MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)
B.Tech in Civil Engineering
Scheme of Instruction and Examination
(Choice Based Credit System)
Applicable from AY 2022-23 Batch

V SEMESTER

S. No	Course Code	Course Title	Instruction Hours per week			Examination Max. Marks		Duration of SEE in hours	Credits
			L	T	P	CIE	SEE		
1.	CE501PC	Structural Analysis - II	3	0	0	40	60	3	3
2.	CE502PC	Geotechnical Engineering	3	0	0	40	60	3	3
3.	CE503PC	Structural Engineering -I (RCC)	3	0	0	40	60	3	3
4.	CE504PC	Transportation Engineering	3	0	0	40	60	3	3
5.	CE505PC	Hydrology and Water Resources Engineering	3	0	0	40	60	3	3
6.	MS501HS	Business Economics and Financial Analysis	3	0	0	40	60	3	3
7.	CE551PC	Transportation Engineering Laboratory	0	0	2	40	60	3	1
8.	CE552PC	Geotechnical Engineering Laboratory	0	0	2	40	60	3	1
9.	*MC502ES	Artificial Intelligence	3	0	0	40	60	3	0
Total			**21**	**0**	**4**	**360**	**540**	**-**	**20**

VI SEMESTER

S. No	Course Code	Course Title	Instruction Hours per week			Examination Max. Marks		Duration of SEE in hours	Credits
			L	T	P	CIE	SEE		
1.	CE601PC	Environmental Engineering	3	0	0	40	60	3	3
2.	CE602PC	Foundation Engineering	3	0	0	40	60	3	3
3.	CE603PC	Structural Engineering -II (Steel Structures)	3	0	0	40	60	3	3
4.		Professional Elective – I	3	0	0	40	60	3	3
5.		Open Elective - I	3	0	0	40	60	3	3
6.	CE651PC	Environmental Engineering Laboratory	0	0	2	40	60	3	1
7.	CE652PC	Computer Aided Design Laboratory	0	0	2	40	60	3	1
8.	EN651HS	Advanced English Communication Skills Laboratory	0	0	2	40	60	3	1
9.	CE653PC	Industry Oriented Mini Project/ Internship	0	0	4	---	100	3	2
10.	*MC602ES	Cyber Security	3	0	0	40	60	3	0
11.	*MC601HS	Intellectual Property Rights	3	0	0	40	60	3	0
Total			**21**	**0**	**10**	**400**	**700**		**20**

12.	*MC601BS	Environmental Science **(for Lateral Entry Students)**	3	0	0	40	60	3	0

VII SEMESTER

S. No	Course Code	Course Title	Instruction			Examination			Credits
			Hours per week			Max. Marks		Duration of SEE in hours	
			L	T	P	CIE	SEE		
1.	CE701PC	Quantity Survey & Valuation	2	0	0	40	60	3	2
2.	CE702PC	Project Management	2	0	0	40	60	3	2
3.		Professional Elective – II	3	0	0	40	60	3	3
4.		Professional Elective – III	3	0	0	40	60	3	3
5.		Professional Elective - IV	3	0	0	40	60	3	3
6.		Open Elective - II	3	0	0	40	60	3	3
7.	CE751PC	Civil Engineering Software Laboratory	0	0	2	40	60	3	1
8.	CE752PC	Project Stage - I	0	0	6	100	-	--	3
		Total	**16**	**0**	**8**	**380**	**420**		**20**

VIII SEMESTER

S. No	Course Code	Course Title	Instruction			Examination			Credits
			Hours per week			Max. Marks		Duration of SEE in hours	
			L	T	P	CIE	SEE		
1.		Professional Elective – V	3	0	0	40	60	3	3
2.		Professional Elective - VI	3	0	0	40	60	3	3
3.		Open Elective - III	3	0	0	40	60	3	3
4.	CE851PC	Project Stage – II including Seminar	0	0	22	40	60	-	11
		Total	**9**	**0**	**22**	**160**	**240**		**20**

***MC – Satisfactory/Unsatisfactory**

Professional Elective – I

CE611PE	Green Building Technologies
CE612PE	Geomatic Applications in Civil Engineering
CE613PE	Smart Cities Planning and Management

Professional Elective – II

CE711PE	Prestressed Concrete
CE712PE	Elements of Earthquake Engineering
CE713PE	Advanced Structural Analysis

Professional Elective-III

CE714PE	Earth Retaining Structures
CE715PE	Ground Improvement Techniques
CE716PE	Stability Analysis of Slopes

Professional Elective -IV

CE717PE	Design of Hydraulic Structures
CE718PE	Advanced Water Resources Engineering
CE719PE	Ground Water Hydrology

Professional Elective –V

CE811PE	Solid Waste Management
CE812PE	Environmental Impact Assessment
CE813PE	Air pollution

Professional Elective -VI

CE814PE	Airports, Railways and Waterways
CE815PE	Pavement Asset Management
CE816PE	Pavement Analysis & Design

Open Elective -I

CE621OE	Disaster Preparedness & Planning Management
CE622OE	Environmental Impact Assessment

Open Elective -II

CE721OE	Remote Sensing & Geographical Information Systems
CE722OE	Solid Waste Management

Open Elective -III

CE821OE	Energy Efficient Buildings
CE822OE	Environmental Pollution and control

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
V Semester Syllabus
CE501PC: Structural Analysis-II

Course Objectives:

The objectives of the course are to:

1. Identify the various actions in arches.
2. Understand classical methods of analysis for statically indeterminate structures.
3. Differentiate the approximate and numerical methods of analysis for indeterminate structures.
4. Find the degree of static and kinematic indeterminacies of the structures.
5. Plot the variation of S.F and B.M when a moving load passes on indeterminate structures

Course Outcomes:

After the completion of the course, the student will be able to:

1. **Analyze** the two hinged arches and continuous beams and Sketch moment diagrams.
2. **Solve** the shear force and bending statically indeterminate beams and analyze forces in suspension bridges.
3. **Formulate** the flexibility matrix and analyze the beams by matrix methods.
4. **Formulate** the stiffness matrix and analyze the beams by matrix methods.
5. **Sketch** the influence diagrams for indeterminate structures.

UNIT – I

Two Hinged Arches: Introduction – Classification of Two hinged Arches – Analysis of two hinged parabolic arches – Secondary stresses in two hinged arches due to temperature and elastic shortening of rib.

Moment Distribution Method - Analysis of continuous beams with and without settlement of supports using - Analysis of Single Bay Single Storey Portal Frames including side Sway - Shear force and Bending moment diagrams, Elastic curve.

UNIT – II

Kani's Method: Analysis of continuous beams including settlement of supports - Analysis of single bay single storey and single bay frames including Side Sway using Kani's Method - Shear force and bending moment diagrams - Elastic curve.

Cables and suspension bridges: Equilibrium of a Suspension Cable subjected to concentrated loads and uniformly distributed loads - Length of a cable - Cable with different support levels - Suspension cable supports - Suspension Bridges - Analysis of Three Hinged Stiffening Girder Suspension Bridges.

UNIT – III

Matrix Methods - Flexibility Matrix Method: Introduction to Flexibility matrix methods of analysis; Analysis of continuous beams including settlement of supports ; Analysis of pin-jointed determinate plane frames

UNIT – IV

Matrix Methods - Stiffness Matrix Method:: Introduction to Stiffness matrix methods of analyses using 'system approach' up-to three degree of indeterminacy – Analysis of continuous beams including settlement of supports- Analysis of pin-jointed determinate plane frames ; Analysis of single bay single storey portal frames using stiffness method - Shear force and bending moment diagrams - Elastic curve.

UNIT- V

Influence Lines for Indeterminate Beams: Introduction — Influence line diagram for shear force and bending moment for two span continuous beam with constant and different moments of inertia - influence line diagram for shear force and bending moment for propped cantilever beams.

TEXT BOOKS:

1. Structural Analysis Vol –I &II by Vazarani and Ratwani, Khanna Publishers.
2. Structural Analysis Vol I & II by G.S. Pandit S.P. Gupta Tata McGraw Hill Education Pvt. Ltd.
3. Indeterminate Structural Analysis by K.U. Muthu et al., I.K. International Publishing House Pvt.Ltd

REFERENCE BOOKS:

1. Structural analysis T. S Thandavamoorthy, Oxford university Press
2. Mechanics of Structures Vol –II by H.J. Shah and S.B. Junnarkar, Charotar Publishing HousePvt. Ltd.
3. Basic Structural Analysis by C.S. Reddy., Tata McGraw Hill Publishers.
4. Examples in Structural Analysis by William M.C. McKenzie, Taylor & Francis.
5. Structural Analysis by R. C. Hibbeler, Pearson Education
6. Structural Analysis by Devdas Menon, Narosa Publishing House.
7. Advanced Structural Analysis by A.K. Jain, Nem Chand & Bros.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
V Semester Syllabus
CE502PC: Geotechnical Engineering

Course Objectives:

The objectives of the course are to :

1. Understand the formation of soil and classification of the soils.
2. Characterize the Index & Engineering Properties of Soils.
3. Determine the flow characteristics & stresses due to externally applied loads.
4. Estimate the consolidation properties of soils.
5. Determine the shear strength parameters.

Course Outcomes:

After the completion of the course, the student will be able to:

1. **Characteriz**e and classify the soils.
2. **Estimate** seepage, stresses under various loading conditions.
3. **Assess** the stress distribution in soils and **illustrate** the mechanism of laboratory and field compaction characteristics.
4. **Analyze** the compressibility and consolidation of soils.
5. **Assess** the strength of soils for various drainage conditions under shear loading.

UNIT – I

Introduction: Soil formation and structure – moisture content – Mass, volume relationships – Specific Gravity- Field density by core cutter and sand replacement methods-Relative density.

Index Properties of Soils: Grain size analysis – consistency limits and indices – I.S. Classification of soils.

UNIT –II

Permeability: Soil water – capillary rise – flow of water through soils – Darcy's law- permeability – Factors affecting permeability – laboratory determination of coefficient of permeability –Permeability of layered soils.

Effective Stress & Seepage through Soils: Total, neutral and effective stress – principle of effective stress - quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.

UNIT –III

Stress Distribution in Soils: Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.

Compaction: Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.

UNIT – IV

Consolidation: Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log(p) curves — normally consolidated soil, over consolidated soil and under consolidated soil – pre-consolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods - computation of total settlement and time rate of settlement.

UNIT - V

Shear Strength of Soils: Importance of shear strength – Mohr-Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions – strength envelops – Shear strength of sands - dilatancy – critical void ratio, Introduction to stress path method.

TEXT BOOKS:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & A. S. R. Rao, 2nd Edition, New age International Publishers, 2006
2. Soil Mechanics and Foundation Engineering by V. N. S. Murthy, CBS Publishers & Distributors/Alkem Company (S), 2011
3. Principals of Geotechnical Engineering by Braja, M. Das, Cengage Learning Publishers, 10th Edition, 2020

REFERENCE BOOKS:

1. An Introduction to Geotechnical Engineering by R. D. Holtz, W. D. Kovacs, and Thomas Sheahan, Pearson, 2nd edition (2011).
2. Geotechnical Engineering by C. Venkataramiah, New age International Pvt. Ltd, (2002).
3. Geotechnical Engineering Principles and Practices by Coduto and M. Y. Ronald, Pearson 2nd edition (2010).
4. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata McGraw-Hill Publishers NewDelhi (2017).
5. Foundation Engineering by P.C. Varghese, PHI (2005).

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
V Semester Syllabus
CE503PC: Structural Engineering I (RCC)

Course Objectives:

The objectives of the course are to :

1. Identify the basic components of any structural system and the standard loading for the RC structure
2. Identify and tell the various codal provisions given in IS. 456
3. Describe the salient feature of limit state method, compare with other methods and the concepts of limit state
   of collapse and limit state of serviceability
4. Evaluate the behavior of RC member under flexure, shear and compression, torsion and bond.

Course Outcomes:

After the completion of the course, the student will be able to:

1. **Summarize** the fundamental concepts of limit state method and **Design** of RC sections under flexure.
2. **Design** of RC beams for Shear, Torsion and bond.
3. **Design** and detailing of Reinforced concrete Slabs- Limit state of collapse and serviceability
4. **Design** of Reinforced concrete columns.
5. **Design** and detailing of isolated and combined footings.

UNIT- I

Introduction- Structure - Components of structure - Different types of structures - Equilibrium and compatibility– Safety and Stability - Loads – Different types of Loads – Dead Load, Live Load, Earthquake Load and Wind Load– Forces – What is meant by Design? – Different types of materials – RCC, PSC and Steel – Planning of structural elements- Concepts of RCC Design – Different methods of Design- Working Stress Method and Limit State Method .

Limit state method: Load combinations - Materials - Characteristic Values – Partial safety factors – Behavior and Properties of Concrete and Steel- Stress Block Parameters as per IS 456 -2000-Behavior of RC section under flexure-, Design of Singly and Doubly Reinforced rectangular sections- Detailing of reinforcement

UNIT-II

Limit state of flexure: Limit state Analysis and design of T and L-sections, – Detailing of reinforcement

Design for Shear, Bond and Torsion - Mechanism of shear and bond failure - Design for shear using limit state concept – Design for Bond –Anchorage and Development length of bars - Design of sections for torsion - Detailing of reinforcement

UNIT-III

Design of Slabs: Design of Two-way slabs with different end conditions, one-way slab, and continuous slab Using I S Coefficients -Limit state design for serviceability for deflection, cracking and codal provisions.

UNIT-IV

Design of Compression Members: Design of compression members - Short and Long Columns - Columns with axial loads, uni-axial and bi-axial bending – Use of design charts- I S Code provisions.

UNIT-V

Design of Footings: Different types of footings –Design of flat isolated square, rectangular, circular footings and combined footings for two columns.

TEXT BOOKS:

1. Limit State Design of Reinforced concrete-Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain, Limit
   State Design of Reinforced concrete, Laxmi, publications Pvt. Ltd. 2007
2. Reinforced Concrete Design-Krishna Raju N. and PraneshR.N.,Reinforced Concrete Design, New age International Publishers, 2018
3. Design of Reinforced Concrete Foundations – P.C. Varghese Prentice Hall of India.

REFERENCE BOOKS:

1. Reinforced Concrete Design-Unnikrishna Pillai S. &Devdas Menon , Tata McGraw Hill, Third edition, 2017.
2. Fundamentals of Reinforced concrete design by M. L. Gambhir, Prentice Hall of India Pvt.Ltd.
3. Design of Reinforced Concrete Structures by N.Subramanian, Oxford University Press.
4. Design of concrete structures by J.N. Bandhyopadhyay PHI Learning Private Limited.
5. Design of Reinforced Concrete Structures by I. C. Syal and A. K. Goel, S. Chand & company.
6. Karve & Shah, Limit state theory & design of Reinforced concrete (IS 456 :2000), Standard Publishers
   2014.

CODE BOOKS:

1. IS 456 : 2000-Plain and Reinforced Concrete - Code of Practice, BIS, New Delhi
2. IS 875-1 (1987): Code of practice for design loads (other than earthquake) for buildings and structures,
   BIS, New Delhi
3. IS 875-2 (1987): Code of Practice for Design Loads (Other Than Earthquake) for buildings and structures,
   BIS, New Delhi
4. SP-16- Design Aids for Reinforced Concrete, BIS, New Delhi

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
V Semester Syllabus
CE504PC: Transportation Engineering

Course Objectives:

The objectives of the course are :
This course aims at providing a comprehensive insight of various elements of Highway transportation engineering. Topics related to the highway development, characterization of different materials needed for highway construction, structural and geometric design of highway pavements along with the challenges and possible solutions to the traffic related issues will becovered as a part of this course

Course Outcomes:

After the completion of the course, the student will be able to:

1. **Apply** the knowledge of mathematics, science and engineering in the areas of traffic engineering, highway development and maintenance
2. **Apply** engineering knowledge in the area of geometric design of highways
3. **Design** and conduct surveys in area of Traffic & Transportation engineering for efficient design of facilities.
4. **Characterize** the materials used in pavements viz. flexible and rigid highway pavements.
5. **Design** flexible and rigid highway pavements for varying traffic compositions as well as soil sub-grade and environmental conditions using the standards stipulated by Indian Roads Congress.

UNIT –I

Introduction: History and Importance of Highways, Characteristics of road transport, Current road development plans in India, Highway development in India, Highway planning, Highway alignment, Engineering surveys for Highway alignment, Highway projects, Highway drawings and reports, Detailed Project Report preparation, PPP schemes of Highway Development in India, Government of India initiatives in developing the highways and expressways in improving the mobility and village road development in improving the accessibility.

UNIT – II

Introduction to Highway Geometric Design: Introduction to Highway Geometric Design; Width of Pavement, Formation and Land, Cross Slopes etc; Concept of Friction: Skid and Slip; Elements of geometric design of highways; Sight Distances: Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Horizontal alignment: Design of horizontal curves, super elevation, extra widening of pavement at curves, Transition curves; Vertical Alignment: Gradients, Compensation in Gradient, Design of summit curves and valley curves using different criteria; Integration of Horizontal and Vertical Curves

UNIT – III

Basic Traffic Characteristics: Basic traffic characteristics: Speed, volume and concentration, relationship between flow, speed and concentration; Highway capacity and Level of service (LOS) concepts: Factors affecting capacity and LOS, relationship between V/C ratio and LOS; Traffic Studies - Traffic volume and spot speed studies: Methods; Road Safety; Traffic Signals: Types, warrants for signalization, design of isolated traffic signal by IRC method; Parking and road accidents: Types of parking facilities – On-street and off street, introduction to parking studies; Accident studies, road safety auditing; Introduction to street lighting; Road Intersections: Design considerations of at-grade intersections, introduction to interchanges

UNIT – IV

Tests on Soils : CBR, Field CBR, modulus of sub-grade reaction, Tests on Aggregates: specific gravity, shape (flakiness and elongation indices), angularity number, water absorption, impact, abrasion, attrition, crushing resistance, durability (weathering resistance), stone polishing value of aggregates; Tests on bitumen: spot, penetration, softening point, viscosity, ductility, elastic recovery, flash and fire points, Introduction to modified bituminous binders like crumb rubber modified, natural rubber modified and polymer modified bitumen binders; Bituminous Concrete: Critical parameters controlling bituminous concrete mixture design, aggregate blending concepts viz. Rothfuch's method, trial and error procedure. Introduction to advanced concretes for road applications.

UNIT – V

Introduction to Pavement Design: Types of pavements and their typical cross sections: flexible, rigid and composite; Flexible Pavement analysis and design: Introduction to multi layered analysis, IRC 37 2012 method of flexible pavement design; Rigid pavement analysis and design: Factors controlling rigid pavement design, types of stresses in rigid pavements, critical load positions, load stresses and temperature stresses in interior, corner and edge locations of jointed plain cement concrete pavement slabs, IRC 58-2015 method of rigid pavement design; Overlay Designs: Types of overlays on flexible and rigid pavements.

TEXT BOOKS:

1. Khanna, S.K, Justo, A and Veeraragavan, A, 'Highway Engineering', Nem Chand & Bros. Revised Tenth Edition, 2014
2. Kadiyali L.R. and Lal N B, Principles and Practices of Highway Engineering; Seventh Edition, Khanna Publishers, New Delhi, 2018

REFERENCE BOOKS:

1. Papacoastas,C. S. and Prevedouros, Transportation Engineering and Planning, Third Edition, Third Impression; Pearson Education, 2018.
2. Khisty C J and Lall B Kent; Transportation Engineering: An Introduction, Third Edition, 1st Indian Adaptation; Pearson India Education Service Pvt. Ltd, New Delhi 2017.
3. Subhash C Saxena, Text Book of Highway and Traffic Engineering; First Edition; CBS Publishers and Distributors. New Delhi, 2014.
4. Venkatramaiah C, Transportation Engineering Volume 1 – Highway Engineering, 1st Edition, Universities Press, 2016.
5. Garber, N.J. and Hoel, L.A. Traffic and Highway Engineering, Fourth Edition; Cengage, Learning, Stamford, CT, USA, 2010.
6. Partha chakroborty and Animesh Das, Principles of Transportation Engineering, PHI, 2013.
7. Nicholas J Garber and Lester A Hoel, Traffic and Highway Engineering, 5th Edition, Cengage.

CODE BOOKS:

1. IRC 37-2018 Guidelines for the Design of Flexible Pavements, 4th Revision, 2018.
2. IRC 58-2015, Guidelines for the Design of plain jointed rigid pavements for Highways, 4th Revision, 2015.
3. IRC 81-1997, Guidelines for strengthening of flexible road pavements using Benkelman Beam Deflection Technique, 1st Revision, 1997.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
V Semester Syllabus
CE505PC: Hydrology and Water Resources Engineering

Course Objectives:

The objectives of the course are to :
This course provides the description of hydrological cycle and derive various formulas used estimation of different basic components of surface and Ground water cycle and its components.
Further it will explain the water requirement for irrigation and connectivity of hydrology to the field requirement.

Course Outcomes:

After the completion of the course, the student will be able to:

1. **Demonstrate** Hydrologic cycle and its applications and **Analyze** hydro-meteorological data.
2. **Discuss** various abstractions from precipitation.
3. **Formulate** rainfall-runoff equations and **Interpret** hydrograph and its analysis.
4. **Determine** the yield of wells and **Evaluate** duty, delta and irrigation efficiencies**.**
5. **Design** alluvial canals and **compute** design discharge over a catchment.

UNIT – I

Introduction: Concepts of Hydrologic cycle, Applications of Hydrologic cycle in Engineering.

Precipitation: Forms of precipitation, characteristics of precipitation in India, measurement of precipitation: Recording and non-recording types, rain gauge network: mean precipitation over an area by various methods, Missing Rainfall Data – Estimation, Consistency of Rainfall records, depth area-duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP),rainfall data in India.

UNIT – II

Abstractions from Precipitation: Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations: Penman and Blaney & Criddle Methods, potential evapotranspiration over India, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modeling infiltration capacity, classification of infiltration capacities, infiltration indices.

UNIT – III

Runoff: Components of Runoff, Factors affecting runoff, Basin yield, Flow duration curves, Mass curve of runoff –Analysis.

Hydrographs: Hydrograph –Distribution of Runoff–Hydrograph Analysis, Flood Hydrograph–Effective Rainfall–Base Flow- Base Flow Separation, Unit Hydrograph, definition, limitations and applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa - S-hydrograph. conversion from one unit duration to other unit duration..

UNIT – IV

Groundwater Hydrology: Occurrence, movement and applications of groundwater, aquifers – types, Specific Yield, Permeability, Storage coefficient, Transmissibility, Darcy's Law.

Well Hydraulics: - Steady radial flow into well for confined and unconfined aquifers, yield of an open well Recuperation test.

Crop Water Requirements: Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.

UNIT – V

Canal Systems: Classification of canals under various considerations, alignment of canals, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Regime channels, Kennedy's and Lacey's theory of regime channels. Water logging: causes, effects and remedial measures. Lining of canals- Types of lining-Advantages and disadvantages of canal lining.

TEXT BOOKS:

1. Santhosh KumarGarg , Irrigation Engineering and Hydraulic structures, KhannaPublishers.2006
2. Punmia B.C &Lal, Irrigation and Water Power Engineering, Laxmi publications Pvt.Ltd, New Delhi.,2016
3. Jaya Rami Reddy. P, Engineering Hydrology ,LaxmiPublications,2011
4. K.R. Arora, Irrigation, Water Power and Water Resources Engineering, Standard Publishers Distributors,2010

REFERENCE BOOKS:

1. Singh V.P. Elements of Engineering Hydrology ,TataMcGraw-Hill,2009
2. Asawa G L, Irrigation Engineering, Wiley Eastern Publications,2005
3. David Keith Todd , Ground water Hydrology, John Wiley & Son, NewYork,2004
4. Duggal K.N. and SoniJ.P. ,Elements of Water Resources Engineering ,New Age International,2016

L	T	P	C
3	0	0	3

B. Tech. V Semester
MS501HS: Business Economics and Financial Analysis
(Common to CIVIL, EEE, MEC, ECE, MCT, MME & CSE (AI & ML))

Course Objectives: The Objective of the course are:

1. Students will understand various forms of Business and the impact of economic variables on the business, concepts of Business Economics and its significance.
2. Gain the knowledge on various market dynamics namely Demand, elasticity of demand, and demand forecasting.
3. To disseminate the knowledge on production function, Laws of production, Market structures, while dealing with the concept of cost and breakeven analysis.
4. To acquaint the students regarding Accounting and various books of accounts.
5. To enable the students to analyze a company's financial statements through ratios and come to a reasoned conclusion about the financial situation of the company.

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

1. Select a suitable business organization with available resources.
2. Analyze various aspects of Demand, Elasticity of demand and Demand Forecasting.
3. Gain knowledge on different market structures, production theories, cost variables and pricing methods.
4. Prepare Books of accounts and Financial Statements.
5. Analyze financial well-being of the business while using ratios.

UNIT – I
Introduction to Business and Economics

Economics: Significance of Economics, Micro and Macro Economic Concepts, National Income - Concepts and Importance, Inflation, Business Cycle - Features and Phases.

Business: Structure of Business Firm, Types of Business Entities – Sole Proprietorship – Partnership – Cooperative Societies - Limited Liability Companies, Sources of Capital – Conventional sources and Non - Conventional Sources of Finance.

Business Economics: Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT – II
Demand and Supply Analysis

Demand Analysis: Demand - Meaning, Determinants of Demand, Law of Demand, Exceptions of Law of Demand, Demand Function, Changes in Demand – Increase and decrease in Demand - Extension and Contraction in Demand.

Elasticity of Demand: Elasticity – Meaning, Types of Elasticity – Price Elasticity – Income Elasticity – Cross Elasticity–Advertising Elasticity of Demand, Factors affecting Elasticity of Demand, Measurement and Significance of Elasticity of Demand, Elasticity of Demand in decision making.

Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting – Survey methods, Statistical methods.

Supply Analysis: Supply – Meaning, Determinants of Supply, Supply Function & Law of Supply.

UNIT III

Production, Cost, Market Structures & Pricing

Production Analysis: Production – Meaning, Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Cobb-Douglas production function.

Cost analysis: Cost–Meaning, Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

Pricing: Pricing -Meaning, Objectives of pricing, pricing methods – Cost based pricing methods – Demand based pricing methods – Competition based pricing methods – Strategy based pricing methods - Product Life Cycle based Pricing, Break Even Analysis (simple problems), Cost Volume Profit Analysis.

UNIT IV

Financial Accounting

Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts along with adjustments– Trading account – Profit and loss account – Balance sheet (simple problems).

UNIT – V

Financial Analysis through Ratios

Concept of Ratio Analysis, Importance, Liquidity Ratios- Current Ratio – Quick Ratio – Absolute Liquid Ratio, Profitability Ratios – Gross Profit Ratio – Net Profit Ratio – Operating Ratio, Turnover Ratios – Stock Turnover Ratio – Debtors Turnover Ratio – Creditors Turnover Ratio, Leverage Ratios – Debt-to-Assets Ratio - Debt-Equity Ratio - Proprietary Ratios and interpretation (simple problems).

TEXT BOOKS:

1. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury,"Managerial Economics", 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.
2. Dhanesh K Khatri, "Financial Accounting", Tata McGraw Hill, 2011.
3. Ramachandra Aryasri. A, "Business Economics and Financial Analysis", McGraw Hill Education India Pvt. Ltd. 2020.

REFERENCE BOOKS:

1. P. L. Mehta, Managerial Economics, Analysis, Problems & Cases, 8th Edition, Sultan Chand & Sons, 2001.
2. S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.
3. D.D. Chaturvedi, S.L. Gupta, "Business Economics - Theory and Applications", International Book House Pvt. Ltd. 2013.

L	T	P	C
0	0	2	1

B.Tech in Civil Engineering
V Semester Syllabus
CE551PC: Transportation Engineering Laboratory

Course Objectives:

The objectives of the course are :

1. To learn laboratory tests and their procedures for coarse aggregate.
2. To learn laboratory tests and their procedures for bitumen and bituminous mixes.
3. To learn the art of making laboratory reports based on experimental observations.

Course Outcomes:

After the completion of the course, the student will be able to:

1. **Categorize** and grade the aggregates used in pavement construction.
2. **Examine** the tests performed for bitumen and bituminous mixes.
3. **Organize** traffic surveys and analyze the data for solving traffic engineering problems

LIST OF EXPERIMENTS:

I. Tests on Aggregates

1. Shape (Flakiness and elongation indices)
2. Impact Test.
3. Los angeles abrasion test.
4. Crushing Value Test.

II. Tests on Bitumen and Bituminous Mixes

5. Penetration Test and Softening point Test.
6. Ductility & Elastic Recovery Test.
7. Viscosity Test
8. Flash and Fire Point (Demo)
9. Marshall's Stability sample preparation. (Demo)
10. Marshall's Stability sample testing (Demo)

III. Traffic Lab

11. Volume Studies at Mid blocks
12. Volume Studies at Intersections
13. Speed Studies using Spot Speed
14. Parking Studies
15. Road safety Audit with respect to Geometric design (video demonstration only)

TEXT BOOK:

Khanna S.K, Justo C.E.G. and A. Veeraraghavan, Highway Material Testing manual, Nemchand Brothers.

CODE BOOKS:

1. IS 1201 -1220 (1978) "Methods for testing tars and bituminous materials".
2. IS 73: 2013 Specification for Paving grade bitumen.
3. IS 2386 Part IV – Methods of Test for Aggregates for Concrete.
4. IRC SP 53 -2010 "Guidelines on use of modified bitumen".
5. MS-2 Manual for Marshalls Mix design 2002.

L	T	P	C
0	0	2	1

B.Tech in Civil Engineering
V Semester Syllabus
CE552PC: Geotechnical Engineering Laboratory

Course Objectives:

The objectives of the course are :

1. To obtain index and engineering properties of locally available soils.
2. To understand the behavior of these soil under various loads.
3. To determine field density of soils

Course Outcomes:

After the completion of the course, the student will be able to:

1. **Classify** the soils and assess physical & flow properties.
2. **Assess** the compaction and consolidation behavior of the soils subjected to loads.
3. **Assess** the strength of soils in compression & shear and determine the swelling properties.

LIST OF EXPERIMENTS:

1. Atterberg Limits (Liquid Limit, Plastic Limit, and Shrinkage Limit)
2. a) Field density by core cutter method and
   b) Field density by sand replacement method
3. Determination of Specific gravity of soil and Grain size distribution by sieve analysis
4. Permeability of soil by constant and variable head test methods
5. Standard Proctor's Compaction Test
6. Determination of Coefficient of consolidation (square root time fitting method)
7. Unconfined compression test
8. Direct shear test
9. Vane shear test
10. Differential free swell index (DFSI) test

REFERENCE BOOKS:

1. Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International, 2002.
2. Manual of Soil Laboratory Testing, K. H., Head, CRC Press, 2006, 3rd Edition.

L	T	P	C
3	0	0	0

B.Tech V Semester
*MC502ES: Artificial Intelligence

(Common to all branches except CSE, IT, CSBS, CSE(AI&ML))

Course Objectives:

- To train the students to understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation, reasoning.
- Study of Markov Models enable the student readyto step into applied AI.

UNIT - I

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents **Basic Search Strategies**: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

UNIT - II

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning

Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

UNIT - III

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Non-monotonic Reasoning, Other Knowledge Representation Schemes

Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

UNIT - IV

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

UNIT - V

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

TEXT BOOK:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009

REFERENCE BOOKS:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice-Hall, 2010.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VI Semester Syllabus
CE601PC: Environmental Engineering

Course Objectives:

The objectives of the course are to:

1. Design and safely distribute potable water to the consumers.
2. Learn Treatment, and dispose wastewater safely into the environment.

Course Outcomes:

After the completion of the course, the student will be able to:

1. **Assess** the water demand through forecasting methods.
2. **Describe** the stages in waste water treatment process.
3. **Assess** characteristics of water and wastewater.
4. **Design** components of water and wastewater treatment plants.
5. **Classify** types of air pollutants and their control.

UNIT – I

Introduction: Waterborne diseases – protected water supply – Population forecasts, design period – types of water demand – factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards: sources of water - Comparison from quality and quantity and other considerations – intakes – infiltration galleries.

UNIT – II

Layout and general outline of water treatment units: Sedimentation – principles – design factors – coagulation-flocculation clarifier design – coagulants - feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation - comparison of filters – disinfection – theory of chlorination, chlorine demand - other disinfection practices–Design of distribution systems–pipe appurtenances.

UNIT - III

Characteristics of sewage :Waste water collection–Estimation of waste water and storm water – decomposition of sewage, examination of sewage – B.O.D. Equation – C.O.D. Design of sewers – shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – plumbing requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing **–** ultimate disposal of sewage – sewage farming –self-purification of rivers.

UNIT – IV

Waste water treatment plant : Flow diagram - primary treatment Design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – Biological treatment – trickling filters – ASP– Construction and design of oxidation ponds. Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.

UNIT – V

Air pollution: Classification of air pollution– Effects air pollution–Global effects–Meteorological parameters affecting air pollution–Atmospheric stability–Plume behavior –Control of particulates — Gravity settlers, cyclone filters, ESPs–Control of gaseous pollutants–automobile pollution and control.

TEXT BOOKS:

1. Environmental Engineering by H. S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw Hill Education (India) Pvt Ltd, 2014
2. Environmental Engineering by D. P. Sincero and G.ASincero, Pearson 2015.
3. Environmental Engineering, I and II by BC Punmia, Std. Publications.
4. Environmental Engineering, I and II by SK Garg, Khanna Publications.
5. Environmental Pollution and Control Engineering CS Rao, Wiley Publications

REFERENCE BOOKS:

1. Water and Waste Water Technology by Steel, Wiley
2. Wastewater engineering by Metcalf and Eddy, McGraw Hill, 2015.
3. Water and Waste Water Engineering by Fair Geyer and Okun, Wiley, 2011
4. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr. Wiley, 2007.
5. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
6. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
7. Integrated Solid Waste Management, Tchobanoglous, Theissen& Vigil. McGraw HillPublication

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VI Semester Syllabus
CE602PC: Foundation Engineering

Course Objectives:

The objectives of the course are to:

1. Plan and execute the Soil exploration program for civil Engineering Projects.
2. Analyse the stability of slopes.
3. Determine the lateral earth pressures and design retaining walls.
4. Determine the Bearing capacity of Soils for design of foundations.
5. Design pile foundation.

Course Outcomes:

After the completion of the course, the student will be able to:

1. **Illustrate** the principles and methods of Geotechnical Exploration.
2. **Assess** the stability of slopes.
3. **Calculate** lateral earth pressures and check the stability of retaining walls.
4. **Analyze** and **Design** shallow foundations.
5. **Analyze** and **Design** deep foundations.

UNIT - I

Soil Exploration: Need – methods of soil exploration – boring and sampling methods –penetration tests – plate load test– planning of soil exploration program, Bore logs and preparation of soil investigation report.

UNIT - II

Slope Stability: Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish slip circle method, method of slices, Bishop's Simplified method of slices – Taylor's Stability Number- stability of slopes of earth dams under different conditions.

UNIT - III

Earth Pressure Theories: Active, Passive and at rest soil pressures Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory.

Retaining Walls: Types of retaining walls – stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity, filter material for drainage.

UNIT - IV

Shallow Foundations: Types - choice of foundation – location and depth - safe bearing capacity – shear criteria – Terzaghi's, and IS code methods - settlement criteria – allowable bearing pressure based on SPT N value and plate load test.

UNIT - V

Pile Foundation: Types of piles – load carrying capacity of piles based on static pile formulae – dynamic pile formulae – Pile Capacity through SPT results - pile load tests - load carrying capacity of pile groups in sands and clays – Settlement of pile groups – negative skin friction.

TEXT BOOKS:

1. Gopal Ranjan & Rao ASR, Basic and Applied Soil Mechanics, New ageInternational Pvt. Ltd, New Delhi
2. Braja M, Das, Principals of Geotechnical Engineering, Cengage Learning Publishers.
3. Arora K.R., Soil Mechanics and Foundation Engg. 2020, Standard Publishers and distributors, Delhi.

REFERENCE BOOKS:

1. VNS Murthy (2018), Soil Mechanics and Foundation Engineering, CBS Publishers and Distributors.
2. Cuduto, Geotechnical Engineering Principles and Practices, PHI International.
3. Swami Saran,Analysis and Design of Substructures, Oxford and IBH Publishing company Pvt Ltd
4. S. K.Gulhati& Manoj Datta, Geotechnical Engineering ,Tata Mc.Graw Hill Publishing company New Delhi. 2005.
5. Bowles, J.E., (1988) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishing company, New York.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VI Semester Syllabus
CE603PC: Structural Engineering -II (Steel Structures)

Course Objectives:

The objectives of the course are to:

1. **Explain** the mechanical properties of structural steel, plasticity, yield.
2. **Describe** the salient features of Limit State Method of design of Steel structures.
3. **Identify** and **explain** the codal provisions given in IS. 800.
4. **Analyze** the behaviour of steel structures under tension, compression and flexure.
5. **Design** the tension, compression, flexural members and plate girder
6. Design the connection in steel structure, build - up member and (bolted and welded)

Course Outcomes:

After the completion of the course, the student will be able to:

1. **Assess** the properties of steel used in constructions and Design connections.
2. **Analyz**e the tension members, compression members.
3. Carry out Plastic **Analysis** of member and **Design** beams. .
4. **Analyze** and Design the Plate girders and connections.
5. **Design** industrial truss structures and their members.

UNIT – I

Materials: Types of structural steel – Mechanical properties of steel – Concepts of plasticity – yield strength - Loads and Stresses – Local buckling behavior of steel. Concepts of limit State Design – Different Limit States – Load combinations for different Limit states - Design Strengths - deflection limits — serviceability – stability check.

Design of Connections: Different types of connections – Bolted connections – Design strength – efficiency of joint– prying action - Welded connections – Types of welded joints – Design requirements - Design of Beam- column connections - Eccentric connections - Type I and Type II connection.

UNIT – II

Design of tension members: Simple and built up members - Design strength – Design procedure for splicing - lug angle.

Design of compression members: Buckling class – slenderness ratio – Design of simple compression members
- laced – battened columns – splice – column base – slab base.

UNIT – III

Plastic Analysis: Plastic moment – Plastic section modulus - Plastic analysis of continuous beams Design of Flexural Members — Design of laterally supported beams - Bending and shearstrength/buckling – Built-up sections - Beam splice.

UNIT – IV

Design of welded plate girders: Elements – economical depth – design of main section – connections between web and flange – design of stiffeners - bearing stiffener– intermediate stiffeners – Design of web splice and flange splice.

UNIT – V

Design of Industrial Structures: Types of roof trusses - loads on trusses – wind loads - Purlin design - truss design.

TEXT BOOKS:

1. Design of steel structures by S.K. Duggal, Tata McGraw-Hill publishers, 2000, 2nd Edition.
2. Design of steel structures by N. Subramanian, Oxford University press, 2008.
3. Design of steel structures by K.S. Sairam, Pearson Educational India, 2nd Edition, 2013.

REFERENCE BOOKS:

1. Design of steel structures by Edwin H. Gayrold and Charles Gayrold, Tata McGraw hill publishers, 1972
2. Design of steel structures by L.S. Jaya Gopal, D. Tensing, Vikas Publishing House.

CODE BOOKS:

1. IS 800 (2007): General Construction in Steel - Code of Practice
2. IS 875-1 (1987):Code of Practice for Design Loads (other than earthquake) for buildings and structures
3. IS 875-2 (1987): Code of Practice for Design Loads (other than earthquake) for buildings and structures.
4. IS 875-3 (1987):Code of Practice for Design Loads (other than earthquake) for buildings and structures.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VI Semester Syllabus
CE611PE: Green Building Technologies
(Professional Elective-I)

Course Objectives:

The objectives of the course are :

1. To learn about the environmental Implications of building construction materials.
2. To learn about suitable Industrial waste materials including Biomass materials that can be usedas construction material for various Infra Projects.
3. To understand Thermal characteristics and heat flow characteristics of building materials.
4. To study about the non-conventional energy resources like solar energy and different casestudies.
5. To learn about management of water, solid and sewage.

Course Outcomes:

After the completion of the course, the student will be able to:

1. **Recognize** the implications of conventional buildings.
2. **Identify** the role of recyclable materials and Renewable Energy systems.
3. **Analyze** various types of thermal related issues in buildings. .
4. **Investigate** for the use of solar energy systems in buildings.
5. **Identify** the need for the utilization of green composites and waste management.

UNIT- I

Introduction: Environmental implications of buildings energy, carbon emissions, water use, waste Disposal

Buildingmaterials: sources, methods of production and environmental Implications, Green cover and built environment.

UNIT- II

Implications of Resources: Implication of resources for Building Materials and alternative concepts. Recycling of Industrial and Building Wastes. Biomass Resources for buildings.

UNIT- III

Comforts in Building: Thermal Comfort in Buildings-Issues; Heat Transfer Characteristics of Building Materials and Building Techniques, Incidence of Solar Heat on Buildings.

UNIT- IV

Energy Conservation: Utility of Solar energy is buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling, Case studies of Solar Passive Cooled and Heated Buildings.

UNIT- V

Green Composites for Buildings: Concepts of Green Composites, Water Utilization in Buildings.

Waste Management: Low Energy Approaches to Water Management, Management of Solid Wastes, Management of Sullage water and Sewage.

TEXT BOOKS:

1. K.S. Jagadish, B.U. Venkatarama Reddy and K.S. Nanjundarao. Alterative Building Materials and Technologies. New Age International, 2007.
2. Michael Bauer, Peter Mosle and Michael Schwarz "Green Building-Guide book for Sustainable Architecture "Springer, 2010.

REFERENCE BOOKS:

1. Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill, 2010.
2. Michael F. Ashby Materials and the Environment, Elsevier, 2009.
3. Jerry Yudelson Green building Through Integrated Design McGraw Hill, 2009.
4. Mili M.Ajumdar (Ed) Energy Efficient Building in India. Teri and Mnes, 2001/2002
5. Low Energy Cooling for Sustainable Buildings John Wiley and Sons Ltd. 2009.
6. Green My Home': 10 Steps to Lowering Energy Costs and Reducing Your Carbon Footprint by Dennis.
7. C. Brewer, ISBN: 97814227798411, Publisher: Kaplan Publishing. Publications Date
8. B. Givoni Man, Climate and Architecture Elsevier, 1969.
9. T. A Markus and E. N. Morris Buildings Climate and Energy. Pitman, London Arvindkishan etal (Ed)

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VI Semester Syllabus
CE612PE: Geomatic Applications in Civil Engineering
(Professional Elective-I)

Course Objectives:

The objectives of the course are to:

1. Know the concepts of Remote Sensing, its interpreting Techniques and concepts of Digitalimages.
2. Know the concept of Geographical Information System (GIS), coordinate system GIS Data andits types
3. Understand the students managing the spatial Data Using GIS.
4. Understand Implementation of GIS interface for practical usage.

Course Outcomes:

After the completion of the course, the student will be able to:

1. **Describe** different concepts and terms used in Remote Sensing and its data.
2. **Illustrate** the Data conversion and Process in different coordinate systems of GIS interface.
3. **Evaluate** the role of spatial data base in GIS and illustrate the importance of raster and vector data.
4. **Evaluate** different methods of spatial data entry and geo spatial analysis.
5. **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.

UNIT- III

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- IV

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- V

Applications: Land use and landcover mapping determination of crop characteristics, ground water potential identification, pollutant mapping, snow mapping, rainfall runoff modelling, soil erosion, soil classification, water shed prioritization, solid waste collection, water supply.

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, Wiley Publishers, 2012.

REFERENCE BOOKS:

1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, Wiley Publishers, 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. Sathi Kumar, N. Madhu, Pearson Education, 1st Edition, 2007.
4. Textbook of Remote Sensing and Geographical Information systems by M. Anji Reddy.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VI Semester Syllabus
CE613PE: Smart Cities Planning and Management
(Professional Elective-I)

Course Objectives:

The objectives of the course are :

1. To introduce students on smart city basic concepts, global standards and Indian context ofsmart cities.
2. To understand smart community, smart transportation and smart buildings.
3. To understand Energy demand, Green approach to meet Energy demand and their capacities.
4. To identify Smart Transportation Technologies in cities and concepts towards smart city.

Course Outcomes:

After the completion of the course, the student will be able to

1. **Identify** key challenges in Urban Infrastructure and Indian policies on Smart Cities
2. **Describe** the principles of smart Infrastructural facilities.
3. **Identify** key issues related to smart energy demand.
4. **Describe** the smart energy grid systems in Indian Scenario.
5. **Illustrate** smart road and pavement systems.

UNIT – I

Introduction to Smart Urban Infrastructures and Smart Cities: Introduction to City Planning - Understanding Smart Cities - Dimensions of Smart Cities - Global Experience of Smart Cities Smart Cities – Global Standards and Performance Benchmarks, Practice Codes -Indian scenario - India "100 Smart Cities" Policy and Mission.

UNIT – II

Smart Cities Planning and Development: Introduction to Smart Community - Smart community concepts: Concept of Smart Community - Smart Transportation - Smart Building and Home Device - Smart Health - Smart Government - Smart Energy and Water — Cyber Security, Safety, and Privacy - Internet of Things, Block chain, Artificial Intelligence, Alternate Reality, Virtual Reality.

UNIT – III

Smart Urban Energy Systems — I: Conventional vs. Smart, City components, Energy demand, Green approach to meet Energy demand, Index of Indian cities towards smartness — a statistical analysis -Meeting energy demand through direct and indirect solar resources - Efficiency of indirect solar resources and its utility, Capacity limit for the indirect solar resources - Effectiveness in responsive environment in smart city; Smart communication using green resources.

UNIT – IV

Smart Urban Energy Systems – II: Introduction to PV technology - PV of various scale for smart city applications - Energy efficiency - Policies of Solar PV in smart domains (RPO, REC, Carbon credit, etc.) Definition - Structure of Smart Grid - Indian Perspective - Advantage & limitation - Definition, Structure of Smart Grid- Indian Perspective Advantage & limitation.

UNIT – V

Smart Urban Transportation Systems: Smart Transportation Technologies - Driverless and connected vehicles - ride sharing solutions - The "improve" pathway - The "shift" pathway – Smart Roads and Pavement systems.

TEXT BOOKS:

1. Internet of Things in Smart Technologies for Sustainable Urban Development, G. R. Kanagachidambaresan, R. Maheswar,
2. V. Manikandan, K. Ramakrishnan, Springer, 2020 2. Society 5.0: A People-centric Super-smart Society, Hitachi-UTokyo Laboratory (HUTokyo Lab), Springer, 2020 3.
3. The Routledge Companion to Smart Cities, Katharine S. Willis, Alessandro Aurigi, Routledge International Handbooks, 2020

REFERENCE BOOKS:

1. Smart Cities in Asia: Governing Development in the Era of Hyper-Connectivity YuminJoo, Yu Min Joo, Teck- Boon Tan, Edward Elgar Pub, 2020.
2. Urban Systems Design: Creating Sustainable Smart Cities in the Internet of Things Era, Yoshiki Yamagata, Perry P. J. Yang, Elsevier, 2020.
3. Smart Cities and Artificial Intelligence: Convergent Systems for Planning, Design, and Operations, Christopher Grant Kirwan, Zhiyong Fu, Elsevier. 2020.
4. P.P.Anil Kumar, Introduction to Smart Cities, 1st Ed., 2019.
5. Negin Minaei, Smart Cities, CRC Press.2022.
6. Rachna Shah, Smart Cities, CRC Press, 2022
7. Jian Bin Gao, Smart Cities, CRC Press, 2022

L	T	P	C
3	0	0	3

Open Elective for other Departments
VI Semester Syllabus
CE621OE: Disaster Preparedness and Planning Management
(**Open Elective-I**)

Course Objectives:

The objectives of the course are :

1. To understand basic concepts in Disaster Management.
2. To understand Definitions and Terminologies used in Disaster Management.
3. To understand Types and Categories of Disasters.
4. To understand the Challenges posed by Disasters.
5. To understand Impacts of Disasters Key Skills.

Course Outcomes:

After the completion of the course, the student will be able to :

1. **Illustrate** basic concepts of disasters.
2. **Classify** various types of disasters.
3. **Assess** the impacts of disasters.
4. **Evaluate** the disaster risk reduction factors and the role of legislations.
5. **Identify** the linkage between Developmental projects and Disaster vulnerability.

UNIT - I:

Introduction: Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation, disaster phenomena, events-global National & Regional.

UNIT - II

Disasters: Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, Covid 2019 in India , mountain and coastal areas, ecological fragility, coping with disaster- strategies , safety norms & survival kits.

UNIT - III

Disaster Impacts: Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters, capacity building —concepts, assessment –structural & nonstructural measures, legislative support.

UNIT - IV

Disaster Risk Reduction (DRR): Disaster management cycle — its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT - V

Disasters, Environment and Development: Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

TEXT BOOKS:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
3. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation.
4. Manual on Natural Disaster Management plans.
5. Disaster Management in India, Rajendra Kumar Pandey, SAGE Publications, TEXTS, 2020.

REFERENCE BOOKS:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority).
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003.
4. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC.

L	T	P	C
3	0	0	3

Open Elective for other Departments
VI Semester Syllabus
CE622OE: Environmental Impact Assessment
(Open Elective-I)

Course Objectives:

The objectives of the course are to:
1. Define and Classify Environmental Impacts and the terminology.
2. Understands the environmental Impact assessment procedure.
3. Explain the EIA methodology.
4. List and describe environmental audits.

Course Outcomes:

After the completion of the course, the student will be able to :
1. **Identify** the environmental attributes to be considered for the EIA study.
2. **Formulate** objectives of the EIA studies.
3. **Identify** the methodology to prepare rapid EIA.
4. **Describe** environmental legislations to mitigate negative impact.
5. **Relate** case studies in Environmental impact assessment.

UNIT- I

Introduction: The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

UNIT- II

EIA Methodologies: Environmental attributes-Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions -Construction Stage Impacts, post project impacts.

UNIT- III

Environmental Management Plan: EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief &Rehabilitation, Stipulating the conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT- IV

Environmental Legislation and Life cycle Assessment: Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for controlof noise, loss of biodiversity, solid and Hazardous waste management rules.
Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria-case studies.

UNIT- V

Case Studies: Preparation of EIA for developmental projects-Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Air ports.

TEXT BOOKS:

1. Anjaneyulu. Y and Manickam. V., Environmental Impact Assessment Methodologies, B. S. Publications, Hyderabad, 2007
2. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers 2002

REFERENCE BOOKS:

1. Jain, R.K., Urban, L.V., Stracy, G.S., Environmental Impact Analysis, Van Nostrand Reinhold Co., New York, 1991.
2. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., New York, 1996.

L	T	P	C
0	0	2	1

B.Tech in Civil Engineering
VI Semester Syllabus
CE651PC: Environmental Engineering Laboratory

Course Objectives:

The objectives of the course are to:

1. **Perform** the experiments to determine water and waste water quality.
2. **Understand** the water & wastewater sampling, their quality standards.
3. **Estimate** quality of water, wastewater, Industrial water.

Course Outcomes:

After the completion of the course, the student will be able to :

1. **Examine** the properties of water and waste water.
2. **Assess** the toxic elements in water and waste water.
3. **Compare** the water, waste water and air quality standards as prescribed by the local governments.

LIST OF EXPERIMENTS:

1. Determination of pH
2. Determination of Electrical Conductivity
3. Determination of Total Solids (Organic and inorganic)
4. Determination of Turbidity
5. Determination of Alkalinity
6. Determination of Hardness (Total, Calcium and Magnesium Hardness)
7. Determination of Chlorides
8. Determination of optimum coagulant Dosage
9. Determination of Dissolved Oxygen (Winkler Method)
10. Determination of BOD
11. Determination of COD
12. Determination of Residual Chlorine
13. Total Count
14. Noise level measurement

Note: Any 12 Experiments may be Performed.

TEXT/REFERENCE BOOKS:

1. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
2. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson / Brooks/ Cole; Second Edition 2008.
3. Peavy, H. s, Rowe, D. R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985.
4. Met Calf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.
5. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
6. Plumbing Engineering. Theory, Design and Practice, S. M. Patil, 1999
7. Integrated Solid Waste Management, Tchobanoglous, Theissen& Vigil. McGraw Hill Publication
8. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.

L	T	P	C
0	0	2	1

B.Tech in Civil Engineering
VI Semester Syllabus
CE652PC: Computer Aided Design Laboratory

Course Objectives:

The objectives of the course are to:

1. Learn the usage of any fundamental software for design.
2. Create geometries using pre-processor.
3. Analyse and interpret the results using post processor.
4. Design the structural elements.

Course Outcomes:

After the completion of the course, the student will be able to :

1. **Formulate** model the geometry of real-world structure Represent the physical model of structural element/structure
2. Perform **analysis** and Interpret from the Post processing results.
3. **Design** and detail the structural element as per IS Codes.

LIST OF EXPERIMENTS:

1. Analysis & Design of determinate beams using a software
2. Analysis & Design of indeterminate beams using a software.
3. Analysis & Design of Plane Frames.
4. Analysis & Design of space frames subjected to DL & LL.
5. Analysis & Design of residential building subjected to all loads (DL, LL, WL, EQL)
6. Analysis & Design of Roof Trusses.
7. Developing an excel template for slab design
8. Developing an excel template for foundation design
9. Detailing of RCC beam and RCC slab
10. Detailing of RCC column and RCC footing

Note: *Any 8 experiments to be conducted.*

L	T	P	C
0	0	2	1

B. Tech. VI Semester
EN651HS: Advanced English Communication Skills Laboratory
(Common to CE, ECE, EEE, ME, MCT & MME)

Introduction:

The introduction of the Advanced English Communication Skills Lab is considered essential at the B.Tech 3rd year level. At this stage, the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use appropriate English and perform the following:

1. Gathering ideas and information to organize ideas relevantly and coherently.
2. Making oral presentations.
3. Writing formal letters.
4. Transferring information from non-verbal to verbal texts and vice-versa.
5. Writing project/research reports/technical reports.
6. Participating in group discussions.
7. Engaging in debates.
8. Facing interviews.
9. Taking part in social and professional communication.

Course Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

1. Improve the students' fluency in English, with a focus on vocabulary.
2. Enable them to listen to English spoken at normal conversational speed by educated English speakers.
3. Respond appropriately in different socio-cultural and professional contexts.
4. Communicate their ideas relevantly and coherently in writing.
5. Prepare the students for placements.

Course Outcomes:

Students will be able to:

1. Enhance listening proficiency and reading comprehension and cultivate critical thinking ability.
2. Acquire essential vocabulary and develop strategic planning skills for effective technical writing and gain expertise in E-Correspondence and (N) etiquette.
3. Understand the nuances of oral skills (Speaking skills), gain competence in delivering effective presentations, employing suitable language and body language.
4. Communicate confidently in group discussions and enhance the employability skills of students.
5. Apply effective techniques and strategies for successful job interviews.

Syllabus:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Listening and Reading Comprehension:** Active Listening – Development of Listening Skills Through Audio clips - Benefits of Reading – Methods and Techniques of Reading – Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Sub-skills of reading - Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading — Reading Comprehension – Exercises for Practice.
2. **Activities on Writing Skills**: Vocabulary for Competitive Examinations - Planning for Writing – Improving Writing Skills - Structure and presentation of different types of writing – Free Writing and Structured Writing - Letter Writing –Writing a Letter of Application –Resume vs. Curriculum Vitae – Writing a Résumé **–** Styles of Résumé - e-Correspondence – Emails – Blog Writing - (N)etiquette – Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.
3. **Activities on Presentation Skills –** Dealing with Glossophobia or stage fear, starting a conversation – responding appropriately and relevantly – using the right language and body language – Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral presentations (individual and group) through JAM sessions- PPTs – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation - Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation.
4. **Activities on Group Discussion (GD):** Types of GD and GD as a part of a Selection Procedure - Dynamics of Group Discussion - myths and facts (Dos and Don'ts) of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas - GD Strategies – Exercises for Practice.
5. **Activities on Interview Skills**: Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference & Video-conference - Mock Interviews.

Suggested Books:

1. Effective Technical Communication by M Ashraf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition.
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

Reference Books:

1. Rizvi, M. Ashraf (2018). *Effective Technical Communication*. (2nded). McGraw Hill Education (India) Pvt. Ltd.
2. Suresh Kumar, E. (2015). *Engineering English.* Orient BlackSwan Pvt. Ltd.
3. Bailey, Stephen. (2018). Academic *Writing: A Handbook for International Students.* (5th Edition). Routledge.
4. Koneru, Aruna. (2016). *Professional Communication*. McGraw Hill Education (India) Pvt. Ltd.
5. Raman, Meenakshi & Sharma, Sangeeta. (2015). *Technical Communication, 3E: Principles and Practice*.Oxford University Press.
6. Anderson, Paul V. (2007). *Technical Communication***.** Cengage Learning Pvt. Ltd. New Delhi.
7. McCarthy, Michael; O'Dell, Felicity & Redman, Stuart. (2017). *English Vocabulary in Use* Series. Cambridge University Press.
8. Sen, Leela. (2009). *Communication Skills.* PHI Learning Pvt Ltd., New Delhi.
9. Elbow, Peter. (1998). *Writing with Power.* Oxford University Press.

10. Goleman, Daniel. (2013). *Emotional Intelligence*: *Why it can matter more than IQ.* Bloomsbury Publishing.
11. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
12. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
13. How to Write and Speak Better, Reader's Digest, 2003.
14. TOEFL Reading & Writing Workout, The Princeton Review.
15. How to prepare for Group Discussions and Interviews by Harimohan Prasad and Rajneesh Prasad,TataMcgrawHill.
16. Keep Talking, Frederick Klippel, Cambridge University Press, South Asian edition (6 May 2010).
17. Objective English, Edgar Thorpe & Showick Thorpe, Pearson; 5th edition (1 August 2013).
18. Communication Skills for Engineers, Sunitha Mishra, C.Murali Krishna, Pearson; 4th Edition.

****

L	T	P	C
3	0	0	0

B.Tech VI Semester Syllabus
*MC602ES – Cyber Security

(Common to all branches except CSE, IT, CSBS)

Course objectives:

1. To familiarize various types of cyber-attacks and cyber-crimes
2. To give an overview of the cyber laws
3. To study the defensive techniques against these attacks

Course Outcomes:

1. The students will be able to understand cyber-attacks, types of cybercrimes, cyber laws and how to protect them self and ultimately the entire Internet community from such attacks.

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defence, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV

Cyber Security: Organizational Implications: Introduction cost of cybercrimes and IPR issues, web Threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing, and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains-medical, financial, etc.

Cybercrime: Examples and Mini-Cases Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCE BOOKS:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

L	T	P	C
3	0	0	0

B. Tech. VI Semester
*MC601HS: Intellectual Property Rights
(Common to CIVIL, MECH, ECE, MCT & MME)

Course Objectives: The objectives of the course are:

1. To enable the students to have an overview of Intellectual Property Rights.
2. To provide comprehensive knowledge to the students regarding Trademarks Registration process and law related to it.
3. To disseminate knowledge on Copyrights, its related rights and recent developments.
4. To make the students understand Patent Regime in India and abroad.
5. To understand the framework of Trade secrets.

Course Outcomes: By the end of the course students shall:

1. Gain knowledge on Intellectual property rights and their importance.
2. Understand Indian and International Trademark Law and procedure for registration of Trademarks.
3. Acquire knowledge on Copyright Law, and the privileges awarded to the copyright owners.
4. Familiarized with the process of acquiring the patent and relevant laws.
5. Learn the importance of trade secrets for business sustainability.

UNIT – I

Introduction to Intellectual Property

Introduction of IPR-Meaning of intellectual property, types of intellectual property-trademarks, copyrights, patents, trade secrets, importance of intellectual property rights, International organizations-WTO-WIPO-USPTO-INTA, International Conventions, agencies and treaties- Paris Convention-Berne Convention- Madrid Protocol-NAFTA-PCT-GATT-TRIPS.

UNIT – II

Trademarks

Trademarks: Purpose and functions of Trademarks-Categories of marks, acquisition of trademark rights - Protectable matter - Selecting and evaluating Trademark- Trademark registration process – Trademark Infringement - Remedies for infringement of Trademarks-New developments in Trademark Law-International Trademarks Law.

UNIT III

Copyright

Copyrights-Fundamentals of Copyright Law - Requirements of Copyrightability - Originality of material, fixation of material, Authorship works, exclusions from copyright protection- Rights of Copyright Owner-Right of reproduction of copyrighted work, right to do derivative works ,right to distribute copies of the copyrighted work, right to perform the work publicly, right to display the copyrighted work, – Copyright Ownership issues – Joint Works, Works made for Hire, Specially commissioned works, Copyright Registration - Notice of Copyright – Copyright Infringement - Remedies for infringement in Copyrights-New developments in Copyright Law- International Copyright Law.

UNIT IV

Patents

Concept of Patent - Classification – Utility Patents – Design Patents and Plant Patents, Patent searching process-Types of Patent Applications-Patent Registration Process, Ownership, Transfer, Assignment and Licensing of Patent-Patent Infringement, Remedies for Infringement of Patents, New developments in Patent Law- International Patent Law.

UNIT – V

Trade Secrets & Law of Unfair Competition

Trade Secrets: Trade secret law, determination of trade secret status, measures for protecting trade secret - Liability for misappropriation of trade secrets, protection for submissions, trade secret litigation. New developments in Trade secrets Law - International Trade Secret law.

Law of Unfair Competition: Passing off, Misappropriation, Right of publicity, Dilution of trademarks, Product disparagement, False advertising, Internet Piracy.

TEXT BOOKS:

1. Deborah. E.Bouchoux, Intellectual property, Cengage learning India Pvt.Ltd., 4th edition, 2013.
2. Prabuddha Ganguli, Intellectual Property Right, Tata McGraw Hill Publishing Company, 8th edition, 2016.

REFERENCE BOOKS:

1. Richard Stim, Intellectual Property, Cengage learning India Pvt. Ltd. 3rd edition, 2017.
2. Vinod.V. Sope, Managing Intellectual Property, Asoka K. Ghosh, 2nd edition, 2010.

L	T	P	C
3	0	0	0

B.Tech. VI Semester
*MC601BS Environmental Science
(Common to all branches)

Course Objectives:

1. To understand the natural resources and their conservation.
2. To understand the importance of ecosystem, biodiversity and ecological balance for sustainable development.
3. To gain knowledge about environmental pollution, effects and controlling measures.
4. To study about global environmental problems and global issues.
5. To understand the environmental policies, regulations and sustainable development.

Course Outcomes:

After completing the course, the student will be able to:

1. Learn about different types of natural resources and take up the measures to protect the resources.
2. Get the information about ecosystem, biodiversity and their usage and conservation.
3. Get the information about the types of pollution, understand their effects and controlling measures.
4. Gain the knowledge about current global environmental issues and initiations to be taken to protect the environment.
5. Gain the knowledge about environmental acts, EIA, sustainable development and follow the rules and regulations.

UNIT - I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity.

UNIT – II

Natural Resources:

Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT - III

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In- Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, causes and effects, Ambient air quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). International conventions /Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, biomedical waste management and handling rules, hazardous waste management and handling rules.

Environmental Impact of Assessment (EIA): structure, methods of baseline data acquisition. Concepts of Environmental Management Plan (EMP).

Towards Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Environmental Education, Human health, Environmental Ethics, Concept of Green Building, Green chemistry principles, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha forUniversity Grants Commission.
2 Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHLLearning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHILearning Pvt. Ltd.
3. Environmental Studies by R. Rajagopalan, Oxford University Press.
4. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BSPublications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

L	T	P	C
2	0	0	2

B.Tech in Civil Engineering
VII Semester Syllabus
CE701PC: Quantity Survey & Valuation

Course Objectives:

The objectives of the course are to:

1. The course provides the process of estimation required for various works in building construction.
2. It provides the knowledge of using SOR & SSR for analysis of rates on various works.
3. It provides proficiency in valuation.

Course Outcomes:

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

1. **Estimate** the buildings using approximate methods.
2. **Estimate** the buildings using detailed methods of estimation.
3. **Propose** bar bending schedule for structural components of building and evaluate the earthwork for roads and irrigation canals.
4. **Evaluate** rate analysis for various items of work in buildings.
5. **Prepare** contract documents and understand the utility, purpose and concepts involved in the building valuation.

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 - rental method, direct comparison of capital cost, valuation based on profit, depreciation method.

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. Chakraborthi; 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

L	T	P	C
2	0	0	2

B.Tech in Civil Engineering
VII Semester Syllabus
CE702 PC: Project Management

Course Objectives:

The objectives of the course are:

1. To Define the structure of project management
2. To Identify different aspects of project planning
3. To Explain the importance of project finance
4. To Plan and control the project
5. To Understand the Safety rules and Principles

Course Outcomes:

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

1. **Illustrate** the principles of project management
2. **Identify** the suitable and best plan in construction projects
3. **Learn** project cost estimation
4. **Understand and plan** resource allocation and management
5. **Illustrate** the role of a project manager

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.

TEXT BOOKS:

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.

REFERNCE BOOKS:

1. K. Nagrajan, Project Management, New Age International publishers, 7e 2015.
2. Jack Gido, Jim Clements Rose Baker. Successful Project Management. Cengage Learning, 7e 2015.
3. R Pancerselvam. P. Senthil Kumar, Project Management. PHI, 2009.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VII Semester Syllabus
CE711PE: Prestressed Concrete
(Professional Elective-II)

Course Objectives:

The objectives of the course are to:
1. Understand the principles & necessity of prestressed concrete structures.
2. Know different techniques of prestressing.
3. Get the knowledge on various losses of prestress.
4. Understand Analysis and design of prestressed concrete members.

Course Outcomes:

After the completion of the course, the students will be able to:
1. **Illustrate** the evolution of process of prestressing.
2. **Identify** various prestressing techniques.
3. **Illustrate** the behaviour of prestressing members in flexure and shear.
4. **Formulate** the mechanism of transmission of stress in pre-tension members.
5. **Assess** the behavior of composite beams in prestressing and their deflections.

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 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.

TEXT BOOKS:

1. N. Krishna Raju, Prestressed concrete, Tata McGraw Hill Book – Co. NewDelhi.
2. S. Ramamrutham, Prestressed concrete, DhanpatRai& Sons,Delhi.

REFERENCE BOOKS:

1. Lin T.Y. and Burn, Design of prestress concrete structures by, John Wiley, NewYork.
2. Rajagopalan N., Prestressed Concrete, Narosa Publishing House

CODE BOOK:

IS 1343 (2012), Code of practice for Prestressed Concrete

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VII Semester Syllabus
CE712PE: Elements of Earthquake Engineering
(Professional Elective-II)

Course Objectives:

The objectives of the course are to:

1. Understand Engineering Seismology.
2. Explain and discuss single degree of freedom systems subjected to free and forced vibrations.
3. Acquire the knowledge of the conceptual design and principles of earthquake resistant designsas per IS codes.
4. Understand importance of ductile detailing of RC structures.

Course Outcomes:

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

1. **Explain** and derive fundamental equations in structural dynamics.
2. **Discuss** and explain causes and Theories on earthquake, seismic waves, measurement ofearthquakes.
3. **Evaluate** base shear using IS methods.
4. **Design** and Detail the reinforcement for earthquake forces.
5. **Assess** the ductility considerations in earth quake resistant buildings.

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 deign 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, 2016.
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd., 2013.

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. Masory 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 456:200

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VII Semester Syllabus
CE713PE: Advanced Structural Analysis
(Professional Elective-II)

Course Objectives:

The objectives of the course are to:

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

Course Outcomes :

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

1. **Analyze** the multistory building frames by matrix methods.
2. **Formula**te the stiffness method analysis.
3. **Solve** the continuous beams, portal frames by stiffness method.
4. **Formulate** and analysis continuous beams using flexibility method.
5. **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 (up to four noded truss and two span continuous beam) -general procedure-bank matrix-semi bandwidth-computer algorithm for assembly by direct stiffness matrix method.

UNIT - III

Analysis of plane truss-continuous beam (with and without sinking of supports) -plane frame up to three degree of static indeterminacy by Flexible methods.

UNIT - IV

Analysis of plane truss (up to 2 degrees of freedom) -continuous beams with and without sinking of supports-plane frame up to three degrees of freedom 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. Willam Weaver and Gere, Matrix methods of structural analysis, CBS Publishers,2nd edition,2004
2. Pandit G.S. and Gupta S.P, Structural Analysis -A Matrix approach, McGraw Hill, 2nd edition ,2008
3. Ghali and Neyveli, Structural Analysis: A unified classical and matrix approach Narosa Publishers Pvt Ltd,2003

REFERENCE BOOK:

Jain A.K., Advanced Structural Analysis, Nemch and Publishers.3rd edition,2015

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VII Semester Syllabus
CE714PE: Earth Retaining Structures
(Professional Elective- III)

Course Objectives:

The objectives of the course are:

1. To estimate earth pressure under different loads and conditions.
2. To determine the stability of gravity and cantilever Retaining walls.
3. To design sheet pile walls and bracings.
4. To design reinforced soil walls.

Course Outcomes:

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

1. **Calculate** the earth pressures under different applied loads and ground conditions.
2. **Assess** stability of conventional retaining walls.
3. **Design** flexible retaining walls under different soil and fixity conditions.
4. **Design** the supporting systems for excavations.
5. **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, Indian edition, 2012.
5. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata McGraw-Hill Publishers NewDelhi, 2017.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VII Semester Syllabus
CE715PE: Ground Improvement Techniques
(Professional Elective - III)

Course Objectives:

The objectives of the course are :

1. To identify difficult ground conditions in engineering practice.
2. To select suitable ground improvement techniques for problematic soils.
3. To assess suitable physical, chemical, mechanical and hydraulic modifications.

Course Outcomes:

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

1. **Illustrate** the various ground improvement methods.
2. **Assess** different compaction methods for ground modification.
3. **Design** dewatering systems to reduce the settlements.
4. **Illustrate** stabilizations with chemical and grouting techniques.
5. **Explain** 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 grid reinforced 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 Hillpublications
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.

B. Tech in Civil Engineering
VII Semester Syllabus
CE716PE: Stability Analysis of Slopes
\ **(Professional Elective- III)**

L	T	P	C
3	0	0	3

Course Objectives:

The objectives of the course are :

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

Course Outcomes:

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

1. **Identify** suitable site and materials for the construction of earth / rockfill dams.
2. **Analyze** seepage through a given earth / rockfill dam section and propose suitable seepagecontrol measures.
3. **Analyze** the stability of earthen dams.
4. **Analyze** the slopes by using different analytical methods.
5. **Propose** 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, Inclinometers, 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.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VII Semester Syllabus
CE717PE: Design of Hydraulic Structures
(Professional Elective - IV)

Course Objectives:

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

Course Outcomes:

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

1. **Identify** types of water retaining structures for multiple purposes and its key parametersconsidered for planning and designing.
2. **Analyze** the gravity dams for their stability.
3. **Analyze** earth dams for their and stability and spillways for energy dissipation.
4. **Analyze** different types of diversion head works.
5. **Design** canal falls and regulation works.

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 Ejectorsand 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 permeablefoundations 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 Canal escapes - types of canal modules, proportionality, sensitivity, setting and flexibility. Cross Drainage works: 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., New Delhi

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.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VII Semester Syllabus
CE718PE: Advanced Water Resources Engineering
(Professional Elective - IV)

Course Objectives:

The objectives of the course are to:

1. Overview of Statistical applications in Hydrology.
2. General Idea of Flood routing.
3. Summary of various flood mitigation measures.
4. Overview of climate and causes of climate change.
5. Summary of Optimization models and applications.

Course Outcomes:

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

1. **Apply** statistical techniques for flood frequency studies and hydrological events and Applications of Regression Models for estimation of various parameters.
2. **Apply** flood routing, flood forecasting techniques for real time flood studies.
3. **Illustrate** various mitigation measures for control of floods.
4. **Illustrate** climate change using GCM models.
5. **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- Muskhinghum 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.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VII Semester Syllabus
CE719PE: Ground Water Hydrology
(Professional Elective-IV)

Course Objectives:

The objectives of the course are:

1. To explain the concepts of Groundwater Development and Management.
2. To demonstrate and derive the basic equations used in Groundwater development andmanagement and the corresponding equations.
3. To know the investigations, field studies to conduct basic ground water studies.

Course Outcomes:

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

1. **Identify** different fundamental equations and concepts as applied in the Groundwater studies.
2. **Discuss** and derive differential equation governing groundwater steady flow in three dimensions.
3. **Discuss** and derive differential equation governing groundwater unsteady flow in three dimensions.
4. **Organize** surface and subsurface exploration techniques.
5. **Illustrate** 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, Thesis solution, Jocob 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.
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.

L	T	P	C
3	0	0	3

Open Elective for other Departments
VII Semester Syllabus
CE721OE: Remote Sensing & Geographical Information Systems
(Open Elective-II)

Course Objectives:

The objectives of the course are to:

1. Know the concepts of Remote Sensing, its interpreting Techniques and concepts of Digitalimages.
2. Know the concept of Geographical Information System (GIS), coordinate system GIS Data andits types.
3. Understand the students managing the spatial Data Using GIS.
4. Understand Implementation of GIS interface for practical usage.

Course Outcomes:

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

1. **Describe** different concepts and terms used in Remote Sensing and its data.
2. **Illustrate** the data conversion and Process in different coordinate systems of GIS interface.
3. **Evaluate** the method of input and accuracy of Data in GIS.
4. **Evaluate** the digitization requirements in GIS.
5. **Illustrate** 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, Wiley Publishers, 2012.

REFERENCE BOOKS:

1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, Wiley Publishers, 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. Sathi Kumar, N. Madhu, Pearson Education, 1st Edition, 2007.
4. Textbook of Remote Sensing and Geographical Information systems by M.Anji Reddy

L	T	P	C
3	0	0	3

Open Elective for other Departments
VII Semester Syllabus
CE722OE: Solid Waste Management
(Open Elective – II)

Course Objectives:

The objectives of the course are to:

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

Course Outcomes:

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

1. **Identify** the physical and chemical composition of solid wastes.
2. **Analyze** the functional elements for solid waste management.
3. **Understand** the techniques and methods used in transformation, conservation, and recovery of materials from solid wastes.
4. **Identify** and design waste disposal systems.
5. **Illustrate** the principles of Hazardous waste management.

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 composing - recovery of thermal conversion products; Pyrolisis, 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.

L	T	P	C
0	0	2	1

B.Tech in Civil Engineering
VII Semester Syllabus
CE751PC: Civil Engineering Software Laboratory

Course Objectives:

The objectives of the course are to:
1. Analyze and design structural elements.
2. Apply water resources related problems.
3. Design various geometric elements using transportation software.
4. Analyze slope stability and seepage determination.
5. Estimate the quantities of civil engineering structures.

Course Outcomes:

After the completion of the course, the students will be able to:
1. **Design** G+3 buildings with Staad.Pro Software.
2. **Design** Intersections using MX ROAD software.
3. **Analyze** slopes using Geo Studio Software.
4. **Analyze** water distribution network using EPA NET software.
5. **Schedule** the activities of construction project using PRIMAVERA software.

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. VISSIM	**2. Geo Studio**	2. EPA SWMM	2. TEKLA
3. MIDAS	3. VISSUM		3. EPA EPZ Suite	3. RS & GIS
4. ETabs	**4. MX Road**		**4. EPA NET**	
			5. QGIS	
			6. HECRAS	

Note:
1.) Open/education/academic version of software is desirable.
2.) Anyone software from each of the above groups will be offered for training.

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

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VIII Semester Syllabus
CE811PE: Solid Waste Management
(Professional Elective – V)

Course Objectives:

The objectives of the course are to:

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

Course Outcomes:

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

1. **Identify** the physical and chemical composition of solid wastes.
2. **Analyze** the functional elements for solid waste management.
3. **Illustrate** the techniques and methods used in transformation, conservation, and recovery of materials from solid wastes.
4. **Identify** and design waste disposal systems.
5. **Analyze** issues related to hazardous waste management.

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 composing - recovery of thermal conversion products; Pyrolisis, 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.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VIII Semester Syllabus
CE812PE: Environmental Impact Assessment
(Professional Elective-V)

Course Objectives:

The objectives of the course are to:

1. **Define and Classify** Environmental Impacts and the terminology.
2. **Understands** the environmental Impact assessment procedure.
3. **Explain** the EIA methodology.
4. **List and describe** environmental audits.

Course Out comes:

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

1. **Identify** the environmental attributes to be considered for the EIA study.
2. **Formulate** plan for EIA studies.
3. **List** the suitable methodology and prepare EIA report.
4. **Choose** the right methodology among available alternatives
5. **Understand** Air Act, Water Act, Wildlife Acts.

UNIT - I

Introduction: The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

UNIT - II

EIA Methodologies: Environmental attributes-Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions - Construction Stage Impacts, post project impacts.

UNIT - III

Environmental Management Plan: EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief & Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT - IV

Environmental Legislation and Life cycle Assessment: Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules. Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria-case studies.

UNIT - V

Case Studies: Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Airports.

TEXT BOOKS:

1. Anjaneyulu.Y and Manickam. V. Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad, 2007
2. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002

REFERENCE BOOKS:

1. Jain, R.K., Urban, L.V., Stracy, G.S., Environmental Impact Analysis, Van Nostrand Reinhold Co., New York, 1991.
2. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., New York, 1996.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VIII Semester Syllabus
CE813PE: Air Pollution
(Professional Elective-V)

Course Objectives:

The objectives of the course are to:

1. To Identify the major air pollutants and their sources and then their sampling techniques
2. To learn the concepts of air pollution Meteorology
3. To Predict suitable control mechanisms for particulates
4. To Learn the control of gaseous emissions and to anticipate proper air quality standards
5. To understand about automobile pollution and indoor air quality monitoring

Course Outcomes:

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

1. **Understand** various types of air pollutants by sampling and set air quality standards
2. **Learn** about the dispersion of plume and meteorological parameters
3. **Learn** how to the control of particulates and their removal by equipment
4. **Develop** control mechanisms for gaseous emissions
5. **Analyze** Indoor and outdoor air quality

UNIT - I

Air Pollution: Definition of Air Pollution - Sources & Classification of Air Pollutants - Effects of air pollution- Global effects– Ambient Air Quality and standards– Monitoring air pollution, Sampling and analysis of Pollutants in ambient air – Stack sampling.

UNIT - II

Meteorology and Air Pollution: Factors influencing air pollution , Windrose , Mixing Depths , Lapse rates and dispersion - Atmospheric stability, Plume behavior, Plume rise and dispersion, Prediction ofair quality, Box model - Gaussian model - Dispersion coefficient - Application of tall chimney for Pollutant dispersion.

UNIT - III

Control of Particulate Pollutants: Properties of particulate pollution - Particle size distribution - Control mechanism Dust removal equipment – Working principles and operation of settling chambers, cyclones, wet dustscrubbers, fabric filters & ESP.

UNIT - IV

Control of Gaseous Pollutants: Process and equipment for the removal by chemical methods - Working principles and operation of absorption and adsorption equipment - Combustion and condensation equipment.

UNIT - V

Automobile and Indoor Pollution: Vehicular pollution – Sources and types of emission – Effect of operating conditions-Alternate fuels and emissions-Emission controls and standards, Strategies to control automobile pollution– Causes of indoor air pollution-changes in indoor air quality-control and air cleaning systems-indoor air quality.

TEXT BOOKS:

1. M. N. Rao and HVN Rao, Air Pollution, Tata McGraw Hill Publishers
2. Noel, D. N., Air Pollution Control Engineering, Tata McGraw Hill Publishers, 1999.

REFERENCE BOOKS:

1. Air Pollution Control Engineering by Nevers, , McGraw-Hill, Inc., 2000.
2. Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford &I.B.H.
3. Air Pollution and Health by T. Holgate, Hillel S. Koren, Jonathan M. Samet, Robert L. Maynard publisher Academic Press.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VIII Semester Syllabus
CE814PE: Airports, Railways and Waterways
(Professional Elective-VI)

Course Objectives:

The objectives of the course are:

1. To deal with the characteristics of aircrafts related to airport design; runway and taxiway design, runway orientation, length, grading and drainage.
2. To introduce component of railway tracks, their function and defects.
3. To carry out the geometric design of railway track as per the standard provisions.
4. To impart the knowledge of turnouts, points & crossings, signaling & Interlocking and high speed tracks and Metro Rail.
5. To impart the knowledge of types of harbors, their features, planning and design of port facilities.

Course Outcomes:

After the completion of this course, the student will be able to:

1. **Identify** the components of airport and **Design** runways as per the wind data.
2. **Recommend** suitable materials for components railway track components.
3. **Design** the track geometry for a railway line as per the engineering principles.
4. **Design** various crossings and signals in Railway Projects.
5. **Plan** the requirements of new harbors and ports.

UNIT – I

Airport Engineering: Introduction to Air Transportation - Aircraft Characteristics - Factors Affecting Selection of site for Airport – Aprons – Taxiway – Hanger – Geometric design - Computation of Runway Length, Correction for Runway Length, Orientation of Runway, Wind Rose Diagram.

UNIT – II

Introduction to Railways: Role of Indian Railways in national development – Railways for Urban Transportation – LRT, Mono Rail, Metro Rail & MRTS. Permanent Way: Components and their Functions: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers – Functions, Materials, Density – Functions, Materials, Ballast, Sub-grade and Embankments, Ballast less Tracks.

UNIT- III

Geometric Design of Railway Track: Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal/Vertical Curves.

UNIT – IV

Track maintenance and Operation: Points and Crossings - Turnouts, Stations and Yards - Level Crossings. Signaling and Interlocking - Track Circuiting- Track Maintenance.

UNIT – V

Dock & Harbour Engineering: Water Transportation: Ports and Harbours - Types of water transportation, water transportation in India, Ports and harbours: requirements, classification. Harbour works: breakwaters, jetties, fenders, piers, wharves, dolphins, etc., Navigational aids: types, requirements, light house, beacon lights, buoys, Port facilities: general layout, development, planning, facilities, terminals. Docks and repair facilities: design, dry docks, wet docks, slipways, Locks and lock gates: materials, size, Dredging: classification, dredgers, uses of dredged materials.

TEXT BOOKS:

1. Venkataramaiah C(2016), "Transportation Engineering Vol II – Railways, Airports, Docks, Harbors, Bridges and Tunnels", Universities Press (India) Private Limited, Hyderabad
2. J S Mundrey, Railway Track Engineering (5th Edition) McGraw Hill Education 2017.

REFERENCE BOOKS:

1. Subhash C. Saxena (2008) Airport Engineering, Planning and Design, CBS Publishers and Distributors, New Delhi. (Reprint 2015)
2. R. Srinivasan (2016), Harbour, Dock and Tunnel Engineering 28th Edition, Charotar Publishing House Pvt. Ltd.
3. Saxena SC and Arora S C (2010) A Text Book of Railway Engineering Paperback – 2010, Dhanpat Rai Publications (Reprint 2015)
4. Robert Horonjeff, Francis X. McKelvey, Willian J Sproule, Seth B. Young (2010), Planning & Design of Airports, McGraw-Hill Professional.
5. Transportation Engineering by R. Srinivasa Kumar, University Press India.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VIII Semester Syllabus
CE815PE: Pavement Asset Management
(Professional Elective-VI)

Course Objectives:

The objectives of the course are to:

1. Understand the role of Pavement Asset Management.
2. Understand the Flexible pavement failures and importance of maintenance.
3. Understand the Rigid pavement failures and importance of maintenance.
4. Understand pavement evaluation.
5. Understand pavement performance and deterioration modeling

Course Outcomes:

After the completion of this course, the student will be able to:

1. **Identify** types of road assets and strategies for their management. .
2. **Assess** the flexible pavement condition and will be able suggest suitable methods to mitigate pavement distress.
3. **Assess** the rigid pavement condition and will be able suggest suitable methods to mitigate pavement distress.
4. **Assess** the structural and functional evaluation of pavements.
5. **Identify** pavement performance and distress models for pavement management.

UNIT - I

Introduction to road assets: Pavement structure, shoulders, road side tree plantations, street lighting, traffic signs, traffic signals, intersection elements, interchange elements; Pavement Management as a part of Road **Asset Management:** Evolution and Development of Pavement Management Systems (PMS), Components of PMS and their inter linkages, Project and Network level PMS.

UNIT – II

Flexible Pavement Failures: Identification, measurement, causative factors and remedies for all the varieties of failure under the headings of surface defects, deformation and disintegration of flexible pavements.

Maintenance of Flexible Pavements: Periodic maintenance: periodic renewals, need and importance of periodic renewals, planning and programming of renewals, identification of stretches to be renewed, types of renewal treatments, periodicity of renewal, rectification of profile at the time of renewal; pothole filling / patching, tools and equipment for pothole / patch repairs, modern mobile mechanized pothole filling/road patching technologies, arrangements for traffic and safety measures during road maintenance, preventive maintenance: introduction, selection of preventive maintenance treatment, warrants for preventive maintenance, flexible pavement preservation tools.

Importance of maintenance: Homogeneous sections by AASHTO's cumulative difference approach, types of maintenance – Preventive maintenance, minor rehabilitation, major rehabilitation, reconstruction; planning of maintenance activities.

UNIT - III

Rigid Pavement Failures: Identification, measurement, causative factors and remedies for all the varieties of failure under the headings of joint spalling, faulting, polished aggregate, shrinkage cracking, pumping, linear cracking, durability cracking;

Maintenance of Rigid Pavements: Assessing maintenance needs, methods for repairing concrete pavements, crack sealing and joint resealing, crack stitching (cross stitching), partial-depth repair, full depth repair, slab stabilization, special techniques for rehabilitation of rigid pavements, repair materials, tools and plant, planning the maintenance operations, arrangement for traffic and safety, rigid pavement preservation tools.

UNIT - IV

Pavement Evaluation: Pavement Structural Condition Evaluation: Importance of structural condition evaluation of pavements, benkelman beam technique for flexible pavement evaluation, falling weight deflectometer technique for both flexible and rigid pavements

Pavement Functional Condition Evaluation: Importance of functional condition evaluation of pavements, pavement roughness concepts; instrumentation used to assess pavement roughness, international roughness index and its importance, measurement of surface defects in both flexible and rigid pavements.

Pavement Safety Condition Evaluation: Pavement texture, importance of surface friction characteristics on pavement safety, discussion on the methods of evaluation of pavement safety

UNIT - V

Pavement Performance and Deterioration Modelling: Structural condition (Distress) models, functional condition models, initiation models and progression models; Combined measures of pavement quality, discussions on condition indices and serviceability indices, pavement condition rating, introduction to pavement rating manuals by different agencies.

TEXT BOOKS:

1. Ralph Haas, Ronald Hudson, Zanieswki with Lynne Cowe Falls, “Pavement Asset Management’, Wiley, 2015.
2. Shahin, M.Y., “Pavement Management for Airports, Roads and Parking Lots”, Springer, 2nd Edition, 2005
3. E.J.Yoder and M.W.Witczak, Principles of Pavement Design, John Wiley and Sons, New York, 1975.
4. Y.H.Huang, Pavement Analysis and Design. Prentice Hall, Englewood Cliffs, New Jersey, USA, 1993.

REFERENCE BOOKS:

1. H.N.Atkins, Highway Construction and Maintenance, Soils, and Concretes, Reston Publishing Company, Reston VA, 1983.
2. J.P.Watson, Highway Construction and Maintenance, Longman Scientific and Technical, New York, 1989.
3. IRC 82: 2015, First Revision, Code of Practice for maintenance of Bituminous Road Surfaces.
4. IRC SP 83: 2018, First Revision, Guidelines for maintenance, repair and rehabilitation of cement concrete pavements.
5. Feng Li, Jinyan Feng, Youxin Li, Siqi Zhou, Preventive Maintenance Technology for Asphalt Pavement, Springer, 2021.
6. ACRP Synthesis 22, Common Airport Maintenance Practices, Transportation Research Board, Washington DC, 2011.
7. R. Keith Moble, An Introduction to Predictive Maintenance, Second Edition, Butterworth Heinemann Publications, 2002.
8. NCHRP 523 – “Optimal Timing of Pavement Preventive Maintenance Treatment Applications”, Transport Research Board, 2004.

9. NCHRP Synthesis 501 – "Pavement Management Systems: Putting data to work – A Synthesis of Highway Practice, Transport Research Board, 2017 8. Highway Rating manuals.
10. HDM 4 manuals.
11. Derek Pearson, "Deterioration and Maintenance of Pavements, Ice Publishing, 2012.
12. Rajib Basu Mallick and Tahar El-Kochi, Pavement Engineering: Principles and Practice, CRC Press 2013.

CODE BOOK:

IRC 81-1997, Guidelines for strengthening of flexible road pavements using Benkelman Beam Deflection Technique, 1st Revision, 1997.

L	T	P	C
3	0	0	3

B.Tech in Civil Engineering
VIII Semester Syllabus
CE816PE: Pavement Analysis & Design
(Professional Elective-VI)

Course Objectives:

The objectives of the course are :

1. To identify and categorize the factors affecting design and performance of pavements.
2. To explain the basic methods and concepts used to analyse flexible and rigid pavements.
3. To explain different design methods for flexible and rigid pavement design.
4. To explain Structural and functional requirements of flexible and rigid pavements

Course Outcomes:

After the completion of this course, the student will be able to:

1. **List** and **Explain** the various factors affecting design and performance of pavements.
2. **Assess** the stresses and deflection in flexible pavements.
3. **Assess** the stresses and deflection in rigid pavements.
4. Perform the **Design** of flexible and rigid pavements based on the influencing factors.
5. Perform the **Design** of low volume flexible pavements for rural roads.

UNIT - I

Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT - II

Stresses In Pavements: Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements. **Stresses in Flexible Pavements:** Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two- and Three-Layered Systems, Fundamental Design Concepts.

Stresses In Rigid Pavements: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars.

UNIT - III

Material Characteristics: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilization and Use of Geo Synthetics.

UNIT - IV

Design of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, IRC Methods.

Design of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design.

UNIT - V

Design of Flexible Pavement for Low Volume Roads: Pavement design for low volume roads, Rural Road designs – code of practice. Design of Overlays: Types of Overlays, Suitability, Design of overlays.

TEXT BOOKS:

1. Yoder, E.J., and Witczak, `Principles of Pavement Design', 2nd ed. John Wiley and Sons, 1975.
2. Yang H.Haung , Pavement Analysis and Design, 2nd ed., Pearson Prentice Hall, Upper Saddle River, NJ 07458, 2004.
3. Khanna and Justo, 'Test Book of Highway Engineering 'Nemchand brothers, Roorke, 2004.

REFERENCE BOOKS:

1. Yang, `Design of Functional Pavements', McGraw Hill Book Co.
2. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers.
3. Pavement and Surfacing for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
4. Haas and Hudson `Pavement Management System', McGraw Hill Book Co., New York.

CODE BOOKS:

1. IRC 37-2018, Guidelines for the Design of Flexible Pavements, 4th Revision, 2018.
2. IRC 58-2015, Guidelines for the Design of plain jointed rigid pavements for Highways, 4th Revision, 2015.
3. IRC 81-1997, Guidelines for strengthening of flexible road pavements using Benkelman Beam Deflection Technique, 1st Revision, 1997.
4. IRC SP 72-2007, Guidelines for the Design of Flexible Pavement for Low Volume Rural Roads

L	T	P	C
3	0	0	3

Open Elective for other Departments
VIII Semester Syllabus
CE821OE: Energy Efficient Buildings
(Open Elective-III)

Course Objectives :

The objectives of the course are:

1. To comprehend sustainability and optimize building orientation adhering to NBC 2005 standards.
2. To apply efficient strategies, including passive cooling, daylighting, solar tech, and lighting design.
3. To achieve expertise in indoor environmental quality, encompassing comfort, ventilation, lighting, and energy efficiency.
4. To evaluate energy efficiency through design, understanding ECBC 2007, and applying diverse simulation techniques.

Course Outcomes:

After the completion of this course, the student will be able to:

1. **Understand** sustainable design, considering life cycle impact, optimal building orientation, and NBC 2005 code compliance for sustainability standards.
2. **Apply** knowledge of passive cooling, daylighting, solar tech, energy analysis, simulation, standards, lighting design, for efficient energy use.
3. **Expertise** in managing indoor environmental quality, covering comfort, ventilation, lighting, energy efficiency, and HVAC systems.
4. **Evaluate** energy efficiency through design, comprehend ECBC 2007, apply diverse energy simulation techniques, and understand building energy consumption.
5. **Utilize** sustainable building concepts, considering social, economic, and environmental aspects, and comprehend various rating systems.

UNIT - I

Introduction: Life Cycle impacts of materials and products – sustainable design concepts – strategiesof Design for the Environment -The sun-earth relationship and the energy balance on the earth's surface, climate, wind – Solar radiation and solar temperature – Sun shading and solar radiation on surfaces – Energy impact on the shape and orientation of buildings – Thermal properties of building materials. Studying the Nation Building Code (NBC 2005) code with respect to the Chapter 11 on Sustainability.

UNIT - II

Energy Efficient Buildings: Passive cooling and day lighting – Active solar and photovoltaic- Building energy analysis methods- Building energy simulation- Building energy efficiency standards- Lighting system design- Lighting economics and aesthetics- Impacts of lighting efficiency – Energy audit and energy targeting- Technological options for energy management.

UNIT - III

Indoor Environmental Quality Management: Psychometric- Comfort conditions- Thermal comfort- Ventilation and air quality-Air conditioning requirement- Visual perception- Illumination requirement- Auditory requirement- Energy management options- -Air conditioning systems- Energy conservation in pumps- Fans and blowers- Refrigerating machines- Heat rejection equipment- Energy efficient motors- Insulation.

UNIT - IV

Energy Conservation Building Codes: Energy Efficiency, Energy Efficient Design (Achieving Efficiency through design) Energy Conservation Building Codes (ECBC) Codes 2007 Learning Different Energy Simulation Techniques (Energy / Lighting) Advanced Energy Efficient Standards and Systems HVAC Lighting Appliances and Equipments Building Envelope Understanding and calculation of energy consumption of a House, office building.

UNIT - V

Concepts of Sustainable Building Social, Economic and Environmental aspects Different types of Indian and International Rating Systems (GRIHA, LEED, IGBC, Eco Housing, BREEAM, CASBEE, etc)

TEXT BOOKS:

1. Kibert, C. “Sustainable Construction: Green Building Design and Delivery”, John Wiley & Sons, 2005
2. Edward G Pita, “An Energy Approach- Air-conditioning Principles and Systems”, Pearson Education, 2003.

REFERENCE BOOKS:

1. Colin Porteous, “The New Eco-Architecture”, Spon Press, 2002.
2. Energy Conservation Building Codes: www.bee-india.nic.in
3. Lever More G J, “Building Energy Management Systems”, E and FN Spon, London, 2000.
4. Ganesan T P, “Energy Conservation in Buildings”, ISTE Professional Center, Chennai, 1999.
5. John Littler and Randall Thomas, “Design with Energy: The Conservation and Use of Energy in Buildings”, Cambridge University Press, 1984.
6. Nation Building Code (NBC 2005)
7. ECBC code book.

L	T	P	C
3	0	0	3

Open Elective for other Departments
VIII Semester Syllabus
CE822OE: Environmental Pollution and Control
(Open Elective-III)

Course Objectives :

The objectives of the course are to:

1. Impart knowledge on aspects of air pollution & control and noise pollution.
2. Impart concepts of treatment of waste water from industrial source.
3. Differentiate the solid and hazardous waste based on characterization.
4. Introduce sanitation methods essential for protection of community health.
5. Provide basic knowledge on sustainable development.

Course Outcomes:

After completing the course, the student will be able to:

1. **Identify** the air pollutant control devices and have knowledge on the NAAQ standards and air emission standards.
2. **Differentiate** the treatment techniques used for sewage and industrial wastewater treatment.
3. **Illustrate** the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city.
4. **Formulate** the methods of environmental sanitation and the management of community facilities without spread of epidemics.
5. **Underline** the importance of sustainable development while planning a project or executing an activity.

UNIT – I

Air Pollution: Air pollution Control Methods–Particulate control devices – Methods of controlling Gaseous Emissions – Air quality standards. Noise Pollution: Noise standards, Measurement and control methods - Reducing residential and industrial noise – ISO:14000.

UNIT – II

Industrial waste water Management: Strategies for pollution control – Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants – Recirculation of industrial wastes – Effluent standards.

UNIT – III

Solid Waste Management: solid waste characteristics – basics of on-site handling and collection – separation and processing – Incineration- Composting-Solid waste disposal methods – fundamentals of Land filling. Hazardous Waste: Characterization – Nuclear waste – Biomedical wastes – Electronic wastes – Chemical wastes – Treatment and management of hazardous waste-Disposal and Control methods.

UNIT – IV

Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

UNIT – V

Sustainable Development: Definition- elements of sustainable developments-Indicators of sustainable development- Sustainability Strategies- Barriers to Sustainability–Industrialization and sustainable development – Cleaner production in achieving sustainability- sustainable development.

TEXT BOOKS:

1. Peavy, H. S., Rowe, D. R, Tchobanoglous, "Environmental Engineering", Mc-Graw Hill International Editions, New York 1985.
2. J. G. Henry and G.W. Heinke, "Environmental Science and Engineering", Pearson Education.

REFERENCE BOOKS:

1. G. L. Karia and R.A. Christian, "Waste water treatment- concepts and design approach", Prentice Hall of India
2. M. N. Rao and H. V. N. Rao, "Air pollution", Tata McGraw Hill Company.
3. Ruth F. "Weiner and Robin Matthews Environmental Engineering", 4th Edition Elsevier, 2003.
4. K. V. S. G. Murali Krishna, "Air Pollution and Control" by, Kousal & Co. Publications, New Delhi.