COURSE STRUCTURE & DETAILED SYLLABUS

ACE - R20

CIVIL ENGINEERING

B. TECH FOUR YEAR DEGREE COURSE

STRUCTURE & SYLLABUS

(2020 Batch)

III Year II Semester

ACE

Engineering College

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

(An Autonomous Institution, Affiliated to JNTUH ,Hyderabad)

ACE
Engineering College
Ankushapur(V), Ghatkesar(M), Medchal.Dist - 501 301
(Autonomous)
B.TECH. FOUR YEAR DEGREE COURSE
CIVIL ENGINEERING
COURSE STRUCTURE
III Year II Semester

III Year							II Semester
S.No	Course Type	Course Code	Course Title	Periods Per Week			Credits
				L	T	P	
1	BSC	CE601PC	Hydrology & Water Resources Engineering	3	1	0	4
2	BSC	CE602PC	Environmental Engineering	3	0	0	3
3	ESC	CE603PC	Foundation Engineering	3	0	0	3
4	ESC	CE604PC	Structural Engineering –II **(Steel)**	3	1	0	4
5	HSMC		Professional Elective –II	3	0	0	3
6	BSC		Open Elective –I	3	0	0	3
7	HSMC	CE605PC	Environmental Engineering Lab	0	0	2	1
8	MC	CE606PC	Computer Aided Design Lab	0	0	2	1
9	MC	*MC609	Environmental Science	3	0	0	0
10	MC	MC602	Artificial Intelligence	3	0	0	0
Total				**24**	**2**	**4**	**22**

***MC107ES - Environmental Science – Should be Registered by Lateral Entry Students Only.**

Professional Elective – I

CE511PE	Concrete Technology
CE512PE	Theory of Elasticity
CE513PE	Rock Mechanics

Professional Elective – II

CE611PE	Prestressed Concrete
CE612PE	Elements of Earth Quake Engineering
CE613PE	Advanced Structural Analysis

Professional Elective-III

CE711PE	Remote Sensing &GIS
CE712PE	Ground Improvement Techniques
CE713PE	Advanced Structural Design

Professional Elective -IV

CE721PE	Irrigation and Hydraulic Structures
CE722PE	Pipeline Engineering
CE723PE	Ground Water Hydrology

Professional Elective –V

CE811PE	Solid Waste Management
CE812PE	Environmental Impact Assessment
CE813PE	Air pollution

Professional Elective -VI

CE821PE	Airports, Railways and Waterways
CE822PE	Urban Transportation Planning
CE823PE	Finite Element Methods for Civil Engineering

Open Elective – I

CE600OE	Disaster Preparedness & Planning Management (CE to Other Branches)
CS601OE	Fundamentals of Management For Engineers (Open Elective - I) (H&S to CE)
CS600OE	Entrepreneurship
CS602OE	Cyber Law & Ethic
EI600OE	Basics of Sensors Technology
EC600OE	Fundamentals of Internet of Things
EE600OE	Reliability Engineering
EE601OE	Renewable Energy Sources
ME600OE	Quantitative Analysis for Business Decisions

Open Elective – II

CE700OE	Remote Sensing & GIS (CE to Other Branches)
CS700OE	Data Structures (Open Elective - II) (CSE to CE)
CS701OE	Artificial Intelligence
CS702OE	Python Programming
CS703OE	Java Programming
EI700OE	Fundamentals of Biomedical Applications
EC700OE	Electronic Sensors
EE700OE	Utilization of Electrical Energy
EE701OE	Electric Drives and Control
ME700OE	Basic Mechanical Engineering

Open Elective – III

CE800OE	Environmental Impact Assessment (CE to Other Branches)
EE800OE	Basics of Power Plant Engineering
CS800OE	Machine Learning
CS801OE	Mobile Application Development
CS802OE	Scripting Languages
CS803OE	Database Management Systems
EI800OE	Basics of Virtual Instrumentation
EC800OE	Measuring Instruments
EE801OE	Energy Sources and Applications
ME800OE	Non-Conventional Sources of Energy (Open Elective - III) (ME to CE)

CE601PC: HYDROLOGY AND WATER RESOURCES ENGINEERING

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CE601PC	PCC	3	1	0	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: 0				Total Classes: 60		

Prerequisite: Basic knowledge of Fluid Mechanics and Hydraulic & Hydraulic Machines.

Course Objectives: The objectives of the course are to:

This course provides the description of hydrological cycle and derive various formulas used in 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 tothe field requirement.

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

- Understand the different concepts and terms used in engineering hydrology
- To **identify and** explain various formulae used in estimation of surface and Ground water hydrology components
- Demonstrate their knowledge to **connect** hydrology to the field requirement.

Unit: I	**Introduction, Precipitation**	No. of Classes: 12

Introduction: Concepts of Hydrologic cycle, Global Water Budget, Applications in Engineering. Sources of data.

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: Arithmetic,Theissen's and Isohyetal 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, Runoff**	No. of Classes: 12

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, modelling infiltration capacity, classification of infiltration capacities, infiltration indices.

Runoff

Components of Runoff, Factors affecting runoff, Basin yield, SCS-CN method of estimating runoff, Flowduration curves, Mass curve of runoff – Analysis.

Unit: III	**Hydrographs**	No. of Classes: 12

Hydrographs

Hydrograph –Distribution of Runoff – Hydrograph Analysis Flood Hydrograph –

Effective Rainfall – Base Flow- Base Flow Separation - Direct Runoff Hydrograph Unit pulse and Unit step function - Unit Hydrograph, definition, limitations and applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.

Unit: IV	**Groundwater Hydrology Hydraulics Crop Water Requirements**	No. of Classes: 12

Groundwater Hydrology

Occurrence, movement and distribution 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, Recuperation tests. Well constants.

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 infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying waterto the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.

Unit: V	**Canal Systems**	No.of Classes: 12

Canal Systems: Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Regime channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals-Types of lining-Advantages and disadvantages. Drainage of irrigated lands- necessity, methods.

Text Books:

1. Hydrology by K. Subramanya (Tata McGraw-Hill)
2. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg Khanna publishers
3. G L Asawa, Irrigation Engineering, Wiley Eastern.

Reference Books:

1. Elements of Engineering Hydrology by V.P. Singh (Tata McGraw-Hill)
2. Engineering Hydrology by Jaya Rami Reddy (Laxmi Publications
3. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
4. Elements of Water Resources Engineering by K.N.Duggal and J.P.Soni (New Age
5. International).

Web References:

https://www.youtube.com/watch?v=IphCId7mkhk
https://www.youtube.com/watch?v=fx1uUek3Iqg&list=PL2BD2DA229B513E12

E-Text Books:

https://www.vssut.ac.in/lecture_notes/lecture1525502082.pdf
https://www.worldcat.org/title/hydrology-and-water-resources-engineering/oclc/649900474

CE602PC: ENVIRONMENTAL ENGINEERING

<table>
<tr><td colspan="9">B.Tech. III Year II Semester</td></tr>
<tr><td>Course Code</td><td colspan="2">Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="2">Maximum Marks</td></tr>
<tr><td rowspan="2">CE602PC</td><td colspan="2" rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="2">Contact Classes: 45</td><td colspan="2">Tutorial Classes: 0</td><td colspan="3">Practical Classes: 0</td><td colspan="2">Total Classes: 45</td></tr>
<tr><td colspan="9">Prerequisite:</td></tr>
<tr><td colspan="9">Course Objectives: The objective of this Course is:
This subject provides the knowledge of water sources, water treatment, design of distribution system waste water treatment, and safe disposal methods. The topics of characteristics ofwaste water, sludge digestion are also included.</td></tr>
<tr><td colspan="9">Course Outcome: On completion of the course, the student will be able to:
• Assess characteristics of water and wastewater and their impacts
• Estimate quantities of water and waste water and plan conveyance components
• Design components of water and waste water treatment plants
• Be conversant with issues of air pollution and control.</td></tr>
<tr><td>Unit: I</td><td colspan="5">Introduction</td><td colspan="3">No. of Classes: 9</td></tr>
<tr><td colspan="9">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.</td></tr>
<tr><td>Unit: II</td><td colspan="5">Layout and general outline of water treatment units</td><td colspan="3">No. of Classes: 9</td></tr>
<tr><td colspan="9">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.</td></tr>
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Unit: III	Characteristics of sewage	No. of Classes: 9
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	No. of Classes: 9
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	No. of Classes: 9
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 HillEducation (India) Pvt Ltd, 2014
2. Environmental Engineering by D. P. Sincero and G.A Sincero, 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. Waste water 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, PrenticeHall, 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.

Web References:

E-Text Books:

CE603PC: FOUNDATION ENGINEERING

B.Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CE603PC	PCC	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0				Total Classes: 45		

Prerequisite:

Course Objectives: The objectives of the course are to:

- To Plan Soil exploration programme for civil Engineering Projects
- To check the stability of slopes
- To determine the lateral earth pressures and design retaining walls
- To determine the Bearing capacity of Soil
- To design pile group foundation.

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

- understand the principles and methods of Geotechnical Exploration
- decide the suitability of soils and check the stability of slopes
- calculate lateral earth pressures and check the stability of retaining walls
- analyse and design the shallow and deep foundations.

Unit: I	**SOIL EXPLORATION**	No. of Classes: 9

SOIL EXPLORATION: Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test– planning of soil exploration programme, Bore logs and preparation of soil investigation report.

Unit: II	**SLOPE STABILITY**	No. of Classes: 9

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, RETAINING WALLS**	No. of Classes: 9

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**	No. of Classes: 9

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 – allowable settlements of structures.

Unit: V	**PILE FOUNDATION**	No.of Classes: 9

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. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt .Ltd, New Delhi
2. Principals of Geotechnical Engineering by Braja M. Das, Cengage Learning Publishers.

Reference Books:

1. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.
2. Geotechnical Engineering Principles and Practices by Cuduto, PHI International
3. Analysis and Design of Substructures – Swami Saran, Oxford and IBH Publishing company PvtLtd(1998).
4. Geotechnical Engineering by S. K.Gulhati & Manoj Datta – Tata Mc.Graw Hill Publishingcompany New Delhi. 2005.
5. Bowles, J.E., (1988) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishingcompany, Newyork.

Web References:

E-Text Books:

CE604PC: STRUCTURAL ENGINEERING – II (STEEL)

<table>
<tr><td colspan="9">B.Tech. III Year II Semester</td></tr>
<tr><td colspan="2">Course Code</td><td colspan="2">Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td colspan="2" rowspan="2">CE604PC</td><td colspan="2" rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Contact Classes: 45</td><td colspan="2">Tutorial Classes: 15</td><td colspan="4">Practical Classes: 0</td><td colspan="3">Total Classes: 60</td></tr>
<tr><td colspan="9">Prerequisite: Building Materials</td></tr>
<tr><td colspan="9">Course Objectives: The objectives of the course are to:
• Explain the mechanical properties of structural steel, plasticity, yield.
• Describe the salient features of Limit State Method of design of Steel structures.
• Identify and explain the codal provisions given in IS. 800.
• Analyze the behaviour of steel structures under tension, compression and flexure.
• Design the tension, compression, flexural members and plate girder
• Design the connection in steel structure, build - up member and (bolted and welded).</td></tr>
<tr><td colspan="9">Course Outcomes: Upon completion of this course, students should be able to:
• Analyze the tension members, compression members.
• Design the tension members, compression members and column bases and joints andconnections
• Analyze and Design the beams including built-up sections and beam and connections.
• Identify and Design the various components of welded plate girder including stiffeners.</td></tr>
<tr><td colspan="2">Unit: I</td><td colspan="5">Materials – Types of structural steel</td><td colspan="2">No. of Classes: 12</td></tr>
<tr><td colspan="9">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 – Framedconnection– stiffened / seated connection.</td></tr>
<tr><td colspan="2">Unit: II</td><td colspan="5">Design of tension members</td><td colspan="2">No. of Classes: 12</td></tr>
</table>

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	No. of Classes: 12

Plastic Analysis;Plastic moment – Plastic section modulus - Plastic analysis of continuous beams Design of Flexural Members – Laterally supported and unsupported Beams – Design of laterallysupported beams - Bending and shear strength/buckling – Built-up sections - Beam splice.

Unit: IV	Design of welded plate girders	No. of Classes: 12

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	No.of Classes: 12

Design of Industrial Structures; Types of roof trusses - loads on trusses – wind loads - Purlin design –truss design – Design of welded Gantry girder

Note: Design of structural members include detailed sketches.

Text Books:

1. Design of steel structures by S.K.Duggal,Tata Macgrawhill 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 Mac-grawhillpublishers,1972
2. Design of steel structures by L.S.JayaGopal,D.Tensing,Vikas Publishing House.

Web References:

E-Text Books:

CE611PE: PRESTRESSED CONCRETE (Professional Elective – II)

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE611PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0				Total Classes: 45		

Prerequisite: Reinforced Concrete Design

Course Objectives: The objectives of the course are to:

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

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

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

Unit: I	**Introduction**	No. of Classes: 9

Introduction: Historic development- General principles of prestressing pretensioning 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**	No. of Classes: 9

Methods and Systems of prestressing: Pretensioning 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 posttesnioned 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, Shear**	No. of Classes: 9

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**	No. of Classes: 9

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, Zienlinskiand Rowe's methods – Anchorage zone reinforcement- IS Provisions.

Unit: V	**Composite Beams, Deflections**	No.of Classes: 9

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:

Reference Books:

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

.

Web References:

E-Text Books:

CE612PE: ELEMENTS OF EARTHQUAKE ENGINEERING (Professional Elective – II)

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE612PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0				Total Classes: 45		

Prerequisite: Structual Engineering –II & RC Design

Course Objectives: The objectives of the course are to:

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

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

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

Unit: I	**Engineering Seismology, Theory of Vibrations**	No. of Classes: 9

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 v ibratory 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 to earthquake resistant design**	No. of Classes: 9

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**	No. of Classes: 9

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 ofdesign lateral forces as per IS 1893 (Part-1):2016- Equivalent lateral force procedure- Lateral distribution of base shear.

Unit: IV	**Masonry Buildings**	No. of Classes: 9

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

Unit: V	**Structural Walls and Non-Structural Elements**	No.of Classes: 9

Structural Walls and Non-Structural Elements: Strategies in the location of structural walls- sectional shapes- variations in elevation- cantilever walls without openings – Failure mechanism of non- structures- Effects of non-structural elements on structural system- Analysis of non-structural elements- Prevention of non-structural damage

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 buildingsduring earthquakes.

Text Books:

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

Reference Books:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly,John Wiley & Sons.
2. Eartquake Resistant Design of Buidling 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

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

Web References:

E-Text Books:

CE613PE: ADVANCED STRUCTURAL ANALYSIS (Professional Elective – II)

<table>
<tr><td colspan="9">B.Tech. III Year II Semester</td></tr>
<tr><td>Course Code</td><td colspan="2">Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="2">Maximum Marks</td></tr>
<tr><td rowspan="2">CE613PE</td><td rowspan="2" colspan="2">PEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="2">Contact Classes: 45</td><td colspan="2">Tutorial Classes: 0</td><td colspan="3">Practical Classes: 0</td><td colspan="2">Total Classes: 45</td></tr>
<tr><td colspan="9">Prerequisite:</td></tr>
<tr><td colspan="9">Course Objectives: The objectives of the course are to:
• Understand the matrix method of analysis statically indeterminate frames and trusses.
• Know the transformation of coordinates and assembly of stiffness matrices
• Differentiate between flexibility and stiffness methods of analysis of beams, frames and planetrusses
• Understand the structural behavior of large frames with or without shear walls.</td></tr>
<tr><td colspan="9">Course Outcomes: Upon completion of this course, students should be able to:
• Analyze the multistory building frames by various approximate methods.
• Solve the continuous beams, portal frames by matrix methods of analysis.
• Analyze and design of large frames with or without shear walls.</td></tr>
<tr><td>Unit: I</td><td colspan="6">Introduction to matrix methods</td><td colspan="2">No. of Classes: 9</td></tr>
<tr><td colspan="9">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.</td></tr>
<tr><td>Unit: II</td><td colspan="6">Assembly of stiffness matrix</td><td colspan="2">No. of Classes: 9</td></tr>
<tr><td colspan="9">Assembly of stiffness matrix from element stiffness matrix-direct stiffness method-general procedure-bank matrix-semi bandwidth-computer algorithm for assembly by direct stiffness matrix method.</td></tr>
</table>

Unit: III		No. of Classes: 9
Analysis of plane truss-continuous beam-plane frame and grids by Flexible methods.		
Unit: IV		No. of Classes: 9
Analysis of plane truss-continuous beam-plane frame and grids by stiffness methods.		
Unit: V		No.of Classes: 9
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-approximatemethods of analysis of shear walls.		

Text Books:

1. Matrix methods of structural analysis by Willam Weaver and gere, CBS Publishers.
2. Advanced Structural Analysis by A.K. Jain Nemchand Publishers.

Reference Books:

1. Advanced Structural Analysis by Devdas Menon, Narosa publishing house.
2. Matrix methods of structural analysis by Pandit and gupta
3. Matrix methods of structural analysis by J Meek
4. Structural Analysis by Ghali and Neyveli.

Web References:

E-Text Books:

CE605PC: ENVIRONMENTAL ENGINEERING LAB

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE605PC	PCC	L	T	P	C	CIA	SEE	Total
		0	0	2	1	30	70	100
Contact Classes: 0	Tutorial Classes: 0	Practical Classes: 30				Total Classes: 30		

Prerequisite:

Course Objectives

- **Perform** the experiments to determine water and waste water quality
- **Understand** the water & waste water sampling, their quality standards
- **Estimate** quality of water, waste water, Industrial water

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

- Understand about the equipment used to conduct the test procedures
- Perform the experiments in the lab
- Examine and Estimate water, waste water, air and soil Quality
- Compare the water, air quality standards with prescribed standards set by the localgovernments
- Develop a report on the quality aspect of the environment

Experiment	List of Experiments	No. of Classes
1	Determination of pH	2
2	Determination of Electrical Conductivity	2
3	Determination of Total Solids (Organic and inorganic)	2
4	Determination of Acidity	2
5	Determination of Alkalinity	2
6	Determination of Hardness (Total, Calcium and Magnesium Hardness)	2
7	Determination of Chlorides	2
8	Determination of optimum coagulant Dosage	2
9	Determination of Dissolved Oxygen (Winkler Method)	2
10	Determination of COD	2

11	Determination of BOD/DO	2
12	Determination of Residual Chlorine	2
13	Total count No	2
14	Noise level measurement	2

Reference:

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 - HillInternational Editions, New York 1985.
4. MetCalf 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 HillPublication

Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central PublicHealth and Environmental Engineering Organization, Ministry of Urban Development.

CE606PC: COMPUTER AIDED DESIGN LAB

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE606PC	PCC	L	T	P	C	CIA	SEE	Total
		0	0	2	1	30	70	100
Contact Classes: 0	Tutorial Classes: 0	Practical Classes: 30				Total Classes: 30		

Prerequisite: Computer Aided Civil Engineering Drawing or AUTO CAD Principles –Excel-Structural Engineering -1 & 2

Course Objectives

- Learn the usage of any fundamental software for design
- Create geometries using pre-processor
- Analyse and Interpret the results using post processor
- Design the structural elements.

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

- Model the geometry of real-world structure Represent the physical model of structuralelement/structure
- Perform analysis
- Interpret from the Post processing results
- Design the structural elements and a system as per IS Codes.

Experiment	List of Experiments	No. of Classes
1	Analysis & Design determinate structures using a software	3
2	Analysis & Design of fixed & continuous beams using a software	3
3	Analysis & Design of Plane Frames	3
4	Analysis & Design of space frames subjected to DL & LL	3
5	Analysis & Design of residential building subjected to all loads (DL,LL,WL,EQL)	3
6	Analysis & Design of Roof Trusses	3
7	Design and detailing of built up steel beam	3
8	Developing a design programme for foundation using EXCEL Spread Sheet	3
9	Detailing of RCC beam and RCC slab	3
10	Detailing of Steel built up Compression member	3

Note: Drafting of all the exercises is to be carried out using commercially available designingsoftware's.

*MC609: ENVIRONMENTAL SCIENCE

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
*MC609	MC	3	0	0	0	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0				Total Classes: 45		

Prerequisite:

Course Objectives: The objectives of the course are to:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures
- Understanding the environmental policies and regulations.

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

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development.

Unit: I	**Ecosystems**	No. of Classes: 9

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

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Unit: II	**Natural Resources**	No. of Classes: 9

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**	No. of Classes: 9

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. Field visit. 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**	No. of Classes: 9

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **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.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

Unit: V	**Environmental Policy, Legislation & EIA**	No.of Classes: 9

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, 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 R. Rajagopalan, Oxford University Press.

Reference Books:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

Web References:

E-Text Books:

MC602: ARTIFICIAL INTELLIGENCE

B.TECH. III YEAR II SEMESTER								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
MC602	MC	3	0	0	0	100	0	100

Prerequisite: Nil

Course Objectives:

1. 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 ready to 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, Nonmonotonic 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 BOOKS:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, PrenticeHall, 2010.

REFERENCE BOOKS:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.