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.

REFERENCE BOOKS:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons.
2. Earthquake Resistant Design of Building structures by Vinod Hosur, Wiley India Pvt. Ltd.
3. Elements of Mechanical Vibration by R.N. Iyengar, I.K. International Publishing House Pvt. Ltd.
4. Masonry and Timber structures including earthquake Resistant Design – Anand S. Arya, Nemchand & Bros
5. Earthquake Tips – Learning Earthquake Design and Construction, C.V.R.

Murthy BIS Codes: 1. IS 1893(Part-1):2016. 2. IS 13920:2016. 3. IS 4326. 4. IS 56:200

CE723PE: ADVANCED STRUCTURAL ANALYSIS (Professional Elective – II)

B.Tech. IV Year I Sem.

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Course Objectives: The objectives of the course are to

- Understand the matrix method of analysis statically indeterminate frames and trusses.
- Know the transformation of coordinates and assembly of stiffness matrices.
- Differentiate between flexibility and stiffness methods of analysis of beams, frames and planetrusses.
- Understand the structural behavior of large frames with or without shear walls.

Course Outcomes: After the completion of the course student should be able to

- Analyze the multistory building frames by various approximate methods.
- Solve the continuous beams, portal frames by matrix methods of analysis.
- Analyze and design of large frames with or without shear walls.

UNIT - I

Introduction to matrix methods of analysis statically indeterminacy and kinematics indeterminacy-degree of freedom-coordinate system-structure idealization stiffness and flexibility matrices-suitability element stiffness equations-elements flexibility equations-mixed force-displacement equations-for truss element, beam element and tensional element

Transformation of coordinates-element stiffness matrix-and load vector-local and global coordinates.

UNIT - II

Assembly of stiffness matrix from element stiffness matrix-direct stiffness method-general procedure- bank matrix-semi bandwidth-computer algorithm for assembly by direct stiffness matrix method.

UNIT - III

Analysis of plane truss-continuous beam-plane frame and grids by Flexible methods.

UNIT - IV

Analysis of plane truss-continuous beam-plane frame and grids by stiffness methods.

UNIT - V

Special analysis procedures-static condensation and sub structuring-initial and thermal stresses.

Shear Walls Necessity-structural behavior of large frames with and without shear walls-approximate methods of analysis of shear walls.

TEXT BOOKS:

1. Advanced Structural Analysis by A.K. Jain Nemchand Publishers.
2. Matrix methods of structural analysis by Pandit and Gupta.

REFERENCE BOOKS:

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1. Advanced Structural Analysis by Devdas Menon, Narosa publishing house.
2. Matrix methods of structural analysis by Willam Weaver and gere, CBS Publishers.
3. Matrix methods of structural analysis by J Meek
4. Structural Analysis by Ghali and Neyveli

CE731PE: EARTH RETAINING STRUCTURES (PE – III)

B.Tech. IV Year I Sem.

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Course Objectives:

- To estimate earth pressure under different loads and conditions.
- To determine the stability of gravity and cantilever Retaining walls.
- To design sheet pile walls and bracings.
- To design Reinforced soil walls.

Course Outcome: At the end of the course the student will able to

- Calculate the earth pressures under different applied loads and ground conditions.
- Assess stability of conventional retaining walls.
- Design flexible retaining walls under different soil and fixity conditions.
- Design the supporting systems for excavations.
- Design geosynthetic reinforced earth walls.

UNIT - I

Earth Pressure Theories: Rankine's and Coulomb's Earth pressure theories for cohesive and cohesionless soils, stresses due to compaction and surcharge loads.

UNIT - II

Conventional Retaining Wall: Types of retaining walls, Stability (sliding, overturning, bearing capacity & overall) of gravity and cantilever walls, Proportioning of retaining walls, Backfill material and drainage.

UNIT - III

Flexible Walls: Sheet pile walls, Construction methods- Cantilever and Anchored (Free and Fixed support methods) sheet pile walls in coarse and fine grained soils, Rowe's moment reduction method.

UNIT - IV

Braced Cuts: Lateral earth pressure in braced cuts, Design of various components, Stability of braced cuts, base heave and stability, yielding and settlement of ground surrounding excavation, Diaphragm walls — slurry support.

UNIT - V

Reinforced Soil Walls/Mechanically Stabilized Earth: - Introduction to geosynthetics — Functions and applications - Failure mechanisms of Reinforced soil walls -bond and rupture failures- Internal and external stability by Static analyses -Soil Nailing.

TEXT BOOKS:

1. Das, B. M. - Principles of Foundation Engineering 5th Edition Nelson Engineering (2004)
2. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey

REFERENCE BOOKS:

1. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996)
2. Rowe, R. K. - Geotechnical & Geo-environmental Engineering Hand Book -Springer (2001)
3. Hans Friedrich Winterkorn, Hsai-Yang Fang - Foundation Engineering Handbook, Van Nostrand Reinhold, 1975
4. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indianedition, 2012.
5. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata McGraw-Hill Publishers NewDelhi.

CE732PE: GROUND IMPROVEMENT TECHNIQUES (PE – III)

B.Tech. IV Year I Sem.

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Prerequisites: Geo-Technical Engineering, Foundation Engineering

Course Objectives:

- To Identify difficult ground conditions in engineering practice.
- To select suitable ground improvement techniques for problematic soils.
- To assess suitable physical, chemical, mechanical and hydraulic modifications.

Course Outcomes: At the end of the course the student will able to

- Understand the various ground improvement methods.
- Assess different compaction methods for ground modification.
- Design dewatering systems to reduce the settlements.
- Comprehend stabilizations with chemical and grouting techniques.
- Understand the principles of soil reinforcement and confinement in engineering constructions.

UNIT - I

Introduction to Engineering Ground Modification: Need and objectives, Identification of soil types, In situ and laboratory tests to characterize problematic soils; Mechanical, Hydraulic, Physico-chemical, Electrical, Thermal methods, and their applications.

UNIT - II

Mechanical Modification – Deep Compaction Techniques- Blasting Vibrocompaction, Dynamic Tamping and Compaction piles.

UNIT - III

Hydraulic Modification – Objectives and techniques, traditional dewatering methods and their choice, Design of dewatering system, Electro-osmosis, Electro-kinetic dewatering. Filtration, Drainage and Seepage control with Geosynthetics, Preloading and vertical drains.

UNIT - IV

Physical and chemical modification: Stabilization with admixtures like cement, lime, calcium chloride, fly ash and bitumen; Grouting: Categories of grouting, Art of grouting, Grout materials, Grouting techniques and control.

UNIT - V

Modification by Inclusions and Confinement - Soil reinforcement, reinforcement with strip, and gridreinforced soil. In-situ ground reinforcement, ground anchors, rock bolting and soil nailing.

TEXT BOOKS:

1. Hausmann, M. R. (1990) — Engineering Principles of Ground Modifications, McGraw Hill publications
2. M. P. Moseley and K. Krisch (2006) – Ground Improvement, II Edition, Taylor and Francis
3. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey.

REFERENCE BOOKS:

1. Jones C. J. F. P. (1985) – Earth Reinforcement and soil structures – Butterworths, London.
2. Xianthakos, Abreimson and Bruce - Ground Control and Improvement, John Wiley & Sons,1994.
3. K. Krisch& F. Krisch (2010) - Ground Improvement by Deep Vibratory Methods, Spon Press,Taylor and Francis.
4. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indianedition, 2012.

CE733PE: STABILITY ANALYSIS OF SLOPES – (PE-III)

B.Tech. IV Year I Sem.

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Course Objectives:

- To know the basic concepts of slope stability.
- To identify various causes of failure of slopes.
- To analyse and design the slopes under various loading.
- To adopt slope protection methods.

Course Outcomes: At the end of the course the student will able to

- Select suitable site and materials for the construction of earth / rockfill dams.
- Analyse seepage through a given earth / rockfill dam section and propose suitable seepage control measures.
- Analyse the stability of earthen dams.
- Design the slopes by using different analytical methods.
- Implement slope protection methods.

UNIT - I

Earth and Rock fill Dams: General features, Selection of site; Merits and demerits of the earth and rock fill dams, Classification of earth dams, Causes of failure, Safe design criteria. Instrumentation in earth dams: Pore pressure measurements, Settlement gauges, Inclinerometers, Stress measurements, Seismic measurements.

UNIT - II

Failures, Damages and Protection of Earth Dams: Nature and importance of failure, piping through embankment and foundations, Methods of seepage control through embankments and foundations, Design Criteria for filters.

UNIT - III

Slope Stability Analysis: Types of Failure: Failure surfaces - Planar surfaces, Circular surfaces, Non-circular surfaces, Limit equilibrium methods, Total stress analysis versus effective Stress analysis, Use of Bishop's pore pressure parameters, Short term and Long term stability in slopes. Taylor Charts.

UNIT - IV

Methods of Slope Stability: Method of Slices, Effect of Tension Cracks, Vertical Cuts. Bishop's Analysis, Bishop and Morgenstern Analysis, Non-circular Failure Surfaces: Janbu Analysis, Sliding Block Analysis, Introduction to Seismic stability, Stabilization of slopes: Soil reinforcement (geosynthetics/soil nailing/micro piles etc), soil treatment (cement/lime treatment), surface protection (vegetation/erosion control mats/shotcrete).

UNIT - V

Slope Protection and Rock fill Dams: Stabilization of slopes: Soil reinforcement (geosynthetics/soil nailing/micro piles etc), soil treatment (cement/lime treatment), surface protection (vegetation/erosion control mats/shotcrete). Requirements of compacted rockfill, Shear strength of rockfill, Rockfill mixtures, Rockfill embankments, Earth-core Rockfill dams, Stability, Upstream & Downstream slopes.

TEXT BOOKS:

1. Engineering for Embankment Dams, B. Singh and R. S. Varshney, A.A. Balkema, 1995.
2. Embankment Dams, H.D. Sharma, Oxford and IBH Publishing Co., 1991.

REFERENCE BOOKS:

1. Earth and Earth Rock Dams, J. L. Sherard, John Wiley & Sons Inc, 1963.
2. Earth and Rockfill Dams, Christian Kutzner, A.A. Balkema, 1997
3. Bharat Singh and Sharma, H. D. – Earth and Rockfill Dams, 1999.
4. Sowers, G.F. and Salley, H. I. – Earth and Rockfill Dams, Willams, R.C., and Willace, T.S. 1965.
5. Abramson, L. W., Lee, T. S. and Sharma, S. - Slope Stability and Stabilization methods – JohnWiley & sons. (2002).
6. Bromhead, E. N. (1992). The Stability of Slopes, Blackie academic and professional,London.

CE741PE: DESIGN OF HYDRAULIC STRUCTURES (PE – IV)

B.Tech. IV Year I Sem.

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Pre-Requisites: Hydraulics, Hydrology & Water Resources Engineering

Course Objectives: To study various types of storage works and, diversion headwork, their components and design principles for their construction.

Course Outcomes: At the end of the course, the student will be able to:

- Know types of water retaining structures for multiple purposes and its key parameters considered for planning and designing.
- Understand details in any Irrigation System and its requirements.
- Know, Analyze and Design of a irrigation system components.

UNIT - I

Storage Works-Reservoirs - Types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve- Reservoir Sedimentation

— Life of Reservoir. Types of dams, factors affecting selection of type of dam, factors governing selection of site for a dam.

UNIT - II

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile, and practical profile of a gravity dam, limiting height of a low gravity dam, Factors of Safety - Stability Analysis, Foundation for a Gravity Dam, drainage and inspection galleries.

UNIT- III

Earth dams: types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam-graphical method, measures for control of seepage. Spillways: types of spillways, Design principles of Ogee spillways - Spillway gates. Energy Dissipaters and Stilling Basins Significance of Jump Height Curve and Tail Water Rating Curve - USBR and Indian types of Stilling Basins.

UNIT- IV

Diversion Head works: Types of Diversion head works- weirs and barrages, layout of diversion head work - components. Causes and failure of Weirs and Barrages on permeable foundations, -Silt Ejectors and Silt Excluders

Weirs on Permeable Foundations — Creep Theories - Bligh's, Lane's and Khosla's theories, Determination of uplift pressure- Various Correction Factors – Design principles of weirs on permeable foundations using Creep theories - exit gradient, U/s and D/s Sheet Piles - Launching Apron.

UNIT- V

Canal Falls - types of falls and their location, Design principles of Notch Fall and Sarada type Fall. Canal regulation works, principles of design of cross and distributary head regulators, types of Canalscapes - types of canal modules, proportionality, sensitivity, setting and flexibility. Cross Drainageworks: types, selection of suitable type, various types, design considerations for cross

drainage works

TEXT BOOKS:

1. Irrigation Engineering and Hydraulic structures by Santhosh Kumar Garg, Khanna Publishers.
2. Irrigation engineering by K. R. Arora Standard Publishers.
3. Irrigation and water power engineering by Punmia & Lal, Laxmi publications Pvt. Ltd., NewDelhi

REFERENCE BOOKS:

1. Theory and Design of Hydraulic structures by Varshney, Gupta & Gupta
2. Irrigation Engineering by R.K. Sharma and T.K. Sharma, S. Chand Publishers 2015.
3. Irrigation Theory and Practice by A. M. Micheal Vikas Publishing House 2015.
4. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers.

CE742PE: ADVANCED WATER RESOURCES ENGINEERING (PE – IV)

B.Tech. IV Year I Sem.

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Course Objectives:

- Overview of Statistical applications in Hydrology.
- General Idea of Flood routing.
- Summary of various flood mitigation measures.
- Overview of climate and causes of climate change.
- Summary of Optimization models and applications.

Course Outcomes: Students are expected to have gained knowledge of

- Ability to apply statistical techniques for flood frequency studies and hydrological events and Applications of Regression Models for estimation of various parameters.
- Applications of flood routing, flood forecasting techniques for real time flood studies.
- Understanding of various mitigation measures for control of floods.
- Understanding of climate change using GCM models.
- Ability to formulate optimization models and soft computing applications

UNIT - I

Statistics in Hydrology: Random variables, probability of hydrologic events, probability (Gumbel, Log-Pearson type-III distribution) and statistical methods for flood frequency, trend analysis for hydrologic events.

Regression Analysis: Identification of appropriate models, parameters estimation by the least square method, measures of goodness fit, uncertainty features of LS based model parameters, statistical Inferences of Regression Coefficients, confidence Interval. Multivariate linear regression and correlation.

UNIT - II

Flood Routing: Mathematics of flood routing, various methods of flood routing, Hydrologic and Hydraulic routing. -Modified Puls Method- Muskhingham Method-flood forecasting (unit hydrograph method)

UNIT - III

Flood mitigation: flood ways, channel improvement, evacuation and flood proofing, land management, flood plain management, estimating benefits of flood mitigation.

Flood plain adjustments and regulations: Results of controlling floods, alternatives to controlling floods, range of possible adjustments, practical range of choice, critical characteristics of flood hazards.

UNIT - IV

Climate System- Weather and Climate- Overview of earth-atmosphere- vertical structure of atmosphere- Radiation and Temperature- Temperature variation- vertical variation in Air temperature-temperature extremes. Causes of climate change - Modeling of climate change-General circulation models (GCMs) –IPCC scenarios - IPCC Assessment Report (AR5) - Physical Science

basis.

UNIT - V

Optimization Techniques, Model Formulation, models, General L.P Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Model. Formulation of a LPP - revised simplex method - duality theory - dual simplex method - sensitivity analysis. Introduction and Applications of ANN, Machine and Deep Learning in water resources Engineering.

TEXT BOOKS:

1. Vedula S. and. Mujumdar P.P. '*Water resources Systems*', McGraw-Hill Publishing Company, New Delhi. 2005
2. Ven TeChow, '*Hand book of Applied Hydrology*' McGraw-Hill Book Company, New York., 1964
3. Subramanya, K. '*Hydrology for Engineers*', Tata McGraw-Hill Publishing Company, New Delhi.(1984.
4. Raja Sekharan S. and Vijaya Laxmi Pai G. A., '*Neural Networks, Fuzzy Logic, and Genetic Algorithm*', Prentice-Hall of India, New Delhi. 2003

REFERENCE BOOKS:

1. Snedecor, G.W., and W.G. Cochran, '*Statistical Methods*', East West Press, New Delhi. 1994
2. Alfredo, H.S. and Tang Wah, '*Probability Concepts in Engineering Planning and Design: Vol-I(Basic Principles)*, John Wiley & Sons, New York. 1975
3. RL Wilby, SP charles, E Zoritaa, B Timbal, P WHetton, LO Mearns - *Guide lines for use of climate science from Statistical Modeling models*. 2004
4. *Physical science basis of AR 5 report of IPCC - working group I contribution to Assessment Report-* <https://ipcc.ch/report/ar5/wg1/> 2013.

CE743PE: GROUND WATER HYDROLOGY (PE – IV)

B.Tech. IV Year I Sem.

L T P C

3 0 0 3

Pre-Requisites: Hydraulics & Fluid Mechanics

Course objectives: The objectives of the course are:

- To **explain** the concepts of Groundwater Development and Management.
- To **demonstrate and** derive the basic equations used in Groundwater development and management and the corresponding equations.
- To know the investigations, field studies to conduct basic ground water studies.

Course Outcomes: On successful completion of this course, students should be able to:

- **Identify** different fundamental equations and concepts as applied in the Groundwater studies.
- **Discuss** and derive differential equation governing groundwater flow in three dimensions.
- To **solve** groundwater mathematical equations and analyze pumping tests in steady and non-steady flow cases.
- **Distinguish** and understand the saline water intrusion problem in costal aquifers.

UNIT- I

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, Vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as aquifers, types of aquifers, porosity, specific yield and specific retention. Ground Water Movement- Permeability, Darcy's law, storage coefficient, Transmissivity, Differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system, ground water flow contours and their applications.

UNIT- II

Analysis of Pumping Test Data-I: Steady flow ground water flow towards a well in confined and unconfined aquifers-Dupit's and Theism's equations, assumptions, formation constants, yield of an open well interface and well tests.

UNIT- III

Analysis of Pumping Test Data-II: Unsteady flow towards well-Non-Equilibrium equations, Theis solution, Jacob and Chow's simplifications, Leak aquifers.

UNIT- IV

Surface and sub-surface Investigation: Surface methods of exploration-Electrical resistivity method and Seismic refraction methods. Subsurface methods geophysical logging and resistivity logging. Concept of artificial recharge of ground water, recharge methods, Applications of GIS and RS in artificial recharge of ground water along with case studies.

UNIT- V

Saline water intrusion in aquifer: Occurrence of saline water intrusion, Ghyben-Herzberg relation, Shape of interface, control of water intrusion. Ground water basin management-case studies.

TEXT BOOKS:

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Ground water by H. M. Raghunath, Wiley Eastern Ltd.

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3. Groundwater System Planning & Management, R. Willes & W.W.G. Yeh, Prentice Hall.

REFERENCE BOOKS:

1. Ground water by Bawvwr, John Wiley & Sons.
2. Applied Hydrogeology by C. W. Fetta, CBS Publishers & Distributors.
3. Ground Water Assessment, Development and Management by K R Karanth, McGraw Hill Publications.

CE721OE: REMOTE SENSING & GEOGRAPHICAL INFORMATION SYSTEMS (OE – II)

B.Tech. IV Year I Sem.

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Course Objectives: The objectives of the course are to

- Know the concepts of Remote Sensing, its interpreting Techniques and concepts of Digital images.
- know the concept of Geographical Information System (GIS), coordinate system GIS Data and its types.
- Understand the students managing the spatial Data Using GIS.
- Understand Implementation of GIS interface for practical usage.

Course Outcomes: After the completion of the course student should be able to

- **Describe** different concepts and terms used in Remote Sensing and its data.
- Understand the Data conversion and Process in different coordinate systems of GIS interface.
- **Evaluate** the accuracy of Data and implementing a GIS.
- Understand the applicability of RS and GIS for various applications.

UNIT - I

Concepts of Remote Sensing Basics of remote sensing- elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology & units, energy resources, energy interactions with earth surface features & atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, types of sensors. Remote Sensing Platforms and Sensors, IRS satellites.

Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation. Concepts of Digital image processing, image enhancements, qualitative & quantitative analysis and pattern recognition, classification techniques and accuracy estimation.

UNIT - II

Introduction to GIS: Introduction, History of GIS, GIS Components, GIS Applications in Real life, The Nature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Co-ordinate systems, Map projections, Map transformation, Geo-referencing.

Spatial Database Management System: Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization.

Data models and data structures: Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata.

UNIT - III

Spatial Data input and Editing: Data input methods — keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data accuracy, Micro and Macro components of accuracy, sources of error in GIS.

Spatial Analysis: Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques.

UNIT - IV

Awareness and digitization of GIS: Awareness, developing system requirements, evaluation of alternative systems, decision making using GIS.

UNIT - V

Applications of GIS: GIS based road network planning, Mineral mapping using GIS, Shortest path detection using GIS, Hazard Zonation using remote sensing and GIS, GIS for solving multi criteria problems, GIS for business applications.

TEXT BOOKS:

1. Remote Sensing and GIS by Basudeb Bhatta, Oxford University Press, 2nd Edition, 2011.
2. Introduction to Geographic Information systems by Kang-tsung Chang, McGraw-Hill Education(Indian Edition), 7th Edition, 2015.
3. Fundamentals of Geographic Information systems by Michael N. Demers, 4th Edition, WileyPublishers, 2012.

REFERENCE BOOKS:

1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, WileyPublishers, 7th Edition, 2015.
2. Geographic Information systems – An Introduction by Tor Bernhardsen, Wiley India Publication,3rd Edition, 2010.
3. Advanced Surveying: Total Station, GIS and Remote Sensing by Satheesh Gopi, R. SathiKumar, N. Madhu, Pearson Education, 1st Edition, 2007.
4. Textbook of Remote Sensing and Geographical Information systems by M.Anji Reddy

CE722OE: SUSTAINABLE INFRASTRUCTURE DEVELOPMENT (OE – II)

B.Tech. IV Year I Sem.

L T P C

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Course Objectives:

- Presenting elements and components of sustainable infrastructure creation and management.
- Introducing practices of water management, greenhouse gas reduction, and greencity planning.

Course Outcomes:

- The students will acquire fundamentals and principles of sustainable engineering design.
- Knowledge of existing frameworks to achieve long-term sustainability.
- Methods and techniques for waste water management and greenhouse gas emission reduction.
- Knowledge on the civil engineering aspects overall green city planning.

UNIT - I

Process of Sustainable Engineering Design: Key principle of sustainability; Integration of architecture and engineering; Design drivers for sustainable infrastructure system; implementation.

UNIT - II

Sustainable infrastructure framework: Green building rating system; Sustainable Infrastructure frameworks: Pillars of sustainability, scale-density framework, transect, built form-ecology framework.

UNIT - III

Water conservation and supply: water management plans; achieving water balance; analyzing water resources; water supply strategies

Integrated water management: integrated storm water management; urban storm water treatment strategies; constraints and barriers to implementation; gray water treatment and reuse; integrating gray water into a water resources master plan; Black water management approaches.

UNIT - IV

Energy and greenhouse gases: reducing demand by design; Designing Sustainable power supplies; Addressing climate change and reducing carbon footprint; Policy measures for increasing energy security and efficiency; Design guidelines and Performance standards.

UNIT - V

Sustainable site planning: Built systems, and Material flows: Sustainable site planning; Green streets and transportation network; working with the land, material and waste flows.

TEXT BOOKS:

1. S. BrySarté (2010) Sustainable Infrastructure. John Wiles & Sons, Inc. ISBN 978-0-470-912
2. Sustainable Infrastructure: Sustainable Buildings – Elisabeth Green, Tristram Hope &

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Alan Yates.

3. Sustainable Development spiritual dimension – Krishnan Saigal

REFERENCE BOOKS:

1. Dredging for sustainable infrastructure – aarninkhof, Stefan laboyrie polite/koningsveld, markvan — cedaiadc
2. Sustainable infrastructure: Breakthrough in Research & Practice.

CE723OE: SOLID WASTE MANAGEMENT (OE – II)

B.Tech. IV Year I Sem.

L T P C

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Course Objectives: The objectives of the course are to

- **Define** the terms and understand the necessity of solid waste management.
- **Explain** the strategies for the collection of solid waste.
- **Describe** the solid waste disposal methods.
- **Categorize** Hazardous Waste.

Course Outcomes: At the end of the course the student will able to:

- Identify the physical and chemical composition of solid wastes.
- Analyze the functional elements for solid waste management.
- Understand the techniques and methods used in transformation, conservation, and recovery of materials from solid wastes.
- Identify and design waste disposal systems.

UNIT - I

Solid Waste: Definitions, Types of solid wastes, sources of solid wastes, Characteristics, and perspectives; properties of solid wastes, Sampling of Solid wastes, Elements of solid waste management - Integrated solid waste management, Solid Waste Management Rules 2016.

UNIT - II

Engineering Systems for Solid Waste Management: Solid waste generation; on-site handling, storage and processing; collection of solid wastes; Stationary container system and Hauled container systems – Route planning - transfer and transport; processing techniques.

UNIT - III

Engineering Systems for Resource and Energy Recovery: Processing techniques; materials recovery systems; recovery of biological conversion products – Composting, pre and post processing, types of composting, Critical parameters, Problems with composting - recovery of thermal conversion products; Pyrolysis, Gasification, RDF - recovery of energy from conversion products; materials and energy recovery systems.

UNIT - IV

Landfills: Evolution of landfills – Types and Construction of landfills – Design considerations – Life of landfills- Landfill Problems – Lining of landfills – Types of liners – Leachate pollution and control – Monitoring landfills – Landfills reclamation.

UNIT - V

Hazardous waste Management: Sources and characteristics, Effects on environment, Risk assessment – Disposal of hazardous wastes – Secured landfills, incineration - Monitoring – Biomedical waste disposal, E-waste management, Nuclear Wastes, Industrial waste Management

TEXT BOOKS:

1. Tchobanoglous G, Theisen H and Vigil SA 'Integrated Solid Waste Management, Engineering Principles and Management Issues' McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, 'Solid Waste Engineering' Brooks/Cole Thomson Learning Inc., 2002.

REFERENCE BOOKS:

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, 'Environmental Engineering', McGraw Hill Inc., New York, 1985.
2. Qian X, Koerner RM and Gray DH, 'Geotechnical Aspects of Landfill Design and Construction' Prentice Hall, 2002.

CE724OE: PROFESSIONAL PRACTICE, LAW & ETHICS (OE - II)

B.Tech. IV Year I Sem.

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3 0 0 3

Course Objectives:

- To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession.
- To develop some ideas of the legal and practical aspects of their profession.

Course Outcome:

- The students will understand the importance of professional practice, Law and Ethics in their personal lives and professional careers.
- The students will learn the rights and responsibilities as an employee, team member and a global citizen.

UNIT - I

Professional Practice and Ethics: Definition of Ethics, Professional Ethics - Engineering Ethics, Personal Ethics; Code of Ethics - Profession, Professionalism, Professional Responsibility, Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistle blowing, protected disclosures. Introduction to GST- Various Roles of Various Stake holders.

UNIT – II

Law of Contract: Nature of Contract and Essential elements of valid contract, Offer and Acceptance, Consideration, Capacity to contract and Free Consent, Legality of Object. Unlawful and illegal agreements, Contingent Contracts, Performance and discharge of Contracts, Remedies for breach of contract. Contracts-II: Indemnity and guarantee, Contract of Agency, Sale of goods Act -1930: General Principles, Conditions & Warranties, Performance of Contract of Sale.

UNIT – III

Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system: Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalats.

UNIT- IV

Engagement of Labour and Labour & other construction-related Laws: Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piecerate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other - Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017.

UNIT - V

Law relating to Intellectual property: Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet –

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Remedies and procedures in India; Law relating to Patents under Patents Act, 1970.

TEXT BOOKS:

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ravinder Kaur, Legal Aspects of Business, 4e, Cengage Learning, 2016.

REFERENCE BOOKS:

1. RERA Act, 2017.
2. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
3. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House.
4. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers.

CE703PC: CIVIL ENGINEERING SOFTWARE LAB**B.Tech. IV Year I Sem.****L T P C****0 0 2 1****Course Objectives:**

- Analyze and design structural elements.
- Apply water resources related problems.
- Design various geometric elements using transportation software.
- Analyze slope stability and seepage determination.
- Estimate the quantities of civil engineering structures.

Course Outcomes: At the end of the course the student should be able to:

- Understand the features and capabilities of the software.
- Apply fundamental principles in problem solving using software tools.
- Apply the software algorithm in the domain area.
- Develop solution for a range of problem of civil engineering using software tools and prepare technical report.

Student Version Softwares:

Group 1	Group 2	Group 3	Group 4	Group 5
1. STAAD	1. CIVIL 3D	1. Plaxis	1. eQuest	1. PRIMAVERA
2. DESIGN BUILDER	2. ISSIM	2. Geo Studio	2. EPA SWMM	2. TEKLA
3. MIDAS	3. ISSUM		3. EPA EPZ Suite	3. RS & GIS
4. ETags	4. MX Road		4. EPA NET	
			5. QGIS	
			6. HECRAS	

***Note:**

- 1.) Open/education/academic version of software is desirable.
- 2.) The student may choose any software one from each of the groups.

List of experiments:

1. Estimate, planning and management of any one civil engineering structure.
2. Analyze and design G+3 building.
3. Design various geometric elements and intersections for any Highway.
4. Analyze slope stability and seepage determination.
5. Analyze and design water networks, storm water, channel flow and flood determination.