Implementation of NEP/LOCF/CBCS / ECS

Minutes of Meetings (MoM) of Board of Studies (BoS)

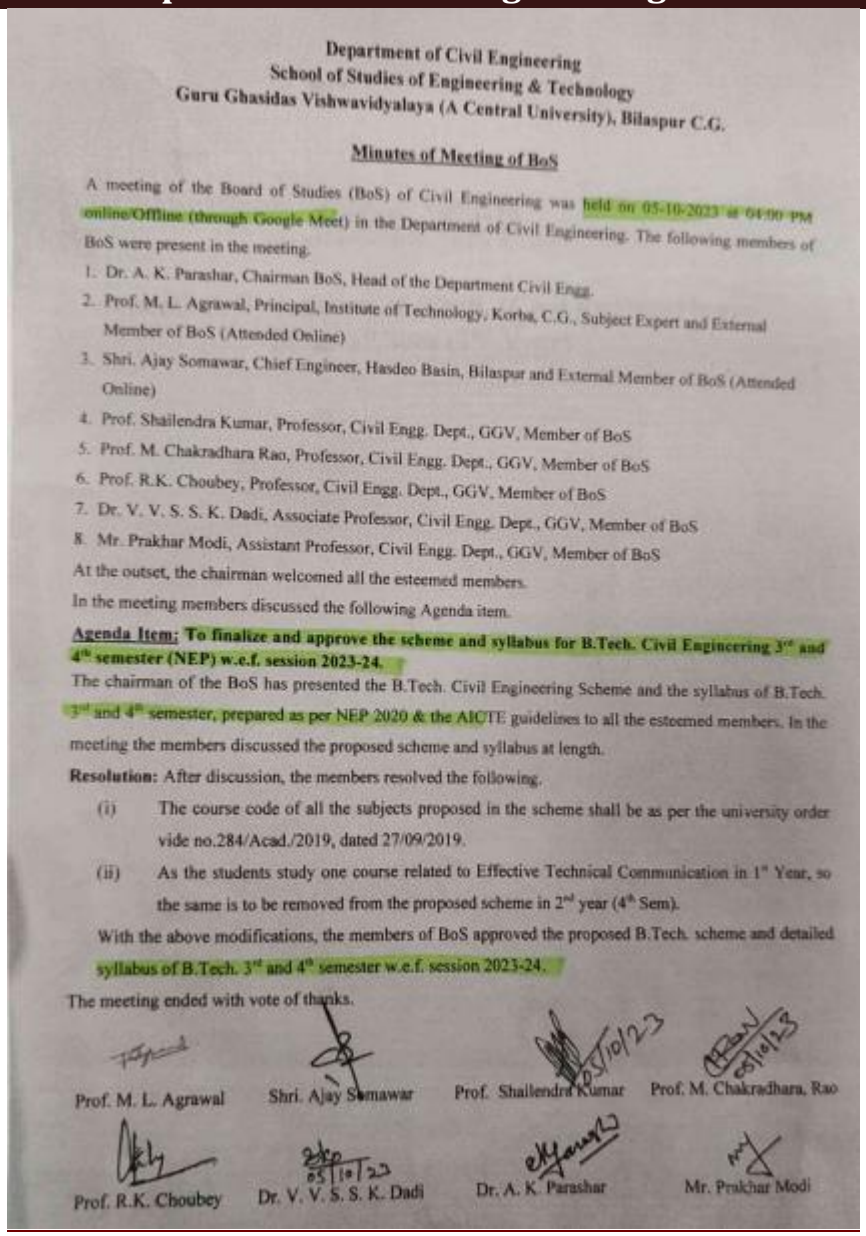
Academic Year : 2023-24

School : *Engineering and Technology*

Department : *Civil Engineering*

Date and Time : 15/10/2023; 4:00 Pm

Venue : Department of Civil Engineering



Department of Civil Engineering
School of Studies of Engineering & Technology
Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur C.G.

Minutes of Meeting of BoS

A meeting of the Board of Studies (BoS) of Civil Engineering was held on 05-10-2023 at 04:00 PM online/Offline (through Google Meet) in the Department of Civil Engineering. The following members of BoS were present in the meeting.

1. Dr. A. K. Parashar, Chairman BoS, Head of the Department Civil Engg.
2. Prof. M. L. Agrawal, Principal, Institute of Technology, Korba, C.G., Subject Expert and External Member of BoS (Attended Online)
3. Shri. Ajay Somawar, Chief Engineer, Hasdeo Basin, Bilaspur and External Member of BoS (Attended Online)
4. Prof. Shailendra Kumar, Professor, Civil Engg. Dept., GGV, Member of BoS
5. Prof. M. Chakradhara Rao, Professor, Civil Engg. Dept., GGV, Member of BoS
6. Prof. R.K. Choubey, Professor, Civil Engg. Dept., GGV, Member of BoS
7. Dr. V. V. S. S. K. Dadi, Associate Professor, Civil Engg. Dept., GGV, Member of BoS
8. Mr. Prakhar Modi, Assistant Professor, Civil Engg. Dept., GGV, Member of BoS

At the outset, the chairman welcomed all the esteemed members.

In the meeting members discussed the following Agenda item.

Agenda Item: To finalize and approve the scheme and syllabus for B.Tech. Civil Engineering 3rd and 4th semester (NEP) w.e.f. session 2023-24.

The chairman of the BoS has presented the B.Tech. Civil Engineering Scheme and the syllabus of B.Tech. 3rd and 4th semester, prepared as per NEP 2020 & the AICTE guidelines to all the esteemed members. In the meeting the members discussed the proposed scheme and syllabus at length.

Resolution: After discussion, the members resolved the following.

(i) The course code of all the subjects proposed in the scheme shall be as per the university order vide no.284/Acad./2019, dated 27/09/2019.

(ii) As the students study one course related to Effective Technical Communication in 1st Year, so the same is to be removed from the proposed scheme in 2nd year (4th Sem).

With the above modifications, the members of BoS approved the proposed B.Tech. scheme and detailed syllabus of B.Tech. 3rd and 4th semester w.e.f. session 2023-24.

The meeting ended with vote of thanks.

Prof. M. L. Agrawal | Shri. Ajay Somawar | Prof. Shailendra Kumar | Prof. M. Chakradhara Rao

Prof. R.K. Choubey | Dr. V. V. S. S. K. Dadi | Dr. A. K. Parashar | Mr. Prakhar Modi

Scheme and Syllabus- UG

SCHOOL OF STUDIES OF ENGINEERING AND TECHNOLOGY

Scheme of Teaching and Evaluation 2022-2023 (As per NEP-2020)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

(Effective from the Academic Year 2022–2023)

I-SEMESTER BTech Mechanical/IP/Chemical/Civil Engineering

S.N.	Course Code	Course Title	Teaching Hours/week			Examination				Credits
			Theory/Lecture	Tutorial	Practical/ Drawing	Examination in Hours	CIA Marks	SEA Marks	Total Marks	
			L	T	P					
1	AMIIATB1	Engineering Mathematics - A	3	1	-	03	40	60	100	4
2	CYUIATB1	Engineering Chemistry	3	-	-	03	40	60	100	3
3	ECUIATB1	Basic Electrical and Electronics Engineering	3	-	-	03	40	60	100	3
4	FOUIATC1	Environmental Science and Ecology	2	-	-	03	40	60	100	2
5	CSUIATB1	Computer Programming	3	-	-	03	40	60	100	3
6	LAUIATC1	Indian Constitution	1	-	-	01	50	-	50	1
7	CYUIALB1	Engineering Chemistry Laboratory	-	-	2	03	25	25	50	1
8	CSUIALB1	Computer Programming Laboratory	-	-	2	03	25	25	50	1
9	EPUALL1	Engineering Workshop Practices	-	-	2	03	25	25	50	1
10	PEUALS2	Sports and Yoga	-	-	2		25	25	50	1
		Total	15	1	08	25	350	400	750	20

Note: AM:Mathematics, PP:Physics, ME: Mechanical Engineering, IP: Industrial & Production Engineering, CE: Civil Engineering, CS: Computer Sc. & Engg., IT: Information Technology, PE: Physical Education, FO: Forestry, LA: Law, NS: NSS, U: Undergraduate, T: Theory, L: Laboratory,

BASIC SCIENCE (B)	ENGINEERING SCIENCE (E)	SKILL ENHANCEMENT COURSE (L)	HUMANITIES SCIENCE (H)	MANDATORY COURSE (C)	EXTRA-CURRICULAR ACTIVITIES (S)
1. Mathematics – A 2. Physics 3. Chemistry 4. Mathematics - B	1. Engineering Mechanics 2. Introduction to Information Technology 3. Basic Electrical Engineering 4. Basic Electrical and Electronics Engineering 5. Computer Programming 6. Basic Communication Engineering	1. Engineering Graphics 2. Engineering Workshop Practices	1. English for communication 2. Human Values and Ethics	1. Indian Constitution 2. Environmental Science & Ecology	1. NSS 2.Sports and Yoga

SCHOOL OF STUDIES OF ENGINEERING AND TECHNOLOGY

Scheme of Teaching and Evaluation 2022-2023 (As per NEP-2020)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

(Effective from the Academic Year 2022–2023)

II-SEMESTER BTech Mechanical/IP/Chemical/Civil Engineering

S.N.	Course Code	Course Title	Teaching Hours/week			Examination				Credits
			Theory/Lecture	Tutorial	Practical/ Drawing	Examination in Hours	CIA Marks	SEA Marks	Total Marks	
			L	T	P					
1	AMLRTB4	Engineering Mathematics-B	3	1	-	03	40	60	100	4
2	PPUBTB2	Engineering Physics	3	1	-	03	40	60	100	4
3	ITUBTB2	Introduction to Information Technology	3	-	-	03	40	60	100	3
4	ELUBTB1	English for Communication	3	-	-	03	40	60	100	3
5	CEUBTB1	Engineering Mechanics	3	-	-	03	40	60	100	3
6	ME UBTH2/CH UBTH2/ IP UBTH2/CEUBTH2	Human Values and Ethics	1	-	-	02	50	-	50	1
7	PPUBLB2	Engineering Physics Laboratory	-	-	2	03	25	25	50	1
8	CEUBLB1	Engineering Mechanics Laboratory	-	-	2	03	25	25	50	1
9	MEUBLL1	Engineering Graphics	1	-	3	03	25	25	50	3
10	NSUBLS1	NSS	-	-	2	01	25	25	50	1
		Total	17	2	09	27	350	400	750	24

Note: AM:Mathematics, PP:Physics, ME: Mechanical Engineering, IP: Industrial & Production Engineering, CE: Civil Engineering, CS: Computer Sc. & Engg., IT: Information Technology, PE: Physical Education, NS: NSS, U: Undergraduate, T: Theory, L: Laboratory,

BASIC SCIENCE (B)	ENGINEERING SCIENCE (E)	SKILL ENHANCEMENT COURSE (L)	HUMANITIES SCIENCE (H)	MANDATORY COURSE (C)	EXTRA-CURRICULAR ACTIVITIES (S)
1. Mathematics – A 2. Physics 3. Chemistry 4. Mathematics - B	1. Engineering Mechanics 2. Introduction to Information Technology 3. Basic Electrical Engineering 4. Basic Electrical and Electronics Engineering 5. Computer Programming 6. Basic Communication Engineering	1. Engineering Graphics 2. Engineering Workshop Practices	1. English for communication 2. Human Values and Ethics	1. Indian Constitution 2. Environmental Science & Ecology	1. NSS 2.Sports and Yoga

Scheme of B.Tech. III Semester Civil Engineering (As per NEP 2020, CBCS & OBE)
W.E.F 2023-24 (Even Semester)

S. No	Course Code	Subjects	Periods			Evaluation Scheme				Credits
		Theory	L	T	P	TA	IA	ESE	Total	
1	AMUCTB1	Engineering Mathematics-III	3	0	0	10	30	60	100	3
2	CEUCTT1	Strength of Materials	3	1	0	10	30	60	100	4
3	CEUCTT2	Fluid Mechanics-I	3	0	0	10	30	60	100	3
4	CEUCTT3	Surveying & Geomatics	3	0	0	10	30	60	100	3
5	CEUCTP1	Building Materials & Construction	3	0	0	10	30	60	100	3
	CEUCTP2	Engineering Geology								
	CEUCTP3	Ancient Philosophy of Civil Engineering								
6	CEUCTO1	Green Buildings	3	0	0	10	30	60	100	3
	CHUCTO1	Engineering Materials								
	CSUCTO1	Data Structure with C++								
	ITUCTO1	Computer Organization and Architecture								
	IPUCTO1	I.C. Engine								
	MEUCTO1	Introduction to Thermodynamics								
	ECUCTO1	Data Communication								
Total (A)			18	1	0				600	19
Practical's/Labs										
7	CEUCLT1	Survey Lab	0	0	2		25	25	50	1
8	CEUCLT2	Fluid Mechanics Lab	0	0	2		25	25	50	1
Total(B)			0	0	4				100	2
Total Credits (A+B)									700	21

L-Lecture, T-Tutorial, P-Practical, TA-Teacher Assessment, IA- Internal Assessment (Based on two class tests (CT)of marks-15 each), ESE-End Sem Examination, NEP-National Education Policy, CBCS-Choice Based Credit System, OBE-Outcome Based Education

Scheme of B.Tech. IV Semester Civil Engineering (As per NEP 2020, CBCS & OBE)
W.E.F 2023-24 (Even Semester)

S.No	Course Code	Subjects	Periods				Evaluation Scheme			Credits
		Theory	L	T	P	TA	IA	ESE	Total	
1	CEUDTT1	Structural Analysis-I	3	1	0	10	30	60	100	4
2	CEUDTT2	Fluid Mechanics-II	3	0	0	10	30	60	100	3
3	CEUDTT3	Concrete Technology	3	0	0	10	30	60	100	3
4	CEUDTP1	Estimation and Costing	3	0	0	10	30	60	100	3
	CEUDTP2	Sustainable Construction								
	CEUDTP3	Ocean Engineering								
5	CEUDTO1	Remote Sensing & GIS	3	0	0	10	30	60	100	3
	CHUDTO1	Fluidization Engineering								
	CSUDTO1	Introduction to Information Science								
	ITUDTO1	Computer Network								
	ITUDTO1	Fundamentals of python programming								
	IPUDTO1	Automobile Engineering								
	MEUDTO1	Introduction to Fluid Mechanics								
	ECUDTO1	Introduction to Electronic Devices & Circuits								
6	CEUDTM1	Management and Organizational Behaviour	2	0	0					0
Total (A)			17	1	0				500	16
Practical's/Labs										
7	CEUDLT1	Civil Engineering Drawing with Computer Applications	0	0	2		25	25	50	1
8	CEUDLT2	Material Testing Lab	0	0	2		25	25	50	1
9	CEUDPT1	Mini Project	0	0	4		50	50	100	2
Total(B)			0	0	8				200	4
Total Credits(A+B)									700	20

L-Lecture, T-Tutorial-Practical, TA-Teacher Assessment, IA- Internal Assessment (Based on two class tests (CT)of marks-15 each), ESE-End Sem Examination, NEP-National Education Policy, CBCS-Choice Based Credit System, OBE-Outcome Based Education

DEPARTMENT OF CIVIL ENGINEERING B.TECH. THIRD YEAR SYLLABUS W.E.F 2022-23

SYLLABUS	(SEMESTER-VI)							
Subject Code:	CE206TPE01X	CREDITS: 3			SESSIONAL : TA			ESE
Subject:	Professional Elective -1X	L	T	P	CT-I	CT-II	TOTAL	
		3	0	-	15	15	30	70
Professional Elective-1A or Professional Elective-1B or Professional Elective-1C or Professional Elective-1D or Professional Elective-1E		Any one subject to be Selected from the Professional Electives						
Professional Electives Group -1								
CE206TPE01A		Structural Analysis by Matrix Methods						
CE206TPE01B		Advanced Surveying						
CE206TPE01C		Advanced Concrete Design						
CE206TPE01D		Construction Engineering Materials						
CE206TPE01E		Basics of Computational Hydraulics						

DEPARTMENT OF CIVIL ENGINEERING B.TECH. FOURTH YEAR SYLLABUS W.E.F 2023-24

SYLLABUS								
Subject Code:	CE207TPE02X	CREDITS: 3			SESSIONAL - TA			ESE
Subject:	Professional Elective -2X	L	T	P	CT-I	CT-II	TOTAL	70
		3	0	0	15	15	30	
Professional Elective-2A or Professional Elective-2B or Professional Elective-2C or Professional Elective-2D or Professional Elective-2E		Any one subject to be Selected from the Professional Electives Group-2						
Professional Electives Group -2								
CE207TPE02A		Environmental Geo-technology						
CE207TPE02B		Air and Noise Pollution and Control						
CE207TPE02C		Solid and Hazardous Waste Management						
CE207TPE02D		Urban Hydrology and Hydraulics						
CE207TPE02E		Environmental Impact Assessment and Life Cycle Analysis						

SYLLABUS (SEMESTER-VII)								
Subject Code:	CE207TPE04X	CREDITS:3			SESSIONAL - TA			ESE
Subject:	Professional Elective - 4X	L	T	P	CT -I	CT-II	TOTAL	70
		3	-	-	15	15	30	
Professional Elective-4A or Professional Elective-4B or Professional Elective-4C or Professional Elective-4D or Professional Elective-4E	Any one subject to be Selected from the Professional Electives							
Professional Electives Group -4								
CE207TPE04A	Industrial Structures							
CE207TPE04B	Airport Planning and Design							
CE207TPE04C	Railway Engineering							
CE207TPE04D	Contracts Management							
CE207TPE04E	Construction Projects Planning & Systems							

DEPARTMENT OF CIVIL ENGINEERING B.TECH. FOURTH YEAR SYLLABUS W.E.F 2023-24

SYLLABUS (SEMESTER-VII)								
Subject Code:	CE207TPE03X	CREDITS:3			SESSIONAL - TA			ESE
Subject:	Professional Elective - 3X	L	T	P	CT I	CT II	TOTAL	70
		3	-	-	15	15	30	
Professional Elective-3A or Professional Elective-3B or Professional Elective-3C or Professional Elective-3D or Professional Elective-3E	Any one subject to be Selected from the Professional Electives							
Professional Electives Group -3								
CE207TPE03A	Engineering Hydrology							
CE207TPE03B	Structural Dynamics							
CE207TPE03C	Foundation Engineering							
CE207TPE03D	Rock Mechanics							
CE207TPE03E	Water Resources Planning & Management							

SYLLABUS (SEMESTER-VIII)								
Subject Code:	CE208TPE05X	CREDITS:3			SESSIONAL - TA			ESE
Subject:	Professional Elective - 5X	L	T	P	CT 1	CT 2	TOTAL	70
		3	-	-	15	15	30	
Professional Elective-5A or Professional Elective-5B or Professional Elective-5C or Professional Elective-5D or Professional Elective-5E		Any one subject to be Selected from the Professional Electives						
Professional Elective-5 (PE Group-5)								
CE208TPE05A	Offshore Engineering							
CE208TPE05B	Surface Hydrology							
CE208TPE05C	Bridge Engineering							
CE208TPE05D	Traffic Engineering							
CE208TPE05E	Construction Equipment & Automation							

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DEPARTMENT OF CIVIL ENGINEERING B.TECH. FOURTH YEAR SYLLABUS W.E.F 2023-24

SYLLABUS	(SEMESTER-VIII)							
Subject Code:	CE208TPE06X	CREDITS: 3			SESSIONAL - TA			ESE
Subject:	Professional Elective -6	L	T	P	CT-I	CT-II	TOTAL	
		3	-	-	15	15	30	70
Professional Elective-6A or Professional Elective-6B or Professional Elective-6C or Professional Elective-6D or Professional Elective-6E		Any one subject to be Selected from the Professional Electives Group-6						
Professional Electives Group -6								
CE208TPE06A	Low Cost Housing Techniques							
CE208TPE06B	Water and Air Quality Modelling							
CE208TPE06C	Repair and Rehabilitation of Structures							
CE208TPE06D	Finite Element Analysis							
CE208TPE06E	Urban Hydrology and Hydraulics							

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	AMUATB1	L	T	P	CT-I	CT-II	Attendance & Assignments	TOTAL	60	100	04
Subject:	ENGINEERING MATHEMATICS - A	3	1	-	15	15	10	40			

Course Objectives:

1. To study the mean value theorem and nth derivative.
2. To study the indeterminate forms, partial and total differentiation.
3. To study the various concepts of integral calculus such as reduction formula, area, volume and length.
4. To study the ordinary and partial differential equations.
5. To study the applications of ordinary and partial differential equations

Differential Calculus

UNIT-1:
Leibnitz theorem, Roll's theorem, Lagrange's theorem, Mean value theorem, Expansions of functions by McLaurian and Taylor's series, Tangents and normal, Maxima and minima

UNIT-2:
Indeterminate forms, Asymptotes, Radius of curvature, Partial differentiation, Total differentiation

Integral Calculus

UNIT-3:
Reduction formulae, Curve tracing, Area, Volume, Length, Surface area, Double and triple integrals, Gamma and beta function.

Differential Equations

UNIT-4:
Differential equations of first order, Linear differential equation of higher order with constant coefficient, Equations reducible to linear equations with constant coefficients, Cauchy's homogeneous linear equations, Application of linear differential equations, Simultaneous differential equations.

UNIT-5:
Series solution of differential equations about ordinary point, Partial differential equations, linear homogeneous partial differential equations, application of partial differential equations: One dimensional heat equation and wave equation.

Recommended Books:

1. N.P. Bali, A Textbook of Engineering Mathematics, Laxmi publications, 10th edition, 2016.
2. H.K. Das, Higher Engineering Mathematics, S. Chand, 2014
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th edition

Course Outcomes: After completing the course, the students will be able to:

1. Expand the function in Maclaurin's and Taylor's series.
2. Find the limit of some indeterminate forms and solve the problems of partial and total differentiation.
3. Solve the problems related to area, volume and length.
4. Solve the ordinary and partial differential equations.
5. Solve the engineering problems using differential equations.

Course Outcomes and their mapping with Programme Outcomes: ENGINEERING MATHEMATICS – A (AMUATB1)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2		1	1				1	2		2	1	1	2
CO2	3	2		1	1				1	2		2	1	1	2
CO3	3	2		1	1				1	2		2	1	1	2
CO4	3	3		1	1				1	2		2	1	1	2
CO5	3	3		1	1				1	2		2	1	1	2

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	CYUATB3	L	T	P	CT-1	CT-II	Attendence & Assignments	TOTAL	60	100	03
Subject:	ENGINEERING CHEMISTRY	3	-	-	15	15	10	40			

Course Objectives:
The objective of this Course is to:

- To make aware and enrich the students about the basic concept and understanding of chemical concepts of basic Chemistry and spectroscopic techniques.

Course Content:

UNIT-1: I Concept of Quantum Energy and Spectroscopy: Quantization of Energy, Regions of spectrum. Electronic Spectroscopy: Electronic Transition, Woodward Fieser rules for calculating λ_{max} of conjugated dienes & α, β-unsaturated carbonyl compound, various shifts in λ_{max} and intensities. Infra-Red Spectroscopy: Conditions for Infra-Red Spectroscopy, Molecular vibrations & factors affecting Infra-Red frequencies.
UNIT-2: Chemical Bonding in Molecules: Introduction of chemical bonding, VSEPER Theory, V.B. Theory and Molecular Orbital Theory. Energy level diagrams of diatomic molecules and ions.
UNIT-3: Concept of Chirality, Enantiomers, Diastereomers, Meso-compounds and Racemic mixtures. Conformation of Acyclic hydrocarbons (Ethane, Propane & n-Butane) and cyclic hydrocarbon (Cyclohexane), Plane of symmetry, Centre of symmetry, Absolute and Relative Configuration (R &S, D & L and E & Z).
UNIT -4: Reactivity of Organic Molecules, Factors influencing acidity, basicity and nucleophilicity of molecules, kinetic vs thermodynamic control of reactions.
UNIT -5: Strategy for Synthesis of Organic Compounds: Reaction intermediates: Stability of Free Radicle, Carbocation and Carbanion. Introduction to reaction eg. Elimination and Substitution, Mechanisms of some named reactions.

Course Outcomes: After completing the course, the students will be able to:

1. Understand about quantum energy, spectroscopy and spectroscopic analysis of molecules.
2. Have adequate knowledge regarding bonding in molecules and different theories for the same. The students will be able to predict the hybridization and geometry of any molecules.
3. Understand the concept of organic molecules with respect to chirality and stereo chemistry.
4. Predict organic reactions influencing parameters and develop some knowledge regarding kinetic vs thermodynamic control of reactions.
5. Design the strategy for performing organic reactions. They will have develop a now how regarding the reaction intermediate and their stability.

Textbooks/References:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai PublicationCo.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015edition.
3. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition(second).
4. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015edition.
5. A textbook of Engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., LatestEdition
6. Applied Chemistry by H.D. Gesser, SpringerPublishers
7. Textbook of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press,IIM
8. B. Siva Shankar, "Engineering Chemistry", Tata Mc Graw Hill Publishing Limited, 3rd Edition, 2015.
9. S. S. Dara, Mukkanti, "Text of Engineering Chemistry", S. Chand & Co, New Delhi, 12th Edition, 2006.
10. C. V. Agarwal, C. P. Murthy, A. Naidu, "Chemistry of Engineering Materials", Wiley India, 5th Edition, 2013.
11. R. P. Mani, K. N. Mishra, "Chemistry of Engineering Materials", Cengage Learning, 3rd Edition, 2015.

Course Outcomes and their mapping with Programme Outcomes: ENGINEERING CHEMISTRY (CYUATB3)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2			1						1	1		
CO2	2	1	1									1	1		
CO3	2	1	1									1	1		
CO4	2	1	1									1	1		
CO5	2	1	1									1	1		

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	ECUATE4	L	T	P	CT-I	CT-II	Attendance & Assignments	TOTAL	60	100	03
Subject:	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	3	-	-	15	15	10	40			

Course Learning Objectives:

- To provide knowledge for the analysis of DC and AC circuits.
- To explain the working principle, construction, applications of Transformer
- Study of DC machines and AC machines.
- To impart knowledge of analog and digital electronics

Unit-I: DC CIRCUITS

Electrical circuit elements (R, L and C), voltage and current sources, Ohm's Law, Kirchoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Mesh & nodal analysis, Star- Delta Transformation.
Time-domain analysis of first-order RL and RC circuits.

Unit-II: AC CIRCUITS

Representation of sinusoidal waveforms, average and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections. Three-phase power measurement- Two- Wattmeter method.

UNIT-III: ELECTRICAL MACHINES

Construction, classification, ideal and practical transformer, equivalent circuit, losses in transformers, tests, voltage regulation and efficiency.
Introduction to DC Machines and three phase Induction Machine

Unit-IV: ANALOG and DIGITAL ELECTRONICS

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Introduction to Bipolar Junction Transistor.
Binary Number System, Logic Gates, Combinational circuits, Boolean Algebra, De Morgan's Theorem, Half and Full Adders,

UNIT V: Simulation and analysis of DC and AC circuits. Testing on single phase transformer. Demonstration of DC and AC machines. Basic analog and digital applications

Suggested Text / Reference Books:

(i) D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
(ii) D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
(iii)B L Theraja & AK Theraja,"A Textbook of Electrical Technology- Vol-I & II, S. CHAND &Co ltd, 2013.
(iv) E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
(v) Jacob Millman, Christos Halkias, Chetan Parikh, "Millman's Integrated Electronics - Analog and Digital Circuit and Systems", 2nd Edition 2017
(vi) Robert L Boylestad, Louis Nashlsky," Electronics devices and circuit theory", Pearson 11* edition 2013
(vii) M. Morris Mano ," Digital Logic and Computer Design", Pearson, 2004.

Course Outcomes:

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

1. Analyze DC circuits.
2. Analyze AC circuits.
3. Understand the working principle of Transformer, DC and AC machines.
4. Understand the characteristics and working of diodes and transistors.
5. Understand the basics of digital circuits and its importance.

Course Outcomes and their mapping with Programme Outcomes: BASIC ELECTRICAL & ELECTRONICS ENGINEERING (ECUATE4)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1		1						3	3		2
CO2	3	2	2	1		1						3	3		2
CO3	3	2	2	1		1						3	3		2
CO4	3	2	2	1		1						3	3		2
CO5	3	2	2	1		1						3	3		2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	FOUATC2	L	T	P	CT-I	CT-II	Attendance & Assignments	TOTAL	60	100	02
Subject:	ENVIRONMENTAL SCIENCE AND ECOLOGY	2	-	-	15	15	10	40			

Course Learning Objectives:

- To understand the concept of ecosystem and environment and its importance for sustaining life on earth.
- To be aware of the various natural resources and different types of pollution and its management.
- To gain knowledge on the sources and different types of energy for meeting daily human needs.

Course Content

UNIT – I
Introduction: Environment - Components of Environment Ecosystem: Types & Structure of Ecosystem, Balanced ecosystem Human Activities – Food, Shelter, Economic & Social Security.
Definition, Scope and basic principles of ecology and environment, Fundamentals of Ecology and Ecosystem – Structural and Functional Components. Food chain & Food webs. Ecological pyramids; Energy flow

UNIT – II
Air Pollution & Automobile Pollution: Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, controlling measures.

UNIT-III
Solid Waste Management, E - Waste Management & Biomedical Waste Management - Sources, Characteristics & Disposal methods.

UNIT – IV
Natural Resources, Water resources – Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water, Mineral resources, Forest Wealth, Material Cycles – Carbon Cycle, Nitrogen Cycle & Sulphur Cycle.

UNIT-V
Energy – Different types of energy, Conventional sources & Non-Conventional sources of energy: solar energy, Hydro-electric energy, Wind Energy, Nuclear energy, Biomass & Biogas Fossil Fuels, Hydrogen as an alternative energy.

Text Books

1. Fundamentals of Ecology (3rd Ed.) 2001- MC Dash, Tata - McGraw Hill, New Delhi.
2. Introduction to Environmental Engg. (1991). - GM Masters, Prentice Hall of India.
3. Benny Joseph (2005), "Environmental Studies", Tata McGraw – Hill Publishing Company Limited.
4. R.J.Ranjit Daniels and Jagadish Krishnaswamy, (2009), "Environmental Studies",Wiley India Private Ltd., New Delhi.
5. R.Rajagopalan, "Environmental Studies – From Crisis to Cure",Oxford University Press, 2005.
6. Aloka Debi, "Environmental Science and Engineering", Universities Press (India) Pvt. Ltd. 2012

Course Outcome: At the end of the course students will be:

1. Acquainted with different types, needs and importance of ecosystem and environmental components on earth.
2. Aware of and able to sustainably manage the natural resources and different types of pollution caused by anthropogenic activities.
3. Able to identify and know the different types and sources of energy and the strategies to conserve the conventional energy.

Course Outcomes and their mapping with Programme Outcomes: ENVIRONMENTAL SCIENCE AND ECOLOGY (FOUATC2)

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1							3		1			1			
CO2							3		1			1			
CO3							3		1			1			

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	CSUATE5	L	T	P	CT-I	CT-II	Attendance & Assignments	TOTAL	60	100	03
Subject:	COMPUTER PROGRAMMING	3	-	-	15	15	10	40			

Course Objectives:

- To learn the basic ideas of the Algorithms and Flowcharts.
- To learn Basic C concepts Data types and Control statements.
- To learn the Functions and Structure of Array.
- To learn the concepts of Sorting and Searching Algorithms.
- To learn basic concepts of Linked List Notations.

Course Content:

UNIT-1: Introduction to Programming
Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) -
Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

UNIT-2: Arithmetic expressions and precedence
Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching Iteration and loops, **Arrays** (1-D, 2-D), Character arrays and strings

UNIT-3: Basic Algorithms
Searching, concept of binary search etc., Basic Sorting Algorithms Bubble sort etc., Finding roots of equations, introduction of Algorithm complexity

UNIT-4: Function
Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference binary search etc.
Recursion functions Recursion, as a different way of solving problems. Example programs, such as, Finding Factorial, Fibonacci series, etc.

UNIT -5: Structure
Structures, Defining structures and Array of Structures
Pointers Idea of pointers, defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Course Outcomes- At the end of the course students will be able to
1. Understand the designing of basic level Algorithm and Flowcharts.
2. Understand the C programming fundamentals on the different Control Statements, Functions and Arrays.
3. Understand the Searching, Sorting Algorithms and concepts of linked list operations.

Textbooks/References:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
3. Brian W. Kernighan and Dennis M. Ritchie, the C Programming Language, Prentice Hall of India

Course Outcomes and their mapping with Programme Outcomes: COMPUTER PROGRAMMING (CSUATE5)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2				1	2	2	1	3	2	2	3
CO2	3	2	3	2	3			1	2	2	1	3	2	2	3
CO3	3	2	3	2	3				2	2	1	3	2	2	2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	LAUATC1	L	T	P	CT-I	CT-II	Attendance & Assignments	TOTAL			
Subject:	INDIAN CONSTITUTION	1	-	-	20	20	10	50	-	50	01

Course Learning Objectives:

- To the importance of preamble of the constitution of India.
- To understand the fundamental rights and duty as a citizen of India.
- To understand the functioning of union and state government and their inter-relationship.

Course Content:

UNIT 1: Introduction: Constitution-meaning of the term, Sources and constitutional theory, Features, Citizenship. Preamble.

UNIT 2: Fundamental Rights and Duties: Fundamental Rights, Fundamental Duties, Directive Principles of State Policy

UNIT 3: Union Government: Structure of Indian Union: Federalism, Centre-State relationship President: Role. Power and position, Prime Minister and council of ministers, Cabinet and Central Secretariat, Lok Sabha. Rajya Sabha

UNIT 4: State Government: Governor: Role and position, Chief Minister and council of ministers, State Secretariat

UNIT 5: Relationship between Centre and States: Distribution of Legislative Powers, Administrative Relations, Coordination between States

Textbooks/References:

1. Constitution of India, V.N. Shukla
2. The Constitutional Law of India, J.N. Pandey
3. Indian Constitutional Law, M.P. Jain

Course Outcome: At the end of the course students will be able to:

1. Describe the salient features of the Indian Constitution
2. List the Fundamental Rights and Fundamental Duties of Indian citizens
3. Describe the Directive Principles of State Policy and their significance

Course Outcomes and their mapping with Programme Outcomes: INDIAN CONSTITUTION (LAUATC1)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						2		3				1			
CO2						2		3				1			
CO3						2		3				1			

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

SYLLABUS	(SEMESTER-I)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	CYUALB3	L	T	P	IA	MSE	TOTAL			
Subject:	ENGINEERING CHEMISTRY LABORATORY	-	-	2	25	--	25	25	50	01

Course Objectives:

The Lab sessions would help in learning:
- Application of iodometrically & titration in lab.
- Recognition of different chemical reaction.
- Advanced lab methods like Spectrophotometry and chromatography

Course Content:

Group – A:

1. Standardization of sodium thiosulphate solution by standard potassium dichromate solution.
2. To determine the Normality and Strength (g/L) of given Ferrous Ammonium Sulphate solution 'A' using standard Ferrous Ammonium Sulphate (N/30) solution 'B' taking KMnO4 solution as an intermediate.
3. To determine the concentration of hypo solution ($Na_2S_2O_3.5H_2O$) iodometrically with given Iodine (N/50) solution.
4. Find out the Temporary hardness of given water sample using 0.01M EDTA solution, buffer solution (pH-10) and EBT as an indicator.
5. To determine chloride ion in a given water sample by Argentometric method (Mohr's method)

Group – B:

6. Preparation of Urea Formaldehyde resin.
7. Acetylation of Primary Amine: Preparation of Acetanilide.
8. Base Catalyzed Aldol Condensation: Synthesis of dibenzal propanone.
9. [4+2] Cycloaddition Reaction: Diels-Alde reaction.
10. Preparation of aspirin and calculate its yield.

Group – C:

11. To calculate the λ_{max} of a given compound using UV-visible spectrophotometer.
12. To separate the metallic ions by paper chromatography.
13. To determine the surface tension of a liquid by stalagmometer.
14. To determine the percentage composition of the given mixture consisting of two liquids A and B (non- interacting system) by viscosity method.
15. To determine the relative viscosity of given liquids by Ostwald's viscometer.

Note: At least two Experiments from each group must be performed.

Course Outcomes- On completion of the course, the students will be able to
1. Have develop basics of volumetric analysis and required calculation ability.
2. Develop ability to perform organic reactions calculate their yields etc.
3. Develop knowledge regarding analytical tools and colligative properties of molecules.

Course Outcomes and their mapping with Programme Outcomes: ENGINEERING CHEMISTRY LABORATORY (CYUALB3)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1						1			1	1		1
CO2	2	2	1						1			1			1
CO3	2	2	1	1	1				1			1	1		1

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

SYLLABUS	(SEMESTER-I)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	CSUALE5	L	T	P	IA	MSE	TOTAL			
Subject:	COMPUTER PROGRAMMING LABORATORY	-	-	2	25	--	25	25	50	01

Course Learning Objectives:

- To learn the Branching and logical expressions and Loops
- To learn the Arrays and Function
- To understand the Numerical methods and Recursion

Course Content:

The laboratory should be preceded or followed by a tutorial to explain the approach or Algorithm to be implemented for the problem given.

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:
Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical Integration):
Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures

Course Outcomes- At the end of the course students will be able to

1. Design basic level Algorithms and Flowcharts.
2. Understand C programming fundamentals on the different Control Statements, Functions and Arrays.
3. Understand the programming concepts of Recursion, Searching, Sorting Algorithms.
4. Write C programs for basic engineering solutions.

Course Outcomes and their mapping with Programme Outcomes: COMPUTER PROGRAMMING LABORATORY (CSUALE5)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	3				2	1	2	3	3	3	2
CO2	3	3	3	2	2				2	2	2	3	3	3	2
CO3	3	3	3	2	3				2	2	2	3	3	3	2
CO4	3	3	3	2	3				2	3	3	3	3	3	2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

SYLLABUS	(SEMESTER-I)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	IPUALL2	L	T	P	IA	MSE	TOTAL			
Subject:	ENGINEERING WORKSHOP PRACTICES	-	-	2	25	--	25	25	50	01

Course objectives:

- To impart student knowledge on various hand tools for usage in engineering applications.
- Be able to use analytical skills for the production of components, electrical switch board wiring and logic gate.

Course Content:

1. Study of M/C tools in lathe machine
   Demonstration of different operations of lathe machine
   Practice of facing plain turning, taper turning etc
2. Study of Carpentry tools, equipments and different jobs
   Practice of Lap joints, Butt joints, T-Lab joints
3. Practice of Lap joint, Butt Joint, T-joint
4. Preparation of ₹ shape, square shape, work pieces as per the given specification
5. Replacement of fuse, condenser of fan/motor and fan regulator;
   Installation of switch board with wiring;
   Concepts of measuring instruments.
6. Identification of various electronics components and their terminals;
   Study of logic gates AND, OR, XOR and NOT, NAND, NOR;
   Study of Basic ICs.

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

1. Understand the appropriate tools, materials, instruments required for specific operations in workshop.
2. Understand the figures of the hand tools used in fitting, carpentry, welding shop and machine tools such as lathe machine.
3. Understand report of procedures followed for a given task in fitting, carpentry, welding and machine shops.
4. Basic understanding of electrical equipment fitting and understanding of electronic logic gates AND, OR, NOT and ICs.
5. Basic understanding of electrical equipment fitting and understanding of electronic logic gates AND, OR, NOT and ICs. Apply techniques to perform basic operations with hand tools and power tools such as center lathe machine, fitting shop, carpentry, welding using given job drawing.

Textbooks/References:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of [illegible], Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I" Pearson Education, 2008. (iv)Roy A. Lindberg, "Processes and Materials of Manufacture", 4thedition, PrenticeHallIndia, 1998.
4. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata Mc-Graw Hill House, 2017.

Course Outcomes and their mapping with Programme Outcomes: ENGINEERING WORKSHOP PRACTICES (IPUALL2)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2								2						
CO2	2								3						
CO3	2								1						
CO4	2								2					1	
CO5	1								3					1	

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

SPORTS & YOGA

SYLLABUS	(SEMESTER-I)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ES Assessment	Grand total	Credits
Subject Code:	PEUALS2	L	T	P	Attendance	Activities	TOTAL			
Subject:	SPORTS AND YOGA	-	-	2	5	20	25	25	50	01

Course Objectives:

- To make the students understand the importance of sound health and fitness principles as they relate to better health.
- To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health, and fitness.
- To create a safe, progressive, methodical, and efficient activity-based plan to enhance improvement and minimize risk of injury.
- To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health.

Physical Fitness Tests

- AAHPER youth fitness test
- Cooper's 12 Minute run-walk test

General Introduction of games and sports

Fundamental skills, history and development of the following games and sports:

- Athletics
- Batminton
- Basketball
- Cricket
- Football
- Hockey
- Handball
- Kabaddi
- Kho-kho
- Volley-ball
- Yoga

Note:

1. Each student will have to clear one of the physical fitness tests by the end of the semester.
2. One project is to be prepared by the students at least for two games.

References:

1. Barron H M, McGhee R (1997) A Practical Approach to Measurement in Physical Education.
2. Kansal D K (1996), Test and Measurement in sports and physical education, New Delhi, D V S Publication

Course Outcomes:

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

1. Apply warming up and warming down exercises in daily physical fitness activities
2. Apply stretching rotation and flexibility exercises in daily physical fitness activities.
3. Make use of acquired yoga asanas skill and pranayama method in daily lifestyle.
4. Utilize the acquired weight training skills for the development of muscular strength and development. Utilize the acquired skills in playing sports and games.

Course Outcomes and their mapping with Programme Outcomes: SPORTS AND YOGA (PEUALS2)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									3			3			
CO2									3						
CO3									3			3			
CO4									3			3			

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	AMUBTB4	L	T	P	CT-I	CT-II	Attendance & Assignments	TOTAL	60	100	04
Subject:	ENGINEERING MATHEMATICS - B	3	1	-	15	15	10	40			

Course Objectives:

1. To study the concepts of vector space, linear transformation, matrices and system of linear equations.
2. To find the roots of equations i.e. quadratic and bi-quadratic equations.
3. To study the concept of gradient, divergence, curl, Green's theorem, Gauss's theorem and Stokes's theorem and their applications.
4. To study the properties of complex numbers and to establish the relation between exponential, hyperbolic and logarithm functions.
5. To test the nature of infinite series i.e. convergence, divergence and oscillatory.

UNIT-1: **Linear Algebra**
Vector space, linear dependence and linear independence of vectors, linear transformations, rank and inverse by elementary transformations, system of linear equations – consistency and inconsistency, eigen value and eigen vectors, Caley-Hamilton theorem and its application to find the inverse.

UNIT-2: **Theory of equations**
Polynomial and polynomial equations, division algorithm, roots of equations, remainder theorem, factor theorem, synthetic division, fundamental theorem of algebra, multiplication of roots, descarte's rule of sign, Descarte's method.

UNIT-3: **Vector Calculus**
Vector functions, differentiation of vectors, velocity and acceleration, scalar and vector fieldm gradient of scalar field, directional derivative, properties of gradient, divergence of vector, curl of vector, point function, properties of divergence and curl, integration of vector function, line integral, surface integral, Green's theorem, gauss theorem, Stoke's theorem (without proof) and their simple applications.

UNIT-4: **Complex Number**
Complex numbers and its properties, conjugate complex numbers, standard form of complex numbers, De-Moivre's theorem, Roots of complex numbers, exponential function of complex variable, circular form of complex variable, Hyperbolic function of complex numbers, Logarithmic function of complex numbers.

UNIT-5: **Infinite Series**
Sequence, convergent, divergent, oscillating sequence, infinite series, behavior of infinite series, ratio test, root test, comparison test, Raabe's test, Logarithmic test.

Recommended Books:

1. N.P. Bali, A Textbook of Engineering Mathematics, Laxmi publications, 10th edition, 2016.
2. H.K. Das, Higher Engineering Mathematics, S. Chand, 2014
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th edition

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

1. To know the concept of vector space, matrices and their various properties and also be able to solve the system of linear equations.
2. To solve the quadratic and bi-quadratic equations.

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	PPUBTB2	L	T	P	CT-I	CT-II	Attendance & Assignments	TOTAL	60	100	04
Subject:	ENGINEERING PHYSICS	3	1	-	15	15	10	40			

Course Objectives:

1. To know the basic principles, effects and applications such as physical, optical parameters used for engineering applications.
2. To learn about various laws and applications of electromagnetic theory.
3. To know the basic structure, working principles and applications of lasers and optical fibre communication.
4. To know the basics of semiconductor physics, semiconductor materials and devices and its characterization for advance technological applications
5. To familiarize the basis of quantum theory and to make students to solve the physical problems for advancement of the technology.

Course Content:

Unit 1: Optics: Interference and Diffraction
Introduction, Young's experiment theory of interference, Coherent and non-coherent sources, Fresnel's Bi- prism and Newton's ring experiment.
Diffraction of light, Fresnel and Fraunhofer's diffraction, diffraction due to plane diffraction grating.

Unit 2 Electromagnetic Theory
Coulomb's law electrostatics field and potential, electric flux, Gauss' law, Poisson's and Laplace's equation. Equation of continuity for charge conservation, Ampere's and Faraday's laws, Maxwell's Electromagnetic equations.

Unit 3 Laser and Fiber optics
Introduction, elementary idea of spontaneous and stimulated emission, active medium population inversion, Einstein's coefficients, Types of lasers and important applications of lasers.
Introduction to optical fibers, basic principles of optical fiber, critical angle numerical aperture, maximum acceptance angle, classification of optical fiber.

Unit 4 Semiconductor physics and Devices
Formation of energy in solids, Energy band gap of metals, insulators and semiconductors, classification of semiconductor: Intrinsic and Extrinsic semiconductors, Fermi levels in intrinsic and extrinsic semiconductors, Electrical conductivity in conductors and semiconductors, working of P-N junction diodes and bipolar junction transistor.

Unit 5 Introduction to Quantum Mechanics
Introduction to Quantum Mechanics, photoelectric effect, Compton effect, wave-particle duality, uncertainty principle, wave function, De-Broglie waves, phase and Group velocity, Davisson and Germer experiment, Schrodinger wave equation, particle in a box (1-Dimensional)

Course Outcome: At the end of the course, students will be able to:

1. Student's ability to understand the basic principles and applications of physical optics for physical parameters measurements such as length, thickness, aperture size etc.
2. Student's will be able to design, characterized the lasers and optical fibers and their effective

3. To solve the problems of gradients, divergent, curl and the applications of vector calculus.
4. To find the roots of complex numbers with the help of De-Moivre's theorem.
5. To know the convergence and divergence of infinite series using various type of tests.

Course Outcomes and their mapping with Programme Outcomes: ENGINEERING MATHEMATICS – B (AMUBTB4)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2		1	1				1	2		2	1	1	2
CO2	3	2		1	1				1	2		2	1	1	2
CO3	2	2		1	1				1	2		2	1	1	2
CO4	2	2		1	1				1	2		2	1	1	2
CO5	2	2		1	1				1	2		2	1	1	2

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

3. Students demonstrate appropriate competence and working knowledge of laws of electromagnetic theory and semiconductor physics and devices for their advance applications

Textbooks/References:

1. Applied physics-I and II By Navneet Gupta, Dhanpat Rai &Co.
2. Engg. Physics by S.K. Srivastava and R.A. Yadav, New Age Pub. New Delhi
3. Engg. Physics by Uma Mukherjee, Narosa Publication.
4. Engg. Physics by M.N. Avadhanulu, S. Chand Pub.
5. Electricity and Magnetism by Rangwala and Mahajan, Tata McGraw Hill 1998
6. Concepts of Physics Part-II by H.C. Verma, Bharati Bhawan (P&D),1998
7. Modern physics by Beiser, McGraw Hill Inc. New York, Publication1995
8. Modern physics by Mani and Mehta, East-West PressPvt.Ltd.1998
9. Introduction to Electrodynamics, David Griffith
10. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc.(1995).
11. B.E.A. Saleh and M.C. Teich, Fundamentals of Photonics, John Wiley & Sons Inc.2007).
12. S.M. Sze, Semiconductor Devices: physics and Technology, Wiley(2008)
13. Yariv and P. yeh, Photonics Optical Electronics in Modern Communications, Oxford University press, New York(2007)
14. P. Bhattacharya, Semiconductor Optoelectronic Devices, prentice Hall of India(1997)
15. Online course: "Semiconductor Optoelectronics" by M. R. Shenoy on NPTEL.
16. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak on NPTEL.

Course Outcomes and their mapping with Programme Outcomes: ENGINEERING PHYSICS (PPUBTB2)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2				1					1	3	2	1
CO2	1	1											3	2	1
CO3	3	3	2	3	3	2	2			1		1	3	2	1

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	ITUBTE2	L	T	P	CT-1	CT-II	Attendance & Assignments	TOTAL	60	100	03
Subject:	INTRODUCTION TO INFORMATION TECHNOLOGY	3	-	-	15	15	10	40			

Course Objective

1. To illustrate the concepts of cyber security and familiar and aware with various cybercrimes attack and their prevention.
2. To describe the different services model of Cloud Computing and understand Understanding of different evaluating computer model of cloud computing.
3. To relate theoretical concepts with problem solving approach in IoT and assess the comparative advantages and disadvantages of Virtualization technology.
4. To provides the basic knowledge of use appropriate storage and access structures. the student must be able to analyse familiar with the machine learning algorithms and applications of various data science.
5. To integrate classroom learning into an everyday communicative activity in distributed system. Familiar with various web services activity.

Course Content:

Unit 1: -Cyber Security Fundamentals Security Concepts: Authentication, Authorization, Non-repudiation, Confidentiality, Integrity, availability. Cyber Crimes and Criminals: Definition of cyber-crime, types of cyber-crimes and types of cyber-criminals.

Unit 2: -Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

Unit 3: -Internet of Things–Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IOT Communication APIs IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

Unit 4. Data Science: -Introduction and Importance of Data Science, Statistics, Information Visualisation, Data Mining, Data Structures, and Data Manipulation, Algorithms used in Machine Learning, Data Scientist Roles and Responsibilities. Data Acquisition and Data Science Life Cycle.

Unit 5: -Evaluation and Emergence of Web Services – Evaluation of Distributed Computing, Core Distributed Technologies, Challenges in Distributed System, and Introduction to web services, Web Services Architecture, Basic steps of implementing web services

Course Outcome:

1. Ability to learn about cybercrimes and how they are planned.
2. Ability to understand the cloud computing concepts and services model.
3. Ability to understand Internet of Things –Definition and Characteristics of IoT.
4. Explain how data is collected, managed and stored for data science. Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists
5. Explain the details of web services Evolution of Distributed Computing.

Textbooks/References:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group
3. Cloud Computing Principles and Paradigm by Rajashekar Buyya, James Broberg, Andhrz M. Wiley 2011.
4. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547.
5. Mining of Massive Datasets, by Leskovec, Rajaraman, and Ullman.
6. R. Nagappan, R.Scekzylas, R.P. Sriganesh, Developing Web Services, Wiley India.

Course Outcomes and their mapping with Programme Outcomes: INTRODUCTION TO INFORMATION TECHNOLOGY (ITUBTE2)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	2		2				2	1		
CO2	3	2	1	1	2	2		2				1	1		
CO3	3	2	1	1	2	2						2	1		
CO4	3	2	2	1	2	2		1				3	1		
CO5	3	2	1	1	2	2						1	1		

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	ELUBTH1	L	T	P	CT-I	CT-II	Attendance & Assignments	TOTAL	60	100	03
Subject:	ENGLISH FOR COMMUNICATION	3	0	-	15	15	10	40			

Course Learning Objectives

- To build up word power, to brush up the knowledge of English grammar, to develop good writing and speaking skills in the students

Course Content:

Unit 1: -Vocabulary Building
The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Synonyms, antonyms, and standard abbreviations.
Unit 2: -Basic Writing Skills
Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely
Unit 3: -Identifying Common Errors in Writing
Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés
Unit 4: -Nature and Style of sensible Writing
Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion.
Unit 5: -Writing Practices
Comprehension, Précis Writing, Essay Writing.

Oral Communication (This unit involves interactive practice sessions in Language Lab)
Listening Comprehension
Pronunciation, Intonation, Stress and Rhythm
Common Everyday Situations: Conversations and Dialogues
Communication at Workplace
Interviews
Formal Presentations

Course Outcome:

1. At the end of the course students will be able learn a lot of new words. They also learnt the particularities and peculiarities of English grammar. As a result, they could speak and write English with the least possible error

Textbooks/References:

1. Practical English Usage. Michael Swan. OUP.1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007 (iii)On Writing Well. William Zinsser. Harper Resource Book.2001
3. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press.2006.
4. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press.2011.
5. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford UniversityPress

Course Outcomes and their mapping with Programme Outcomes: ENGLISH FOR COMMUNICATION (ELUBTH1)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		1	1	1	2	1		1	3	3	2	3			1

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	CEUBTE1	L	T	P	CT-I	CT-II	Attendance & Assignments	TOTAL	60	100	03
Subject:	ENGINEERING MECHANICS	3	0	-	15	15	10	40			

Course Learning Objectives:

- To learn the basics of engineering mechanics and force systems.
- To learn the different type of support reactions and the basics of friction.
- To learn the concepts of centroid, centre of gravity and moment of inertia.
- To learn the basics of linear, curvilinear motions, centripetal and centrifugal forces under dynamics.

UNIT – I

INTRODUCTION: Basic idealization of mechanics, particle, rigid body, mass, time, continuum, force, force system, system of units, principle of transmissibility of forces, principle of superposition.

COPLANAR CONCURRENT FORCE SYSTEM: Resultant of forces. Resolution of forces, Composition of coplanar concurrent, parallel and non-concurrent forces, Moment of a force, Varignon's theorem, free body diagram, equilibrant, equilibrium of particles and rigid bodies.

Self-Study Component: Application of triangle and polygon Law, vector method of resolution and Composition of forces.

UNIT – II

SUPPORT REACTIONS: Types of loads and types of supports, statically determinant beams, Numerical problems on support reactions for beams with point loads (normal and inclined), uniformly distributed load, uniformly varying load and moment.

FRICTION: Introduction, types of friction, laws of friction, angle of friction, angle of repose , cone of friction, characteristics of dry friction, application –body on horizontal plane and inclined plane and ladder friction.

Self-Study Component: Numerical problems on support reaction of beams loaded with trapezoidal loads, Support reactions for Compound beams and wedge friction - numerical problems.

UNIT – III

CENTROID AND CENTRE OF GRAVITY: Introduction to centroid and centre of gravity, Centroid of rectangular, triangular, circle, semicircle, quarter circle lamina and sector from first principles. Numerical problems on Centroid of composite lamina.

Self-Study Component: Determining Centroid for Composite Lamina with openings.

UNIT – IV

MOMENT OF INERTIA: Introduction, radius of gyration, parallel axis theorem, perpendicular axis theorem, polar moment of inertia, moment of inertia of standard geometrical figures by first principles. Numerical problems on moment of inertia of composite sections.

Self-Study Component: Determining moment of Inertia of Composite sections with reference to given axis.

UNIT – V

DYNAMICS: Introduction to dynamics, Classification, linear and curvilinear motion- projectiles, centripetal and centrifugal forces, banking/super elevation.

Introduction to work, power and energy, impulse – numerical problems.

Self-Study Component: Concept of motion with varying acceleration. Collision of elastic bodies.

Text Book(s):

1. S.S Bhavikatti, A text on elements of Civil Engineering and mechanics, New age International publishers, 2015.
2. R.S. Khurmi, A text book of engineering mechanics, S. CHAND & COMPANY LTD.

Reference Book(s):

Publishing House 1999.

3. Ferdinand Beer and Johnson F.R (Jr) Mechanics for Engineers, Tata Mc Graw-hill Publishing comp. Ltd New Delhi.

Course Outcome:

At the end of this course, students will demonstrate the ability to:

1. Determine the resultant force and moment for a given system of forces
2. Determine the support reactions under different loading conditions in structural members and problems related to friction.
3. Determine the centroid and centre of gravity
4. Determine the moment of inertia
5. Calculate the motion characteristics of a body under dynamic conditions

Course Outcomes and their mapping with Programme Outcomes: ENGINEERING MECHANICS (CEUBTE1)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2			1								3	
CO2	3	3	2			1								3	
CO3	3	3	2			1								3	
CO4	3	3	2			1								3	
CO5	3	3	2			1								3	

Weightage: 1-Slightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	MEUBTH2 (for Meoh) CHUBTH2 (for Chem) IPUBTH2 (for IPE) CEUBTH2(for Civil)	L	T	P	CT-1	CT-II	Attendance & Assignments	TOTAL	-	50	01
Subject:	HUMAN VALUES AND ETHICS	1	-	-	20	20	10	50			

COURSE OBJECTIVE:

1. To create an awareness on Engineering Ethics and Human Values.
2. To understand social responsibility of an engineer.
3. To appreciate ethical dilemma while discharging duties in professional life.

COURSE OUTCOME:

On completion of this course, the students will be able to

1. Understand the significance of value inputs in a classroom and start applying them in their life and profession
2. Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3. Understand the role of a human being in ensuring harmony in society and nature.
4. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

COURSE CONTENT:

UNIT I: Introduction to Value Education

1. Value Education, Definition, Concept and Need for Value Education.
2. The Content and Process of Value Education.
3. Basic Guidelines for Value Education.
4. Self exploration as a means of Value Education.
5. Happiness and Prosperity as parts of Value Education.

UNIT II: Harmony in the Human Being

1. Human Being is more than just the Body.
2. Harmony of the Self ('I') with the Body.
3. Understanding Myself as Co-existence of the Self and the Body.
4. Understanding Needs of the Self and the needs of the Body.
5. Understanding the activities in the Self and the activities in the Body.

UNIT III: Harmony in the Family and Society and Harmony in the Nature

1. Family as a basic unit of Human Interaction and Values in Relationships.
2. The Basics for Respect and today's Crisis: Affection, e, Guidance, Reverence, Glory, Gratitude and Love.
3. Comprehensive Human Goal: The Five Dimensions of Human Endeavour.
4. Harmony in Nature: The Four Orders in Nature.
5. The Holistic Perception of Harmony in Existence.

UNIT IV: Social Ethics

1. The Basics for Ethical Human Conduct.
2. Defects in Ethical Human Conduct.
3. Holistic Alternative and Universal Order.
4. Universal Human Order and Ethical Conduct.

5. Human Rights violation and Social Disparities.

UNIT V: Professional Ethics

1. Value based Life and Profession.
2. Professional Ethics and Right Understanding.
3. Competence in Professional Ethics.
4. Issues in Professional Ethics – The Current Scenario.
5. Vision for Holistic Technologies, Production System and Management Models.

TEXT BOOKS

1.A.NTripathy, New Age International Publishers, 2003.
2.Bajpai. B. L. , New Royal Book Co, Lucknow, Reprinted, 2004
3.Bertrand Russell Human Society in Ethics & Politics

REFERENCE BOOKS

1.Corliss Lamont, Philosophy of Humanism
2.Gaur. R.R. ,Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.
3.Gaur. R.R. ,Sangal. R ,Bagaria. G.P, Teachers Manual Excel Books, 2009.
4.I.C. Sharma . Ethical Philosophy of India Nagin & co Julundhar
5.Mortimer. J. Adler, – Whatman has made of man
6.William Lilly Introduction to Ethic Allied Publisher

Course Outcomes and their mapping with Programme Outcomes: HUMAN VALUES AND ETHICS
(MEUBTH2 (for Meoh), CHUBTH2 (for Chem), IPUBTH2 (for IPE) and CEUBTH2 (for Civil))

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1								3	3						
CO2								3	3						
CO3								3	3						
CO4								3	3						

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	PPUBLB2	L	T	P	IA	MSE	TOTAL			
Subject:	ENGINEERING PHYSICS LABORATORY	-	-	2	25	--	25	25	50	01

Course Objectives:

1. To learn and perform the various practical related to optics and its related phenomena's like interference, diffraction and polarization.
2. To apply basic optical phenomena's for measurements such as thickness, refractive index, dispersive power, aperture size etc.
3. To characterized various optical sources such as laser, mercury light, sodium light, gratings, prism and lens.
4. To characterize various semiconductor materials and devices (PN Jn., Transistor, LED and Solar Cell) for their energy band gap, resistivity and IV characteristics.

Course Content:

LIST OF PRACTICALS:

1. To determine the wavelength of sodium light with help of Fresnel's Bi-prism.
2. To determine the refractive index and dispersive power of the material of prism with the help of spectrometer.
3. To determine the sodium light by Newton's ring method.
4. To determine the wavelength of sodium light by plane diffraction grating using spectrometer.
5. To demonstrate the diffraction pattern and determine the wavelength of different colours of mercury (white) light using plane diffraction grating and spectrometer.
6. To determine the wavelength and number of line per cm on a diffraction grating using semiconductor laser diode.
7. To determine the specific rotation of sugar solution with the help of polarimeter.
8. Determine the width of the single slit and diameter of circular aperture using Fraunhofer diffraction pattern produced by semiconductor laser diode.
9. To determine the energy band gap (E_g) of a semiconductor material using P-N junction diode.
10. To determine the e/m ratio by the Thomson's method.
11. To study the P-N junction diode characteristics, in forwarded and reverse bias conditions.
12. To study the Zener diode characteristics.
13. To study the characteristics and gain of Transistor in C-B and C-E mode.
14. Determine the Planck's constant.

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

1. Know about basic optical facts and phenomenon, characterization of optical components and devices
2. To know the basic semiconductor materials and devices and their applications
3. To know how the performance of semiconductor devices can be improves.

Course Outcomes and their mapping with Programme Outcomes: ENGINEERING PHYSICS LABORATORY (PPUBLB2)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	2	1			2			2	2	2	1
CO2	2	2	3	2	2	1			2			2	2	2	1
CO3	2	2	3	2	2	1			2			2	2	2	1

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	CEUBLE1	L	T	P	IA	MSE	TOTAL			
Subject:	ENGINEERING MECHANICS LABORATORY	-	-	2	25	--	25	25	50	01

Course Objectives:

- To perform the practical giving basic understanding to fundamental principles of mechanics like parallelogram of forces, triangle of forces and polygon of forces by universal force table
- To perform the practical giving basic understanding to fundamental application of mechanics like screw jack, winchcrab and simple wheel and axle

Course Content: List of Experiments

1. Verification of law of parallelogram of forces.
2. Verification of law of triangle of forces.
3. Verification of law of polygon of forces by universal force table.
4. Verification of law of moment by parallel forces apparatus.
5. Practical verification of forces in the member of jib crane.
6. Practical verification of forces in the member of the truss.
7. Determination of coefficient of friction between two given surfaces by inclined plane method.
8. Determination of efficiency of simple screw jack.
9. Determination of efficiency of single purchase winch crab.
10. Determination of efficiency of double purchase winch crab.
11. Determination of efficiency of simple wheel and axle.

Course Outcome: At the end of the course students will be able to:

1. Verify the fundamental principles of mechanics like parallelogram of forces, triangle of forces and polygon of forces by universal force table
2. Analyze the friction coefficient between two surfaces
3. Calculate the efficiency of screw jack, winch crab and wheel and axle

Course Outcomes and their mapping with Programme Outcomes: ENGINEERING MECHANICS LABORATORY (CEUBLE1)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1						1	1		1	1	2	
CO2	3	2					1		1	1		1	1	2	
CO3	3	2	1				1		1	1		1	1	2	

SYLLABUS	(SEMESTER-II)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	MEUBLL1	L	T	P	IA	MSE	TOTAL	25	50	01
Subject:	ENGINEERING GRAPHICS	1	-	3	25	--	25			

Course Learning Objectives:

1. To learn the basic of Engineering Drawing and Orthographic Projections
2. To learn the Sections and Sectional Views of Right Angular Solids
3. To learn the Isometric Projections covering and overview of Computer Graphics

UNIT 1:Introduction Engineering Graphics and Engineering Curves: Principles of engineering graphics and their significance – drawing instruments and their use – conventions in drawing – lettering – BIS conventions. Dimensioning rules, geometrical construction. Engineering Curves - Conic Sections, Special Curves-Cycloids, Epicycloids, Hypocycloids, Involutes and trochoid.

UNIT 2:Projection of Points, Straight lines and Planes: Principles of orthographic projections – conventions – first and third angle projections. Projections of points and lines inclined to both the planes. Projections of regular planes, inclined to both planes

UNIT 3:Projections Solids:Introduction, Type of solid, Projections of solids in simple position, Projection of solids with axes inclined to one of the reference planes and parallel to the other, Projections of solids with axes inclined to both H.P. and the V.P.

UNIT 4: Section of Solids and Development of Surfaces: Sectioning of regular solids - Section planes perpendicular to one plane and parallel or inclined to other plane - Development of surfaces of right, regular solids – development of prisms, cylinders, pyramids, cones and their parts.

UNIT 5: Isometric Projections and Orthographic Views: Principles of Isometric Projections-Isometric Scale- Isometric Views Conventions-Plane Figures, Simple and Compound Solids. Conversion of isometric views to orthographic views. Conversion of orthographic views to isometric projections, vice-versa. Introduction to perspective projection.

Computer Aided Drafting: Introduction to computer aided drafting package to make 2-D drawings. Demonstration purpose only - not to be included in examinations.

Textbooks/References:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, PearsonEducation
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. CAD Software Theory and User Manuals

Course Outcomes:

At the end of the course, the student shall be able to

1. Describe the fundamentals of engineering drawing and construct basic engineering curves.
2. Enhance visualization skill using projections of points, lines and planes.
3. Enhance visualization skill using projections of solids.
4. Enhance visualization skill using construction of sections of solids and development of surfaces.
5. Comprehend the theory of Orthographic and Isometric projections and views

Course Outcomes and their mapping with PO and PSO: ENGINEERING GRAPHICS (MEUBLL1)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2									2					
CO2	1									1					
CO3	3									3					
CO4	3									3				1	
CO5	1									1				1	

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

NSS

SYLLABUS	(SEMESTER-II)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE Viva/ Assessment	Grand total	Credits
Subject Code:	NSUBLS1	L	T	P	Attendance	Activities	TOTAL			
Subject:	NSS	-	-	2	5	20	25	25	50	01

Objectives:

1. To develop Personality
2. To do Community Service
3. To do social Awareness and Empowerment
4. To enhance Skill
5. To work for National Integration

Course:

Program Head 1: Cleaning Program **(06 Hours/ Semester)**
Program Head 2: Plantation **(06 Hours/ Semester)**
Program Head 3: Health Camp/Special Days celebration **(10 Hours/ Semester)**
Program Head 4: Awareness program/Ralley **(06 Hours/ Semester)**

Course Outcomes:
At the end of this course, students will demonstrate the ability to:

1. Observe his/her internal ability and develop own personality.
2. Apply knowledge of the importance of cleanliness and hygiene in their surroundings, and develop skills in waste management and recycling.
3. Apply knowledge towards the significance of greenery and environmental conservation, participate in tree plantation drives, and understand the process of nurturing and caring for plants.
4. Apply knowledge of health issues prevalent in the community and methods of prevention and organizing health camps and awareness programs on special days like World Health Day or World AIDS Day.
5. Express social issues and their impact on the community. Actively participate in awareness programs and rallies to create awareness about social problems like gender inequality, or environmental degradation.

Course Outcomes and their mapping with PO and PSO: NSS (NSUBLS1)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									1						
CO2			1			1	2								
CO3			1			1	2								
CO4			1			1	2								
CO5			1			1	2								

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
AMUCTB1	Engineering Mathematics-III	3	0	0	10	30	60	100	3

Course Objectives:

The students will be able

1. Use of the concepts of correlation, Regression and various types of distributions.
2. Get the skills, knowledge and attitudes required to determine approximate numerical solutions to mathematical problems which cannot always be solved by conventional analytical techniques.
3. Demonstrate the importance of selecting the right numerical technique for a particular application,
4. Carefully analyze and interpret the results obtained.
5. Analyze error.

Course Content:

UNIT-1 Correlation & Regression: Scatter diagram, Linear Correlation, Measures of Correlation. Karl Pearson's Coefficient of correlation, Limits for correlation coefficients, Coefficient of correlation for vicariate frequency distribution, Rank correlation, Linear Regression, Equations to the line of Regression. Regression coefficient. Angle between two lines of Regression.

UNIT–2 Theoretical Distributions: Discrete and Continuous probability distribution's Mathematical expectation, Mean and Variance, Moments, Moments generating function, probability distribution, Binomial, Poisson and Normal distribution, Test of significance based on chi-square,T,F, and Z distribution, degree of freedom , conditions for applying X2 (chi-square) test , student's test.

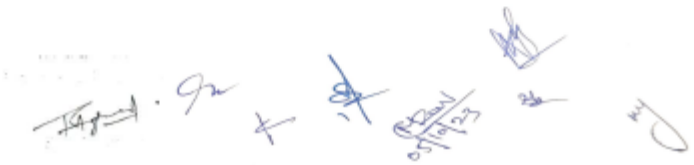
UNIT-3 Introduction of Errors and their Analysis, types of errors, numerical problems on error analysis, curve fitting: method of least squares; Numerical Solution of Algebraic and Transcendental Equations: Graphical method bisection Method, Secant Method, Regula-falsiMethod, Newton Raphson Method.

UNIT- 4 The Calculus of Finite Differences: Finite differences, Difference formula, operators and relation between operators. Inverse Operator, Interpolation with equal intervals: - Newton's forward and backward interpolation formula. Interpolation with Unequal intervals: - Lagrange's interpolation Newton's difference formula, inverse interpolation.

UNIT- 5 Numerical Differentiation and Integration: - Numerical Differentiation Newton's forward and Backward difference interpolation formula. Maxima and Minima of a Tabulated function, Numerical Integration:-Trapezoidol rule, simpson's (1/3) rd and (3/8) th rule, Boole's rule, weddle rule.

Text Books:

1) Prasad C "Advanced Engineering mathematics",
2) Dass H.K. "Advanced Engineering mathematics",
3) Ray M. "Mathematics statistics",
4) HigherEngg. Mathematics by Dr. B.S. Grewal– KhannaPublishers.,
5) Advanced Engg. Mathematics by Erwin Kreyszig – John Wiley & Sons,
6) Advanced Engg.Mathematics by R.K. Jain and S.R.K. Iyengar – Narosa Publishing House.,
7) Applied Mathematics by P.N.Wartikar& J.N. Wartikar. Vol- II– Pune VidyarthiGrihaPrakashan,Pune.
8) JAIN & IYNGAR Numerical Methods for Scientific and Engineering Computations.
9) RAO G.S. Numerical Anlysis.
10) Grewal B S Numerical Methods in Engineering and Science.
11) Rajaraman V., Computer Oriented Numerical Methods



12) P. Kandasamy K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
13) S. S. Sastry, Introduction methods of Numerical Analysis, PHI, 4th Edition, 2005.

Course Outcomes-After successful completion of this course, the students will be able to

CO 1. Understand the statistical concept of correlation, regression and distribution, theory with special reforms to engineering problems.
CO 2. Analyse the errors obtained in the numerical solution of problems.
CO 3. Use appropriate numerical methods, determine the solutions to given non-linear equations.
CO 4. Use appropriate numerical methods, determine approximate solutions to ordinary differential equations.
CO 5. Use appropriate numerical methods, determine approximate solutions to ordinary differential equations.

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	3	2	3					2	2			
CO2	3	2	3	3	2	2					2	2			
CO3	3	2	3	3	2	2					2	2			
CO4	3	1	3	3	2	2					2	2			
CO5	3	1	3	3	2	2					2	2			

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUCTT1	Strength of Materials	3	1	0	10	30	60	100	4

Course Objective:
The objective of this Course is to:
- To understand the nature of stresses induced in material under different loads
- To plot construct the shear force and bending moments diagrams in determinate beams under gravity loads.
- To study the stress variation in beams subjected to bending and shear.
- To understand the elastic behavior of beams using conceptual theories.
- To study the theory of torsion in solid and hollow circular shafts and stresses developed in cylindrical shells.

Course Content:

Unit 1 : Simple Stress - Strain and Compound Stresses: Types of stress and strains, Mechanicals properties, Hooke's law, stress– strain curve for mild & cast iron, and HYSD. Relation between the elastic moduli & Poisson's ratio, Bars subjected to varying loads, Temperature stresses in composite bars, Elongation of bars of prismatic and non prismatic sections.
Plane Stresses: Stress at a point. Components of stress in rectangular coordinates, Stresses on an inclined plane, Principal stresses & Principle plane, Mohr's circle of stresses.

Unit 2 : Shear Force - Bending Moment: Shear Force & Bending Moment diagrams in statically determinate beams loaded with different load combination, Relationship between Load intensity-Shear Force -Bending Moment, Thrust diagram, Point of contra flexure, loading diagram & Bending moment diagram from shear force diagram, beam with internal hinge.

Unit 3 : Bending Stress : Theory of simple bending, Assumptions, Bending equation, Neutral axis, Determination of bending stresses – section modulus of sections, Combine Bending and Direct Stress.
Shear Stress: Derivation of Shear Stress formula, assumptions, Shear stresses in symmetrical elastic beam with different sections. Shear Centre.

Unit 4 : Slope and Deflections of simple Beams: Derivation of differential equation for deflection, Slope & Deflection of Beams by Double integration method, Macaulay's method & Moment area method for Simply supported, Cantilever beam subjected to point load, UDL, UVL.

Unit 5 : Torsion: Equation of Pure Torsion, Assumptions, and Power transmitted, Stiffness of Shafts, Comparison of Solid & Hollow shaft, Strain energy in Torsion.
Cylindrical Shells: Type of Loads in pressure vessels, Stress Distribution in thin cylinder, Spherical vessels.

Text Books:
1) Strength of Materials – R.K. Rajput (S. Chand & Co.)
2) Strength of Materials – R.K. Bansal (Laxmi Publication)

3) Strength of Materials– S.S Ratnam (Tata McGrawHill)

Reference Books:
1) Strength of Materials – Timoshenko, S. & Gere (CBSPublishers)
2) Introductions to Solid Mechanics –Shames &Pitarresi (Prentice Hall of India)
3) Strength of Materials–S.Ramamurtham (DhanpatRai Publications)

Course Outcomes-
At the end of the course the students will be able to:
CO1 : Determine compound stresses and strains in material under different loads.
CO2 : Draw the shear force and bending moment diagrams for the beam subjected to different loading conditions.
CO3 : Evaluate stresses induced in different cross-sectional members subjected to bending and shear.
CO4 : Evaluate the deflections in beams subjected to different loading conditions.
CO5 : Estimate torsional stress in solid and hollow circular shaft and stresses variation in cylindrical shells.

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1			1	1						3		2
CO2	3	2	2	1		1							3	1	2
CO3	3	2	2	1									3	1	2
CO4	3	2	2	1									3		
CO5	3	2	2	1									3	1	2

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUCTT2	Fluid Mechanics-I	3	0	0	10	30	60	100	3

Course Objectives:

- To introduce and give explanation of fundamentals of Fluid Mechanics and give fundamental knowledge of fluid with its properties, behaviour, forces on various surfaces and stability of submerged and floating body.
- To develop understanding about Kinematics of fluid flow.
- To imbibe basic law of energy and equation used for analysis of dynamic fluids.
- To introduce the importance of fluid Flow in Pipes and determine the losses in a flow system.
- To develop understanding about flow through mouthpieces and orifice

Course Content:

UNIT-1: **Introduction:** Fluid, physical properties of fluids ideal and real fluid, Newtonian and Non-Newtonian Fluid Statics: Pressure density height relationship, pressure measurement by Manometers, Pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, metacentric height.

UNIT-2: **Kinematics of fluid flow:** Steady and unsteady flow, uniform and non-uniform flow, laminar and turbulent flow, one, two and three dimensional flow, streamlines and path lines, rotational and irrotational flow, continuity equation, three dimensional continuity equation. Velocity potential and stream function.

UNIT-3:**Dynamics of fluid flow:** Euler's equation of motion along a streamline and its integration, Bernoulli's equation and its applications – Pitot tube, Venturimeter, orificemeter, and problems related to application of momentum equations.

UNIT-4: **Flow in Pipes:** Major and minor losses in pipe lines, loss due to sudden contraction & expansion, Pipes in series and parallel Flow in open Channel: Comparison between open channel and pipe flow, definition of uniform and non-uniform flow, Chezy's and Manning's Formula, Hydraulically efficient channel section of rectangular, trapezoidal.

UNIT -5: **Flow through mouthpieces and orifices:** Hydraulic coefficients of orifice, flow through large rectangular orifice, mouthpieces, Borda's mouthpieces. Notches and Weirs: Rectangular, triangular and trapezoidal notches and weir, cippoletti and broad crested weir.

Text Books:

1) Fluid Mechanics and Machines – Dr. A.K. Jain (Khanna Publications)
2) Fluid Mechanics and Machines – Dr. R.K. Bansal (Laxmi Publications)
3) Fluid Mechanics & Hydraulic Machines – Dr. P. N. Modi & S. M. Seth, (Narosa Publishing House)

Reference Books:

1) Mechanics of Fluid – Irving H. Shames (McGraw Hill)

2) Introduction to Fluid Mechanics – James A. Fay (Prentice Hall India)
3) Fluid Mechanics – R.J. Garde (New Age International Publication)
4) Fluid Mechanics – Streeter V.L. & Wylie E.B. (Tata McGraw Hills)
5) Fluid Mechanics – John F Douglas (Pearson Publication)
6) Introduction to Fluid Mechanics Fox, R.W. and McDonald, A.T., John Wiley & Sons.
7) Fluid Mechanics", Streeter, V.L. and Benjamin, W.E., "McGraw-Hill.
8) Fluid Mechanics and Fluid Mechanics Som, S.K. and Biswas, G., Tata McGraw Hill.
9) Introduction to Fluid Mechanics, Fox, R. W. and A. T. McDonald, 6th ed., John Wiley, New York, (2004)

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

CO1 Define fluid properties and state the Newton's law of viscosity with explain the mechanics of fluid at rest .
CO2 Describe the Kinematics of fluid flow.
CO3 Employ Bernoulli's equation for ideal and real fluid flow and deduce expressions for Venturimeter, orifice meter and pitot tube.
CO4 Explain the concept of Flow in Pipes and types of losses in pipe flow.
CO5 Describe Flow through mouthpieces & orifices and distinguish it.

Course Outcomes and their mapping with Programme Outcomes Fluid Mechanics- I (CE203TPC02)

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2									3	2	2
CO2	3	2	1	2	2								3	2	2
CO3	3	2	1	3									3	2	3
CO4	3	2	2	2	3								3	2	2
CO5	3	2	1	3	2								3	2	3

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUCTT3	Surveying & Geomatics	3	0	0	10	30	60	100	3

Course Objectives:

- To understand the Concepts of surveying & levelling &its application on the field.
- To learn about the concepts of theodolites, tacheometry & triangulation.
- To understand subsidiary surveying like photographic & hydrographic surveying.
- To learn to apply advanced application of surveying like Remote sensing, EDM.

Course Content:

Unit 1: Introduction to Surveying- Basic Principles, Objectives & Classification of surveying, Survey lines- ranging.
Compass Surveying: Bearing of survey lines (QB & WCB), Local attraction, Dip & Declination
Levelling: Principles of levelling- Dumpy level, booking and reducing levels, Methods- simple, differential, reciprocal leveling, profile levelling and cross sectioning. Digital and Auto Level, Errors in leveling.

Unit 2: Theodolite and Tacheometry: Vernier theodolites, Temporary and permanent adjustments, Requirements of nonadjustable parts, Measurement of horizontal angle by repetition and reiteration method, Measurement of vertical angles.
Tacheometery: Definitions, Principles of stadia systems. Instrument constants, Substance and Tangential Systems. Construction and use of Reduction Tacheometers.

Unit 3: Triangulation: Triangulation figures, Triangulation stations, Inter visibility of stations, Satellite Stations and reduction to centre.
Theory of Errors – Types, theory of least squares, Weighting of observations, Most probable value, Computation of indirectly observed quantities - method of normal equations.

Unit 4: Photogrammetry: Phototheodolite, principle of the method of terrestrial photogrammetry, Aerial Surveying: scale and distortion of the vertical and tilted photograph

Unit 5: Principle of Electronic Distance Measurement: Principle, Type, Use, Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications.
Remote Sensing: Introduction– Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors, Introduction to GPS.

Text/Reference Books:

1. B.C. Punamia, A. K Jain, SurveyingVol.1&2, Laxmi Publications.
2. Madhu, N, Sathikumar, Rand Satheesh Gobi, Advanced Surveying: TotalStation, GIS and Remote Sensing, Pearson India, 2006.
3. Bhavikatti ,S. S. ,Surveying and Levelling, Vol. I and II,I.K.International,2010
4. Manoj.K.AroraandBadjatia,GeomaticsEngineering,NemChand&Bros,2011

Course Outcomes-

At the end of the course students will be able to:

CO1: Remember& Understand the principle & classifications of surveying & Apply concepts &techniques of compass surveying & levelling.
CO2: Understand the working of theodolite & apply the concepts of tacheometery.
CO3: Apply the concepts of triangulation & Photogrammetry & Analyze the computations of surveying using theory of errors.
CO4: Employ surveying techniques using advanced surveying equipments & Techniques like EDM's & Remote sensing.

Course Outcomes and their mapping with Programme Outcomes: Surveying & Geomatics (CE23DC303)

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1		2								3	3	3
CO2	2	1	2	1					1				2	2	3
CO3	3		3	2	3							2	2	3	1
CO4	3	3	3	2								2	2	3	2
CO5															

Weightage:1-Sightly;2-Moderately;3-Strongly

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUCTP1	Building Materials & Construction	3	0	0	10	30	60	100	3

Course Objectives:

- To introduce the basic engineering properties of building materials like brick, stones, timber, ceramics,plastics, etc.
- To understand the elementary characteristics of construction materials like cement aggregates, concrete,steel, etc.
- To understand the types of foundations, functions, types of masonry, lintels, etc.
- To learn the structure supporting method like Shoring, Underpinning, and other advanced constructionmaterials & Techniques.

Course Content:

UNIT-1: Bricks, Tiles, Timber; Properties, Classification & application in Construction.

UNIT-2: Miscellaneous Engineering Materials; Ceramics & Glass; Polymers in construction; Plastics & Rubber; Paints & Paint admixtures, Varnishes andDistempers; Composite materials; Adhesives; Thermal, Electrical & Sound Insulators.
Other materials for construction; Cost effective materials, industrial byproducts, agricultural byproducts, Construction & demolition waste, Introduction to new materials (Survey and study), and locally available materials.

UNIT 3: Cement, Mortar, Aggregate, Admixtures, Concrete and Steel; classification, properties & uses.

UNIT-4: Foundations, Masonry, Arches & Lintels, Door & Window, Sill, Stairs case; Classification, Requirements, Uses & Construction, Joints; Construction, Contraction and Expansion Joints in buildings.

UNIT-5: Shoring, Underpinning, Formwork, Scaffolding, Slip form; Types and Construction Practice, Advanced Construction Materials & Techniques, Low Cost housing techniques, Damp Proofing, Sound Proofing, and Fire Proofing Construction Practice.
The relevant IS Codes for all the materials and NBC.

Name of Text Books:

1) Building Materials – S.K. Duggal (New Age Publication)
2) Building Materials – S. C. Rangwala (Charotar Publication)
3) Building Construction by S.G. Rangwala, Charter Publishing House, Anand, India.
4) Building Construction by Sushil Kumar, Standard Publ. and Distributors, New Delhi
5) Building Construction by Punmia B.C., Lakshmi Publications, New Delhi.
6) Advanced Building Materials and Construction by Mohan Rai and Jai Sing, CBRI Publications, Roorkee
7) Concrete Technology – A.M. Neville & J.J. Brooks (Pearson Education)

8) Concrete Technology – M.S. Shetty (S. Chand & Co.)
9) Engineering Materials – Surendra Singh (Laxmi Publication)
10) Construction Engineering and Management – S. Seetharaman (Umesh Publication)
11) Building Materials – Gurucharan Singh (Standard Publishers, Delhi

Course Outcomes:

At the end of the course the students shall be able

CO1 To compare the properties of most common and advanced building materials.
CO2 To understand the typical and potential applications of these materials
CO3 To select the appropriate building material for building construction
CO4 To identify the different components of a building and differentiate various types of foundations, masonry, arches and lintels
CO5 To select the appropriate supporting structure for strengthening of the building

Course Outcomes and their mapping with Programme Outcomes: Building Materials & Construction (CE23DE301)

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2			1		1			1		1	2		
CO2	3	2			1	1	1					1	1	1	
CO3	3	1					1			1			2		
CO4	3	2				1	1						2		
CO5	2	1			1	1	1			1			1		

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUCTP2	Engineering Geology	3	0	0	10	30	60	100	3

COURSE OBJECTIVES

To describe weathering process and mass movements

- To gain knowledge about various properties of minerals and their engineering significance.
- To acquire knowledge of various classification of rocks.
- To interpret the importance of different geological features and their effects.
- To apply the principles of geological investigations in civil engineering structures.

Course Content:

UNIT I: PHYSICAL GEOLOGY Geology in civil engineering – branches of geology; structure of earth and its composition; weathering of rocks – scale of weathering; soils landforms and processes associated with river, wind, groundwater and sea; relevance to civil engineering; Plate tectonics.

UNIT II: MINEROLOGY Physical properties of minerals – Quartz group, Feldspar group; Pyroxene - hypersthene and augite, Amphibole, hornblende; Mica – muscovite and biotite, Calcite, Gypsum and Clay minerals.

UNIT III: PETROLOGY Classification of rocks - distinction between Igneous, Sedimentary and Metamorphic rocks; Engineering properties of rocks-Description, occurrence, engineering properties, distribution and uses of Granite, Dolerite, Basalt, Sandstone, Limestone, Laterite, Shale, Quartzite, Marble, Slate, Gneiss and Schist.

UNIT IV: STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD - Geological maps – attitude of beds, study of structures; folds, faults and joints – relevance to civil engineering; Geophysical methods – Seismic and electrical methods for subsurface investigations.

UNIT V: GEOLOGICAL INVESTIGATION - Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels, and Road cuttings; Coastal protection structures; Investigation of Landslides and earthquakes - causes and mitigation; seismic zonation – seismic zones of India.

TEXT BOOKS :-

1) Parbin Singh, "Engineering and General Geology", S.K. Kataria & Sons, 2008.
2) Venkatareddy. D. Engineering Geology, Vikas Publishing House Pvt. Ltd. 2010.

REFERENCES :-

1) Muthiayya, V.D. (1969), "A Text of Geology", Oxford IBH Publications, Calcutta.

2) Blyth F.G.H. and de Freitas M.H., Geology for Engineers, Edward Arnold, London, 2010.
3) F.G. Bell. Fundamentals of Engineering Geology, B.S. Publications. Hyderabad 2011.
4) Dobrin, M.B An introduction to geophysical prospecting, McGraw-Hill, New Delhi, 1988
5) Varghese, P.C., Engineering Geology for Civil Engineering PHI Learning Private Limited, New Delhi, 2012.
6) MarlandP.Billings, "Structural Geology", PHI Learing Pvt. Ltd. New Delhi, 2012

WEB LINKS :

i. http://studentsuvidha.com/forum/Forum-Engineering-Geology-btech-Notes-study-material
ii. https://www.examrace.com/IES/IES-Free-Study-Material/Civil-Engineering/Engineering-Geology

COURSE OUTCOMES:-

The end of this course, students will be able to :

CO1- Classify the various geological agents and processes involved.
CO2- Identify the available minerals by their properties and behavior.
CO3- Classify and identify the available rock in the construction site.
CO4- Interpret the different geological features and their engineering importance.
CO5- Apply the geological concepts in civil engineering projects.

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2					2	2						2		
CO2	2			2	2				2				2		
CO3	2	2	1	2					2				2		
CO4	2	2		2	2	2	2	2			2	2	2		
CO5			2	2		2	2	2	2		2	2	2		

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUCTP3	Ancient Philosophy of Civil Engineering	3	0	0	10	30	60	100	3

Course Objectives:
The objective of this Course is

- To define the fundamental concepts of heritage resources, including their need, values, types, significance, and the factors contributing to their decay.
- To analyze and compare different approaches for managing and rehabilitating heritage properties.
- To evaluate the criteria used for selecting heritage sites, considering their historical, cultural, and architectural significance
- To apply knowledge of heritage conservation principles by identifying and assessing heritage sites in India.
- To design and recommend appropriate construction materials and techniques, both traditional and modern, for the preservation and conservation of heritage sites

Course Content:

UNIT 1: Basic concepts of Heritage resources - need, values, types, significance, causes of decay, Approaches for Managing and Rehabilitating Heritage Properties, the institutions working for Heritage at the World Level (UNESCO) and India Level (INTACH, ASI), and Criteria for selecting Heritage Sites.

UNIT2: Heritage Sites of India (UNESCO, ASI, etc.), Evolution of Heritage Conservation, Construction Materials for the Conservation/ Preservation of Heritage - Traditional Materials and Modern Materials, Restoration vs. Preservation, Conservation Techniques and Modern Technology in Conservation, Case Studies.

UNIT 3: Construction Techniques for Conservation of Heritage - Traditional and Modern. Emerging trends in conservation practices specific to India and the role of interdisciplinary approaches, ASI regulations for Zoning of allowable Construction around the Heritage Site, Heritage By-laws, and case studies.

UNIT 4: Documentation of Construction Techniques and Materials through Live Indian Heritage Case Studies. (Supported with Site visits, Surveys, Photography, Drawings, etc., of Local Heritage Sites by organizing Heritage tours).

UNIT 5: New Building in Heritage Setting, Heritage Impact Assessment in Historic Settings, Adaptive Reuse, Legislative and Organizational Policies for India, Heritage Regulations & Role of Voluntary Organizations, Heritage Conservation – Issues (contemporary issues, political, economic, and social factors) & Potentials Heritage tourism, sustainability, and way forward.

Reference Books:

1) Appleyard, D. (Ed.). (1979). The Conservation of European Cities. Massachusetts: M.I.T. Press.
2) Basu, S., Mukerji, A. (Eds.) (2017). Integrated Urban Conservation: An Approach towards Development, ISBN: 978-93-5268-866-1, Kharagpur: Department of Architecture and Regional Planning, IIT, Kharagpur.
3) Croci, G. (1998). The Conservation and Structural Restoration of Architectural Heritage. Southampton, UK: WIT Press.
4) Fitch, J.M. (Reprint edition 1990). Historic Preservation: Curatorial Management of the Built World. Virginia: University Press of Virginia.
5) Cullinane, J. J. (2012). Maintaining and Repairing Old and Historic Buildings. Wiley-Blackwell.
6) Evans, N.L. (2014). An Introduction to Architectural Conservation: Philosophy, Legislation and Practice. London: RIBA Publishing.
7) Feilden, B. M. (2003). Conservation of Historic Buildings. London: Routledge.
8) Glendenning, M. (2013). The Conservation Movement: A History of Architectural Preservation: Antiquity to Modernity. London: Routledge.
9) Stipe, R.E. (2003). A Richer Heritage: Historic Preservation in the Twenty-first Century. North Carolina: The University of North Carolina Press.

Course Outcomes:
At the end of the course, the students shall be able

CO1: To demonstrate an understanding of critical concepts related to heritage resources, including their importance, types, and factors contributing to their decay.
CO2: To compare different heritage property management and conservation approaches, and critically assess their effectiveness.
CO3: To apply their knowledge to evaluate heritage sites based on specific criteria, making informed decisions about their preservation or restoration.
CO4: To synthesize information on construction techniques and materials used in heritage conservation and apply this knowledge to real-world scenarios.
CO5: To assess the impact of new construction in heritage settings, perform heritage impact assessments, and analyze the legislative and organizational policies governing heritage conservation in India.

Course Outcomes and their mapping with Programme Outcomes:

CO_S	PO_S												PSO_S		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	3	3				3				1	2	2
CO2	3	3	1	2	3			3					2	3	2
CO3	3	3	1	2	3			3		3			2	3	2
CO4	3	3	1	2	3			3		3			2	3	2
CO5	2	2	2	1	1			3	3				2	2	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Course Code	Subject:	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUCTO1	Green Buildings	3	0	0	10	30	60	100	3

Course Learning Objectives:

- To understand the basics of Green Buildings.
- To learn the concept of site selection and water conservation.
- To study the use of efficient energies.
- To learn about maintenance of Indoor environmental quality.
- To study various green building rating systems including their mandatory requirements and credit points.

Course Content:

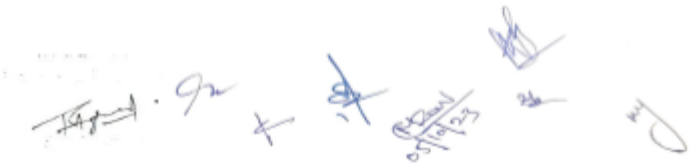
UNIT-I Green Buildings: Introduction, history and evolution, objectives, benefits, typical features of green buildings, sustainability and green buildings, global trends in green buildings, Examples of green buildings in India and the world (case studies to be presented by students).

UNIT-II Site selection and building planning: Criteria for site selection, preservation of landscape, soil erosion control, understanding and minimizing urban heat island effect. Water conservation and efficiency: Rainwater harvesting methods for roof & non-roof, water demand, water efficient plumbing systems, water metering, waste water disposal, recycle and reuse systems.

UNIT-III Energy Efficiency: Concepts of embodied energy, operational energy, demolition energy and life cycle energy. Methods to reduce operational energy: Energy efficient building envelopes, efficient lighting technologies, energy efficient appliances for heating and air conditioning systems in buildings, wind and solar energy harvesting, energy metering and monitoring, concept of net zero buildings.

UNIT-IV Indoor Environmental Quality for Occupant Comfort: Daylighting, air ventilation, exhaust systems, materials, adhesives, building acoustics. **Environment Quality and Occupational Health:** Air conditioning, air quality, Sick building syndrome, minimum fresh air
requirement, improved fresh air ventilation, Measure of Indoor air quality (IAQ), Reasons for poor IAQ, Measures to achieve Acceptable IAQ levels.

UNIT- V Green Building Rating Systems: Introduction to various rating systems (LEED, GRIHA, IGBC etc.), mandatory requirements and credit points of various rating systems, study of green building rating criteria of IGBC, Understanding the green building measures in the areas of site preservation, energy efficiency, materials, water conservation and indoor air quality.



Text Books

1) IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian Green Building Council Publishers.
2) GRIHA version 2015, GRIHA rating system, Green Rating for Integrated Habitat Assessment.
3) Alternative building materials and technologies by K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao.
4) Non-Conventional Energy Resources by G. D. Rai, Khanna Publishers.
5) Sustainable Building Design Manual, Vol.1 and 2, TERI, New Delhi 2004.
6) Mike Montoya, Green Building Fundamentals, Pearson, USA, 2010.
7) Charles J. Kibert, Sustainable Construction Green Building Design and Delivery, John Wiley & Sons, New York, 2008.
8) Regina Leffers, Sustainable Construction and Design, Pearson / Prentice Hall, USA, 2009.

Course Outcomes- At the end of the course students will be able to:

CO1: Apply the concept and knowledge of Green Building in handling any physical projects.
CO2: Conduct a site selection process and apply water conservation techniques for green buildings.
CO3: Make use of technologies with efficient energies.
CO4: Apply the knowledge in maintaining the indoor environmental quality.
CO5: Revise essential parameters of green building rating system.

Course Outcomes and their mapping with Programme Outcomes: Green Buildings (CE23IC301)

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1		3	3					2	2	1	2
CO2	3	2	1	2		3	3					1	2	2	3
CO3	3	2	1	2		3	3					2	2	2	3
CO4	3	2	2	2		3	3					2	2	2	2
CO5	3	2	1	1		2	2					1	2	1	2

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUCLT1	Survey Lab	0	0	2		25	25	50	1

Course Objectives:
The Lab sessions would help in learning:

- Applications of chains & compass in surveying.
- Various Applications of levelling process.
- Use of Plane table surveying in preparing of maps of a location
- Tacheometry & its applications.
- Relative adjustment of non- accessible stations
- Principle & operation of Total Station.

Course Content:
List of experiments:

1. Linear measurement, offsetting using metric chain.
2. Determination of the area of the given field by cross staff survey &metric chain.
3. Compass Open Traversing using prismatic compass and elimination of local attraction.
4. Compass Close Traversing using prismatic compass and elimination of local attraction
5. To find the difference in elevation between the two non-invisible stations by the method of differential levelling.
6. To draw longitudinal profile of the road by the method of profile levelling.
7. To draw Cross-Sectional profile of the road by the method of profile levelling
8. Measurement of horizontal angle by repetition & reiteration method using theodolite.
9. Measurement of vertical angle by using theodolite
10. Determination of Tachometric constants (K & C).
11. Determination of elevation and height by tangential method when both angles are angles of elevation & angles of Depression.
12. Determination of elevation and distance by Stadia Hair method when line of sight inclined Upward & Downward
13. To perform the experiment for reduction to center from different positions of a satellite station when: (i) Satellite station in north position, (ii) Satellite station in left position
14. To perform the experiment for reduction to Centre from different positions of a satellite station when: (i) Satellite station in south position, (ii) Satellite station in right position
15. Traversing of the given area by radiation & intersection method using plane table survey.
16. Find the plane table instrument station using Resection method (Two-point problem & three-point problem)
17. Study of total station

Text Book:

1) Surveying and Levelling. N.N.Basak, 1st Edition, Tata McGraw Hill
2) Surveying (Vol. I & II) – Punmia, B.C. (Laxmi Publications, New Delhi, 1996)
3) Surveying (Vol. I & II) – Kanetkar (Pune VidyarthiGrihaPrakashan, Pune)

Reference Books:

1) Surveying (Vol. II & III) – Agor, R. (Khanna publications, Delhi, 1995)
2) Surveying (Vol. II & III) – Arora, K.R. (Standard Book House, Delhi, 1993)
3) Surveying (Vol. I & II) – S.K. Duggal (Tata McGraw Hill)

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

CO1 Remember about conventional surveying tools such as chain/tape, compass, plane table, levels, Theodolite & Tachometer in the field of civil engineering applications such as structural plotting and highway profiling.

CO2 Understand & apply the concepts of Traversing, Plane Table Surveying & Levelling in the surveying field.

CO3 Understand & apply the concepts of Tacheometery & Triangulation in the surveying field.

Course Outcomes and their mapping with Programme Outcomes: Survey Lab (CE23LB301

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	3								3	3	1
CO2	2	1	2	3	2								2	3	2
CO3	3	2	3	3	2							2	2	1	1

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUCLT2	Fluid Mechanics Lab	0	0	2		25	25	50	1

Course Objectives:

- To understand the verification of Bernoulli's equation.
- Determination of Meta centric height of ship model
- Calibration of flow measuring devices as Venturimeter
- Calibration of flow measuring devices as Orificemeter.
- Demonstrate and find out co-efficient of velocity for orifice and Mouthpiece.
- Demonstrate and find out co-efficient of discharge for various types notches.
- Determination of friction factor for pipes
- Determination of critical velocity in pipe
- Determination of the co-efficient of pitot tube.
- Determination of coefficient of impact for vanes
- To plot velocity profile across the cross section of pipe
- Determine the Reynold's Number in pipe.
- To learn the Calibration of rectangular sharp cornered weir and to study the pressure distribution on the upstream face of the weir.
- To learn the Calibration of rectangular streamlined weir and to study the pressure distribution on the upstream face of the weir.

Course Content:

List of experiments:

1) To calculate the total energy at different points and plot the graph between total energy vs. distance. (Verification of Bernoulli's equation)
2) To determine the Meta centric height with angle of ship model.
3) To determine the co-efficient of Discharge Cd for Venturimeter
4) To determine the co-efficient of Discharge Cd for Orificemeter.
5) To determine the co-efficient of discharge and the co-efficient of velocity for Orifice.
6) To determine the co-efficient of discharge and the co-efficient of velocity for Mouthpiece.
7) To determine the coefficient of discharge Cd of Rectangular Notch.
8) To determine the coefficient of discharge Cd V Notch - 45 0
9) To determine the coefficient of discharge Cd V Notch - 60 0
10) To determine the friction factor for Darcy-Weisbach equation
11) Experimental determination of critical velocity in pipe.
12) To determine the coefficient of impact for vanes
13) To find the co-efficient of pitot tube
14) To plot velocity profile across the cross section of pipe
15) To determine the Reynold's Number in pipe
16) Calibration of rectangular sharp cornered weir and to study the pressure distribution on the upstream face of the weir.
17) Calibration of rectangular streamlined weir and to study the pressure distribution on the upstream face of the weir.

Course Outcomes-At the end of the course students will be able to

CO1 Verify the basic energy principles (Bernoulli's equation).
CO2 Utilize the basic measurement techniques of fluid flow in Venturimeter.
CO3 Utilize the basic measurement techniques of fluid flow in Orificemeter.
CO4 Gain knowledge to calculate co-efficient of velocity for orifice and Mouthpiece
CO5 Gain knowledge to calculate co-efficient of discharge for various types notches
CO6 Determine the critical velocity in pipe.
CO7 Understand the pipe flow systems and its losses.
CO8 Determine the coefficient of impact for vanes.
CO9 Determine co-efficient of discharge for pitot tube
CO10 Plot velocity profile across the cross section of pipe
CO11 Determine the Reynold's Number in pipe
CO12 Calibrate the rectangular sharp cornered weir and to study the pressure distribution on the upstream face of the weir.
CO13 Calibrate the rectangular streamlined weir and to study the pressure distribution on the upstream face of the weir.

Course Outcomes and their mapping with Programme Outcomes: Fluid Mechanics Lab (CE203PPC02)

COs	POs												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	2	1								3	2	2
CO2	3	3	3	2	1								3	2	2
CO3	3	3	2	2	1								3	2	2
CO4	3	3	2	2	1								3	2	2
CO5	3	3	2	2	1								3	2	2
CO6	3	3	3	2	1								3	2	2
CO7	3	3	3	2	1								3	2	2
CO8	3	3	2	2	1								3	2	2
CO9	3	3	3	2	1								3	2	2
CO10	3	3	2	2	1								3	2	2
CO11	3	3	3	2	1								3	2	2
CO12	3	3	2	2	1								3	2	2
CO13	2	2	3	2	1								3	2	2

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUDTT1	Structural Analysis-I	3	1	0	10	30	60	100	4

Course Objectives:

To study the strain energy principles and their application tobeams and pin joint plane frames
To learn about analysis of arches &cables.
To know how to construct the influence line diagrams for determinate beams and its application to estimate the maximum shear force, bending moment at a section and absolute maximum bending moment in the beams.
To study the construction of influence lines for determinate trusses and three hinged arches and its applications.
To learn about the static indeterminacy of structures and methods of analysis, application of three momentstheorem to beams

Course Content:

UNIT 1: Principle of superposition, virtual work principle, Maxwell reciprocal theorem, deflection of beams using conjugate beam method. Deflection of beams and truss using energy method (Castiglianotheorem), Analysis of plane truss using tension coefficient method (determinate).

UNIT 2: Three-hinged Arches: Bending Moment, Shear force, axial force for three-hinged arches, Analysis ofSuspension Bridge without stiffening girders.

UNIT 3: Influence Lines: Basic concept of moving load and influence line; influence lines for reactions, Shearforce and bending moment for determinate beams; absolute maximum shearing force and bending moment.

UNIT4: Influence lines for three-hinged arches and stresses in simply supported plane determinate trusses.

UNIT 5: Static and kinematic indeterminacy of structure, Method of structural analysis, Analysis of fixed beam, continuous beam using Theorem of three moments, Effect of yielding of supports.

Reference Book:

1. Structural Analysis by Devdas Meenon
2. Fundamental of Structural Analysis by Lee.
3. Elementary structural Analysis by A.K. Jain
4. Advanced Structural Analysis by A. K. Jain
5. Structural Analysis (SI units) by R.C hibbeler
6. Structural Analysis by L S nagi & R S Jangid

Course Outcomes:

At the end of the course the students will be able

CO1 To apply the concept of conjugate beam and strain energy methods to estimate the deflections ofdeterminate beams and trusses
CO2 To able to analysis three hinged arches and cables.
CO3 To construct and use the influence lines for estimation of different force functions in determinatebeams
CO4 To able to draw the ILDs for reactions and internal forces in three hinged arches and determinatetrusses and find their values
CO5 To differentiate the determinate and indeterminate structures and apply the three-moment area theoremfor the analysis of continuous beams and fixed beams

Course Outcomes and their mapping with Programme Outcomes: Structural Analysis-I (CE23TDC401)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	2	2							3	1	1	
CO 2	3	3	3	1	2							3	2	1	
CO 3	3	3	2	2	3							3	2	1	
CO 4	3	3	2	2	3							3	2	1	
CO 5	3	3	2	1	2							3	2	1	

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUDTT2	Fluid Mechanics-II	3	0	0	10	30	60	100	3

Course Objectives:

To introduce and give explanation of fundamentals of turbulent flow in pipe.
To develop understanding about Boundary layer Analysis.
To develop understanding about non-uniform flow in open channel.
To introduce the importance of Compressibility effect in pipe flow.
To develop understanding about Hydraulic Machines.

Course Content:

UNIT 1: Non-uniform flow in open channel: Specific energy, critical flow, analysis of flow over hump and transition, equation of gradually varied flow, hydraulic jump and evaluation of its elements in rectangular channel.

UNIT 2: Boundary layer Analysis: Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, turbulent boundary layer, and laminar sub layer, Application of momentum equation, local and average friction coefficient. Fluid flow past submerged bodies. Drag and lift, drag on sphere and cylinder Magnus effect.

UNIT 3: Turbulent flow in pipe: Nature of turbulence, free and wall turbulence, turbulent flow in pipes, equation for velocity distribution over smooth and rough surfaces, Colebrook-White equation, Moody's diagram, Explicit equation for friction factors.

UNIT 4: Compressibility effect in pipe flow: Transmission of pressure waves in rigid and elastic pipes, water hammer Dimensional analysis and Hydraulic similitude. Dimensional analysis, Buckingham's theorem, important dimensionless numbers and their significances, geometric, kinematics and dynamicsimilarity, model study.

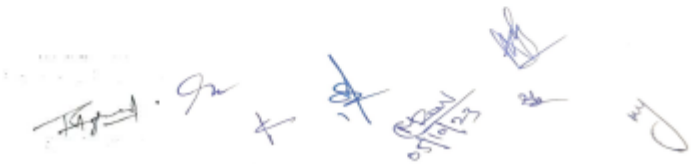
UNIT 5: Hydraulic Machines: Turbines: Classification of turbines, draft tube, specific speed, unit quantities, and characteristics curves of turbines, and governing of turbine. Pump: Introduction, Centrifugal pumps, efficiencies, specific speed, cavitations, slip, percentage slip.

Name of Text Books:

1. Fluid Mechanics and Machines – Dr. A.K. Jain (Khanna Publications)
2. Fluid Mechanics and Machines – Dr. R.K. Bansal (Laxmi Publications)
3. Fluid Mechanics – Dr. P.N. Modi (Standard Book House)
4. Mechanics of Fluid – Irving H. Shames (McGraw Hill)
5. Introduction to Fluid Mechanics – James A. Fay (Prentice Hall India) Name of

Reference Books:

1. Fluid Machines – Dr. Jagdish Lal (Metropolitan Book Company Private Ltd.)2. Fluid Machines – John P. Douglas (Pearson Publication)



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

CO1 Define Turbulent flow in pipe and velocity equations for smooth and rough boundary of pipe.
CO2 Describe the Boundary layer theory and drag and lift.
CO3 Explain the concept of non-uniform flow in open channel
CO4 Explain the concept of Compressibility effect in pipe flow
CO5 Describe the concept of Hydraulic Machines.

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	2							3	3	2
CO2	3	3	2	2	2	3							3	2	2
CO3	3	3	3	2	3	2							3	2	2
CO4	3	3	2	3	2								3	2	2
CO5	3	2	2	3	3								3	2	3

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUDTT3	Concrete Technology	3	0	0	10	30	60	100	3

Course Objectives:

To learn about various ingredients materials of concrete, like cement aggregates, water, etc
To understand the role of various Admixtures added to concrete mixes
To design various grades of concrete as per IS method.
To understand the various testing methods for fresh & hardened properties of concrete.
To learn about various special application concretes.

Course Content:

Unit1: Constituent Material: Cement-Types-Chemical composition and Properties-Tests on cement - IS Specifications- Aggregates-Classification-Mechanical properties and tests as per BIS grading requirements-Water- Quality of water for use in concrete.

Unit 2: Chemical and Mineral Admixtures: Accelerators-Retarders- Plasticizers- Super plasticizers-Water proofers – Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaolin-Their effects on concrete properties

Unit 3: Proportioning of Concrete Mix: Principles of Mix Proportioning-Properties of concrete related to Mix Design Physical properties of materials required for Mix Design – Design Mix and Nominal Mix-BIS Method of Mix Design – Mix Design Examples

Unit4: Fresh and Hardened Properties of Concrete: Workability-TestsforworkabilityofconcreteSlumpTestandCompactingfactorTest-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS – Properties of Hardened Concrete-Determination of Compressive and Flexural Strength-Stress-strain curve for concrete Determination of Young's Modulus.

Unit 5: Special Concretes: Light weight concretes – High strength concrete – Fibre reinforced concrete –Ferrocement–Ready mix concrete–Slurry in filtrated fibrous concrete (IFCON)-Shotcrete–Polymer concrete – High performance concrete- Geopolymer Concrete.

Text Books:

1. Gupta. B.L., Amit Gupta, "ConcreteTechnology",JainBookAgency,2010.
2. Shetty,M.S,"ConcreteTechnology",S.ChandandCompanyLtd,NewDelhi,2003
3. Santha kumar, A.R; "Concrete Technology", Oxford University Press, New Delhi,2007

4. Neville, A.M; "Properties ofConcrete", Pitman Publishing Limited, London,1995
5. Gambir, M.L; "ConcreteTechnology",3rd Edition, Tata McGraw Hill Publishing Co Ltd, NewDelhi,2007
6. IS10262-1982Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1998.

Course Outcomes:

At the end of the course students will be able to:

CO1 Remember & understand properties and role of ingredients like cement, aggregate, admixtures etc. to produce better quality concrete.
CO2 Understand various classification & role of admixtures on properties of concrete.
CO3 Apply design concepts (as per IS method) to design various grades of concrete as per requirement.CO4 Demonstrate destructive, semi-destructive and non-destructive tests for concrete.
CO5 Understand about various special application concretes.

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2			3	2		3	2		3	2		3		2
CO2	1			3	3		3	3		3	3		3		1
CO3	2	2		3			1			3			3		2
CO4				3	2			2	2		3		2	3	2
CO5	2			1	3	3	3	1					3	2	1

Weightage:1-Sigtly;2-Moderately;3-Strongly

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUDTP1	Estimation and Costing	3	0	0	10	30	60	100	3

Course Objectives:

The objective of this Course is

1. To able prepare detailed and abstract estimation for the building and other structure.
2. To prepare bill of quantity and schedule of rate for various item of work.
3. To able to value the existing building and property.

UNIT-I
ESTIMATION OF BUILDING

Types of estimates – Units of measurements – Methods of estimates – Advantages. Quantity estimate for load bearing and framed structures - brick work and RCC works only, Steel requirement and Bar bending schedule - Calculation of quantities of earth work excavation, brickwork, PCC, RCC, Plastering, white washing, colour washing and painting/varnishing for shops and residential building with flat roof.

UNIT-II
ESTIMATE OF OTHER STRUCTURES

Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipe line – sewer line– estimate of bituminous and cement concrete roads

UNIT-III
ANALYSIS OF RATES AND SPECIFICATIONS

Data – Schedule of rates – Analysis of rates – Specifications – sources – General and Detailed Specifications-Material Calculations for each work. - Material cost

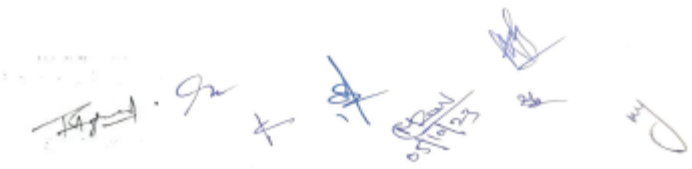
UNIT-IV
CONTRACTS AND TENDER

UNIT-V
REPORT WRITING OF PROJECT

Principles for report preparation – report on estimate of residential and industrial building –Roads – Water supply and sanitary installations. Introduction to Value Engineering: Cash flow and cost control. Systems of cost control based on accounting details of spends and periodicity of cost comparison

TEXTBOOKS

1. Dutta. B.N" Estimation and Costing in civil Engineering,27th Edition -2011.
2. Chackraborti .M 'Estimation and Costing Specification and valuation in civil Engineering,24th edition 2010.
3. Rangalwala S C Estimation costing and valuation, Charotar Publishing House"2008
4. Kohli D.D and Kohli. R. C" a TEXT BOOK OF Estimating and Costing,2013.
5. Estimating and Costing: Including Quantity Surveying, Tendering and Evaluation Kataria & Sons, 2010.



Course Outcomes:

After successful completion of this course, the students should be able to

CO1 Prepare detailed estimation and find out the quantity of various works involved in the building.

CO2 Estimate the quantity of works involved in road works, water supply and sanitary works and septic tank

CO3 Carry out analysis of rates and bill preparation using spreadsheets.

CO4 Able to value the building and calculate rent from building.

CO5 Estimate the value of buildings.

COs	POs												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO 12	PSO 1	PSO 2	PSO 3
CO1						3				3	3		3		2
CO2						3				3	3		3		1
CO3						3				3	3		3		1
CO4						3				3	3		3		1
CO5						3				3	3		3	2	

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUDTP2	Sustainable Built Environment	3	0	0	10	30	60	100	3

Course Objectives:

The objective of this Course is

- To recall key terminology and concepts related to Earth's environment and natural disasters.
- To explain the fundamental principles of Earth's structure, geological processes, and the Earth's spheres.
- To apply knowledge of natural disasters to assess their causes, impact, and methods for monitoring and mitigating them.
- To analyze the complex relationship between human civilization, natural resources, and environmental sustainability, including the environmental impacts of various human activities.
- To evaluate the concept of sustainable development, its importance, and its practical application in different sectors, considering both its benefits and limitations

Course Content:

UNIT 1: Earth and Environment Definition of the environment: origin of the earth, lithosphere, hydrosphere, atmosphere, biosphere; Earth Structure, Plate Tectonics theory, geo-morphological features; Geological structures (folds, faults, discontinuity, dike); Engineering and Genetic classification of soils, Weathering, and Soils; Rocks, rock cycle, Igneous Rocks, Sedimentary Rocks, Metamorphic Rocks, Rock Properties, Rock-water interaction.

UNIT 2: Natural disasters: Cyclones, Tornado, Volcanic Eruptions, Earthquakes– Generation mechanism, different terminologies, earthquake monitoring and measurements, seismic region of the world, Tsunami, Land Slides; Sustainability and resilience for natural disasters;

UNIT 3: Hydrosphere; water cycle, surface, and groundwater origin and its quality, oceans, ocean currents, ocean water quality; Atmosphere; components of the atmosphere; earth's energy budget; air quality, winds, cloud formation, storms; Biosphere; essential components for life; energy, carbon, water, and nutrients and their role in sustaining life; carbon and nutrients recycling; biomes and ecosystems.

UNIT 4: Natural Resource and Human Civilization; Natural Resources; natural resources for energy, food, shelter, and other human needs; Human Civilization; link between human civilization, natural resources and environment; Infrastructure: characteristics of modern human civilization and the need for infrastructure; Environmental Impacts of Human Civilization Environmental impacts of population growth, intensive agriculture, land use changes, urbanization, industrialization, mining; Consequences of fossil fuel burning; global warming and climate change; Loss of biodiversity, desertification, loss of soil fertility, reduction in water availability, land, air and water pollution.

UNIT 5: Sustainable Development; Concept of Sustainable Development: Brundtland Report; Modifications for sustainability; reuse and recycle, demand management, innovative supply-side Engineering; Sustainable development in various sectors; energy, industry, agriculture, transportation, construction, water resources, and land management; Institutional limitations in achieving sustainable development.

TEXTBOOKS

1. Tarbuck, E. J., Lutgens, F. K., Tasa, D., & Tasa, D. (2005). Earth: an introduction to physical geology (p. 744). Upper Saddle River: Pearson/Prentice Hall.
2. Loftness, V., & Haase, D. (Eds.). (2013). Sustainable built environments (p. 431). New York: Springer.
3. Baker, S. (2015). Sustainable development. Routledge.

Course Outcomes:

At the end of the course, the students will be able

CO1 To recall and define key terms and concepts related to Earth's environment, geological processes, and natural disasters.

CO2 To understand the Earth's structure, geological features, and the interconnectedness of its spheres, enabling them to comprehend how these factors influence natural disasters.

CO3 To apply their knowledge to analyze and solve problems related to natural disasters, including their causes and mitigation strategies.

CO4 To develop critical thinking skills by examining the intricate relationship between human civilization, natural resources, and the environment and assessing the environmental consequences of various human activities.

CO5 To understand and apply the concept of sustainable development, its significance, and its application across different sectors. They will also be able to evaluate the challenges and limitations associated with achieving sustainability in various contexts.

COs	POs												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1								3	3	3	3	3		2	2
CO2								3	3	3	3	2		1	1
CO3								3	3	3	2	2		1	1
CO4								3		3	1	1		1	1

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUDTP3	Ocean Engineering	3	0	0	10	30	60	100	3

Course Objective:

- The objective of this Course is to:
- To introduce the students to Oceanography and Ocean Environment.
- To familiarize students with marine vehicles and offshore structures
- To study Engineering aspects in coastal oceanography.
- To provide students understanding of ports and harbor structures
- To understand application of Ocean Engineering with a few case studies.

Course Content:

UNIT I: Introduction to Oceanography – Brief introduction to ocean environment and ocean floor characteristics. Ocean Circulation, Tides, Waves, Currents, Tsunami and Storm surges – origin, generation, propagation and characteristics; Different materials for marine applications - metals, concrete, geosynthetic products and other materials for marine environment; Marine corrosion and control.

UNIT II: Different types of ocean structures and systems (fixed, floating, semi-submersibles, submersibles, pipelines, etc.,) for exploitation and production of oil and gas, minerals and energy. Brief outline of planning, design and construction, launching and installation of Platform.

UNIT III: Beach, coast and shore; Beach features - beach cycles - beach profiles – beach stability - beach erosion and sedimentation; Engineering aspects in coastal oceanography; Coastal protection structures – natural and artificial. Shore protection structures, seawalls, groins, breakwaters; Types and factors determining selection and stability of breakwaters; Sand bypassing and artificial beach nourishment - latest technologies in shore protection techniques; Environmental impacts of coastal developments.

UNIT IV: Types of ports and harbors; Harbour layout and terminal facilities - piers, break waters, wharves, jetties, quays; Spring fenders, dolphins and floating landing stage environmental issues in port planning and operations; Harbor oscillations, seiches; Inlets – siltation of inlets and harbors – remedial measures; Onshore and offshore sediment transport - Dredging.

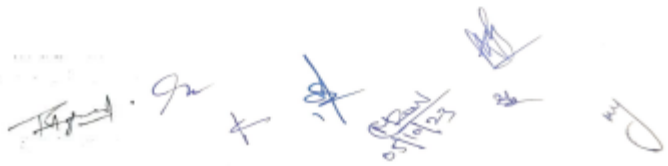
UNIT V: Case studies: Ocean Structure Disaster

Reference Books:

1. An Introduction to Coastal Engineering, J. Paul Guyer, Amazon Asia-Pacific Holdings Private Limited, 2017.

2. Ocean Engineering – Goals, Environment, Technology: J F Brahtz, John Wiley and Sons, 1968.

3. Oceanographic Engineering: R L Weigel, Dover Publications, 2005.



Course Outcomes:

At the end of the course the students will be able to:

CO1. Describe Oceanography and its characteristics

CO2. Distinguish between different types of Onshore and Offshore structures.

CO3. Understand the link between the ocean processes and its implications in the coastal zone

CO4. Gain knowledge on ports and harbors and terminal facilities.

CO5. To raise the awareness and understanding about ocean engineering applications.

Cos	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1			3						1	3	3
CO2	3	2	2			2	3						1	3	3
CO3	3	2	2			2	3						1	3	3
CO4	3	2	2			2	3						1	3	3
CO5	3	2	2	3			3							3	3

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUDTD1	Remote Sensing & GIS	3	0	0	10	30	60	100	3

Course Objectives:

- Apply the concepts of Photogrametry and its applications such as determination of heights of objects on terrain.
- Understand the basic concept of Remote Sensing and know about different types of satellite and sensors.
- Illustrate Energy interactions with atmosphere and with earth surface features, Interpretation of satellite and top sheet maps.
- Understand different components of GIS and Learning about map projection and coordinate system.
- Develop knowledge on conversion of data from analogue to digital and working with GIS software.

SYLLABUS:

UNIT – I: INTRODUCTION TO PHOTOGRAMMETRY Principles and types of aerial photographs, geometry of vertical and aerial photograph, Scale and Height measurement on single and vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of Stereoscopy, fiducial points, parallax measurement using fiducial line.

UNIT – II: REMOTE SENSING Basic concepts and foundation of Remote Sensing elements, Data information, Remote sensing data collection, Remote sensing advantages and Limitations, Remote sensing process. Electromagnetic spectrum, Energy interaction with atmosphere and with earth surface features (soil, water, and vegetation) Indian Satellites and Sensors characteristics, Map and Image false color composite, introduction to digital data, elements of visual interpretations techniques.

UNIT – III: GEOGRAPHIC INFORMATION SYSTEMS Introduction to GIS, Components of GIS, Geospatial data: Spatial Data – Attribute Data- Joining Spatial and Attribute Data, GIS Operations: Spatial Data input- Attribute Data Management-Data Display-Data Exploration-Data Analysis. **COORDINATE SYSTEMS:** Geographic Coordinate system; Approximation of Earth, Datum: Map Projections; Types of Map Projections-Map Projection Parameters-Commonly used Map Projections – Projected Coordinate Systems.

UNIT – IV: VECTOR DATA MODEL Representation of simple features- Topology and its importance: coverage and its data structure, shape file: data models for composite features Object Based Vector Data Model; Classes and their Relationships: The geo-based data model: Geometric representation of Spatial feature and data structure: Topology rules.

UNIT – V: RASTER DATA MODEL Elements of Raster data model: Types of Raster data: Raster data structure: Data conversion, Integration of Raster and Vector data. Data Input: Metadata: Conversion of Existing data, Creating new data, Remote sensing data, Field data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing.

TEXT BOOKS:

1. Bhatta B (2008), Remote sensing and GIS", Oxford University Press
2. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) Remote Sensing and Image Interpretation", Wiley India Pvt. Ltd., New Delhi
3. Schowenger, R. A (2006) Remote Sensing, Elsevier publishers.

4. Parkinson, B. W., Spilker, J. J. (Jr.) (1996). Global Positioning System: Theory & Applications (Volume-I). AIAA, USA.
5. Remote Sensing of the environment- An earth resource perspective- 2nd edition- by John R. Jensen, Pearson Education.
6. Introduction to geographic information system- kang – Tsung Chang, Tata McGraw- Hill Education Private Limited.
7. Concepts & Techniques of GIS by C.P. Lo Albert, K.W. Yeung, Prentice Hall (India) Publications. Remote Sensing and Geographical Information systems by M.Anji Reddy JNTU Hyderabad 2001, B.S. Publications.
8. Principals of Geo physical Information System- Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004
9. Basics of Remote Sensing and GIS by S. Kumar, laxmi Publications.

REFERENCE BOOKS:

1. Fundamentals of Remote Sensing by George Joseph, Universities Press, 2013.
2. Fundamentals of Geographic Information Systems" by Demers, M.N, Wiley India Pvt. Ltd, 2013. 3. Jensen John R. Introduction to Digital Image Processing: A Remote Sensing Perspective Prentice hall, New Jersey
4. Paul Wolf, Elements of Photogrammetry, McGraw Hill.
5. Leick Alfred, 1995: GPS Satellite Surveying, Wiley Interscience
6. Burrough, P. P. &McDonnel, R. A. (1998). Principles of GIS. Oxford University Press

Course Outcomes:

After completing this course, the student will have acquired the ability on the following. 1. Understand the concepts of Photogrammetry and compute the heights of objects.

- **CO1** Understand the principles of aerial and satellite remote sensing. Able to comprehend the energy interactions with earth surface features, spectral properties of water bodies.
- **CO2** Understand the basic concept of GIS and its applications, know different types of data representation in GIS.
- **CO3** Understand and Develop models for GIS spatial Analysis and will be able to know what the questions that GIS can answer are.
- **CO4** Apply knowledge of GIS software and able to work with GIS software in various application fields.
- **CO5** Illustrate spatial and non-spatial data features in GIS and understand the map projections and coordinates systems.
- **CO6** Apply knowledge of GIS and understand the integration of Remote Sensing and GIS.

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3											3		2
CO2	3	2											3	2	
CO3				3			2						3	2	
CO4											2		2	3	
CO5			3	2						2			2	3	2

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUDTM1	Management and Organizational Behaviour	2	0	0	00	00	00	00	0

Course Objectives:
The objective of this Course is

- To describe the concept of Organizational Behavior, its significance, and its contemporary issues.
- To differentiate between various managerial roles, analyze the work of managers, and apply the framework of management perspective to real-world scenarios.
- To evaluate how diversity and individual differences impact organizational behavior, assess the role of perception in decision-making, and synthesize strategies for fostering creativity in the workplace
- To critique team effectiveness factors, assess group and organization leadership strategies, and analyze interdependence and role relationships in meso-level organizational behavior.
- To analyze the influence of power, politics, and conflict in organizations, evaluate the impact of technology and the environment on organizational behavior, and design organizational structures based on macro-level considerations

Course Content:

UNIT1: Organizational Behaviour- Definition, Contemporary Issues, Putting Organizational Behavior Knowledge to Work; Management and Managers: Define management, the work of managers, and the framework of management perspective.

UNIT 2: Micro Organizational Behavior: Managing Diversity and Individual Differences, Perception, Decision Making, Creativity, Work Motivation and Performance, Satisfaction and Stress.

UNIT 3: Meso Organizational Behavior: Efficiency, Motivation, and Quality in Work Design, Interdependence and Role Relationships, Group Dynamics and Team Effectiveness, Leadership of Groups and Organizations.

UNIT 4: Macro Organizational Behavior: Power, Politics, Conflict, Structuring the Organization, Technology, Environment, and Organization Design.

UNIT 5: International Organizational Behavior: International Dimensions, Effects on Organizational Behavior, Managing International Differences; Evidence-Based Management: Critical Thinking and Continuous Learning-Critical Thinking and the Scientific Process, Causal Inferences, Generalizing Research Results, Linking Organizational Behavior Science and Practice

TEXTBOOKS

1. John A. Wagner III and John R (2010). Hollenbeck. Organizational Behavior- Securing Competitive Advantage, Taylor & Francis.

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

CO1 To demonstrate comprehension of Organizational Behavior concepts, issues, and their relevance in the workplace.

CO2 To apply their knowledge of managerial roles and the framework of management to address real-world managerial challenges effectively.

CO3 To demonstrate proficiency in understanding and managing diversity, perception, decision-making, creativity, motivation, and group dynamics to enhance workplace performance and satisfaction.

CO4 To analyze and synthesize the macro-level factors influencing organizational behavior, including power dynamics, politics, conflict resolution, and the impact of technology and the environment on organizational design.

CO5 To apply principles of international organizational behavior, demonstrating an understanding of how global contexts affect organizational behavior. They will also apply critical thinking and research skills to make evidence-based decisions in management practice.

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1								3	3	3	3	3		2	2
CO2								3	3	3	3	2		1	1
CO3								3	3	3	2	2		1	1
CO4								3		3	1	1		1	1
CO5								3		3	1	1		1	1

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUDLT1	Civil Engineering Drawing with Computer Applications	0	0	2		25	25	50	1

Course Objectives

1. To introduce the fundamentals of Civil Engineering drawing.
2. To practice the understanding of the principles of planning.
3. To develop capability to understand and learn drafting of building drawings.
4. To impart knowledge on drafting software such as Auto CAD Course Content:

List of Experiments:

1. To draw various symbols used in building drawings & Learn Bye-Laws of the building drawing.
2. To draw the cross section of a wall (Load bearing & Framed Structures) and its foundation.
3. To draw the line plan of a single storey residential building.
4. To draw the ground floor plan of a residential building.
5. To draw the section for the above plan showing maximum details.
6. To draw the corresponding front elevation of the above residential building.
7. To draw the plan, Elevation and section of a primary school building.
8. To draw the plan, Elevation and section of a hostel building.
9. To draw the plan, Elevation and section of a Primary Health Center building
10. To draw elevation & section of flush shutter, paneled shutter doors and windows.
11. To draw section and elevation of fully glazed, half glazed, half glazed and half paneled doors and windows.
12. To draw Bar Bending Schedule of footing, Beams , Columns & Slab.
13. To draw different stair cases (RC/Steel).
14. To draw the elevations of various types of trusses.

Refrences:

1. National Building Code of India.
2. Building drawing with a ninety grated approach to built environment by M.Shah, C.Kale, S.Patki, Tata McGraw Hill Education; 4th edition.
3. Building Planning and Drawing by M.V. Chitawadagi S.S. Bhavikatti, Dreamtech Press.
4. Civil Engineering Drawing & House Planning: A TextBook by B.P. Verma, Khanna publishers.
5. Civil Engineering Drawing by Rangwala, Charotar Publishing House Pvt.Ltd.
6. Building Planning and Drawing by Dr. N. Kumara Swamy, A. Kameswara Rao, Charotar Publishing House Pvt. Ltd.
7. NKrishna Raju, Structural Design and Drawing, Second Edition, Universities Press (India),

Private Limited, Hyderabad.

Course Outcomes:

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

CO1 Remember & Understand Building Bye-Law & various symbols used for drawings of structures.

CO2 Apply drawing concepts to draw Plans Sections & Elevations for Various types of buildings.

CO3 Apply drawing concepts to draw Sections & Elevations for Various types of Doors, Windows, Staircases and Trusses.

Course Outcomes and their mapping with Programme Outcomes: Computer Aided Civil Engineering Drawing (CE23PLB401)

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1		1	3	1							2	1	1
CO2	2	1								1			3	2	1
CO3	2	1				1				1			2	1	1

Weightage:1-Sightly;2-Moderately;3-Strongly

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUDLT2	Material Test Lab	0	0	2		25	25	50	1

Course Objectives

- To Remember & understand various Properties of Cement & to learn testing methodology of eachproperties of cement.
- To learn to perform various experiments related to properties of Aggregates.
- To be able to examine the various properties of prefabricated bricks.
- To learn to perform various Destructive & non –destructive tests on concrete.

Course Content:

1.Normal Consistency, Fineness of Cement, Setting times of Cement
2.Specific Gravity of Cement
3.Soundness of Cement
4.Compressive strength of cement

Testing of aggregate:

5.Fineness modulus of Fine and Coarse aggregate
6.Bulk density of aggregate
7.Specific Gravity and Water Absorption of Aggregate
8.Bulking of Sand

Testing of bricks

9.Compressive strength, Water Absorption &Efflorescence of BricksTesting of concrete:
10. Workability of Concrete
11. Compressive strength
12. Modulus of Elasticity
13. Tensile Strength of Concrete
14. NDT Test of Concrete

Text Books / References:

1.Building Materials – S.K. Duggal (New Age Publication) 2. Building Materials – S. C. Rangwala (Charotar Publication)
3.Building Construction by S.G. Rangwala, Charter Publishing House, Anand, India

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

CO1 Understand & demonstrate various tests on cement, Aggregates & Bricks.
CO2 Design Concrete for desired grade & test its various mechanical properties.
CO3 Demonstrate modern Non – Destructive method of concrete in-situ testing.

COs	POs												PSOs		
PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
CO1	1	3	1	2	2	1							2		3
CO2	2	2	3	3	2	1							2		2
CO3	1	3	1	3	2	2		2					2	3	2

Course Code	Subjects	Periods			Evaluation Scheme				Credits
		L	T	P	TA	IA	ESE	Total	
CEUDPT1	Mini Project	0	0	4	-	50	50	100	2

Course Outcomes:

After successful completion of this course, the students will be able to

CO1: prepare plan for various types of structures.
CO2: prepare the working and approval drawings for Civil engineering structures
CO3: prepare the project reports in the prescribed formats.
CO4: present project proposals efficiently. Pre-requisites: Nil Course Assessment methods:

(SEMESTER V)

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE205TPC09	L	T	P	CT-I	CT-II	TOTAL			
Subject:	Design of Concrete Structures-I	3	1	0	15	15	30	70	100	04

Course Learning Objectives:

1. To understand the various philosophies of design of concrete structures using IS Codes.
2. To understand the design beam for flexure, shear, bond and torsion
3. To know the design of slabs and staircase with their detailing.
4. To learn the design of axially and eccentrically loaded columns.
5. To know about different types of footings and their reinforcement detailing.

Course Content:

UNIT-1: Introduction to design of concrete structures-limit state analysis and design of beams for flexure, bond.

UNIT-2: Shear and torsion

UNIT-3: One way slabs, staircases, Two-way slabs

UNIT-4: Axially and eccentrically loaded columns. (Uniaxial only)

UNIT-5: Footings – different types of isolated footings, synthesis of limit state and working Stress methods.

Text Books:

1. Reinforced Concrete Design - S Unnikrishna Pillai &Devadas Menon
2. Limit State Design of Reinforced Concrete - P.C. Varghese
3. Design of Reinforced Concrete Structures - N Krishna Raju

Course Outcomes:

After successful completion of this course, the students will be able

CO1: To adopt limit state design philosophy for design of reinforced concrete.
CO2: To carry out the design of RC structural elements for flexure, bond, shear and torsion.
CO3: To implement the design slabs and staircases as per LSD.
CO4: To do the design of RC structural columns subjected to axial and eccentric loads.
CO5: To propose and design the type of footing for a RC structure.

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE205TPC10	L	T	P	CT-I	CT-II	TOTAL			
Subject:	Structural Analysis - II	3	1	0	15	15	30	70	100	04

Course Learning Objectives:

The objective of this course is

1. To understand the principles of energy methods and their applications to indeterminate beams and plane frames
2. To know the principles and applications of slope deflection method to the indeterminate beams and rigid frames
3. To study the principles of moment distribution method and its applications to indeterminate beams and rigid joint plane frames
4. To study the principles of matrix methods and their applications to beams
5. To apply the Muller Breslau Principle for the construction of influence lines to indeterminate beams and two-hinged arches

Course Content:

UNIT-1: Analysis of indeterminate beams by Consistent Deformation methods, Analysis of indeterminate rigid plane frames and truss using energy method.

UNIT-2: Slop Deflection Method: Continuous beams and rigid joint plane frames by slope deflection method due to loads and yielding of supports.

UNIT-3: Moment-distribution method. Continuous beams and rigid joint plane frames by moment distribution method due to loads and yielding of supports.

UNIT-4: Introduction to Flexibility matrix and Stiffness Matrix methods: Applications of the methods to simple indeterminate beams.

UNIT-5: Analysis of symmetrical two hinge arches (parabolic and circular). Influence lines for propped cantilevers, continuous beams using Muller-Breslau's principle.

Text Books:

1. Structural Analysis –Devdas Menon
2. Indeterminate Structural Analysis - C. K. Wang
3. Fundamental of Structural Analysis -Lee
4. Advanced Structural Analysis - A. K. Jain
5. Structural Analysis (SI units) - R C Hibbler
6. Structural Analysis - L S Negi& R.S Jangid

Course Outcomes:

At the end of the course the students shall be able

CO1: To identify the suitable method of analysis for the analysis of indeterminate beams and trusses and analyse the same using consistent deformation method and energy method
CO2: To analyse the indeterminate beams and rigid joint plane frames by slope deflection method and moment distribution method
CO3: To analyse the indeterminate beams and rigid joint plane frames by moment distribution method
CO4: To apply and analyse the indeterminate beams using matrix methods
CO5: To construct the influence lines for stress resultants in indeterminate beams and two-hinged arches and analyse the same for moving loads

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE205TPC11	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Transportation Engineering	3	0	0	15	15	30			

Course Learning Objectives:

The objective of this Course is

1. To understand the importance of transportation and characteristics of highway transport
2. To study the geometric design of highway.
3. To understand the traffic characteristics
4. To know the pavement materials and pavement design
5. To explaindifferent parts of railway track, their functions geometric design of railway.

Course Content:

UNIT-1:Introduction: Importance of transportation, Modes of transportation, characteristics of highway transport.

Highway development & planning: Road development and planning in India, Roads classification, patterns, Planning surveys, Highway alignment and surveys, Highway drainage.

UNIT- 2: Geometric Design: Cross Section elements, Sight Distance, Design of horizontal and vertical Alignment.

UNIT -3: Traffic Engineering: Traffic characteristics, studies such as volume, density, Speed, 'O' and 'D' and their uses, Traffic control devices and road accidents.

UNIT-4:Pavement Materials: Behaviour of highway materials, properties of Subgrade materials and pavement component materials. Tests on subgrade soil, aggregate and bitumen.

Pavement Design: Design of flexible pavements and rigid pavements

UNIT- 5: Railway Engineering: Components of Railway Engineering: Permanent way components, Railway Track Gauge, Cross Section of Permanent Way, Functions of various Components like Rails, Sleepers and Ballast, Rail Fastenings. Geometric Design of Railway Track: Alignment, Engineering Surveys, Gradients, Grade Compensation, Cant and Negative Super elevation, Cant Deficiency, Compensation On Curves

Text Books:

1. Principle and Practices of Highway Engineering – Kadiyali& Lab (Khanna Publishers, Delhi)
2. Highway Engineering – S. K. Khanna& C.E.G. Justo (Khanna Publishers, Delhi)
3. Highway Engineering – Rangawala S.C. (Charotar Publishers)
4. A textbook of Transportation Engineering – S.P. Chandola (S. Chand)
5. Transportation Engineering – A.K. Upadhyay (S.K. Kataria& Sons)

Reference Book:

MoRTH (2013). "Specifications for Road and Bridge Works". Indian Roads Congress, New Delhi.

Course Outcomes:

At the end of the course the studentsshall be able

CO1: To propose modes of transportation, transportation planning and survey.
CO2: To design cross section elements, sight distance, horizontal and vertical alignment.
CO3: To implement traffic studies, traffic regulations and carryout control and intersection designs.
CO4: To determine the properties of pavement materials and design flexible and rigid pavements as per IRC specification
CO5: To describe the components of Railway track, different Gauges and carryout geometric design.

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE205TPC12	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Soil Mechanics - I	3	0	0	15	15	30			

Course Learning Objectives:

The objective of this Course is:

1. To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification.
2. To familiarize the students about the fundamental concepts of compaction & flow through soils.
3. To impart knowledge to stress transformation and its distribution.
4. To develop the basic concept of shear strength of soils and its engineering aspects.
5. To learn about the significance of settlement of soils and calculations.

Course Content:

Unit 1: Introduction to Soil Mechanics and Geotechnical Engineering, Complexity of Soil Nature, Soil Formation and Soil Types. Index Properties of Soil: Basic Definitions, Phase Relationships, Classification of Soils-The Unified Soil Classification System and Indian Standard Soil Classification System, Soil Structure and Clay Minerals.

Unit 2: Soil Compaction: Definition and Compaction Theory, Laboratory Compaction Tests-Standard Proctor Compaction Test & Modified Compaction Test, Factors Affecting Compaction, Effect of Compaction on Engineering Properties of Soil , Field Compaction and Controls.Principle of Effective Stress, Capillarity and Permeability-Principle of Effective Stress, Capillarity in Soils, Effective Stress under Different Field Conditions, Seepage Pressure, Quick Sand Condition, Permeability, Darcy's Law, Determination of Permeability, Permeability of Stratified Soils, Absolute Co-efficient of Permeability, Factors Affecting Permeability , Seepage through Soils-Laplace's Equation, Flow Nets.

Unit 3: Vertical Stresses below Applied Loads: Stresses due to Applied Loads, Boussinesq and Westergaard Theories for Vertical Stresses under Concentrated Loads, Uniformly Loaded Circular and Rectangular Areas, Pressure Bulb, Variation of Vertical Stress under Point Load along the Vertical and Horizontal Planes, Newmark's influence chart.

Stability of Soil Slopes: Introduction, Types of Slope Failures, Slip Circle Method, Determination of Centre of Most Critical Slip Circle, Taylor's Stability Charts, Stabilization of Soil Slopes.

Unit 4: Shear Strength:Introduction, Stress at a Point and Mohr's Stress Circle, Normal and Shear Stresses on a Plane, Mohr-Coulomb Failure Criterion, Laboratory Tests for Shear Strength Determination, Shear Strength Parameters, Direct shear test, Triaxial shear test, Unconfined Compression Test and Vane Shear test, Shear Strength Characteristics of Normally Consolidated and Reconsolidated Clays, Factors Affecting Shear Strength.

Unit 5: Compressibility: Introduction to Compressibility, Consolidation, Effects of Soil Type, Stress History and Effective Stress on Compressibility , Factors Affecting Consolidation and Compressibility Parameters, Normally Consolidated and Over Consolidated Soils, Types of Consolidation, Terzaghi's Theory of 1-D Consolidation and Time Rate of Consolidation.

Text Books:

1. Basic and Applied Soil Mechanics by GopalRanjan and A.S.R. Rao, New Age Int.(P) Ltd., Pub., New Delhi.
2. Soil Mech. and Foundation Engg.Geotech. Engg. Series (PB 2018) by V. N. S. Murthy, CBS Pub., New Delhi.
3. Soil Mech. and Foundations by Dr.BC.Punmia, Ashok Kr. Jain &Arun Kr. Jain, Laxmi Pub. (P) Ltd, New Delhi.
4. Soil Mechanics by Robert V. Whitman & T. William Lambe, Wiley India Pvt Ltd. New Delhi.
5. Soil Mechanics and Foundation Engineering by Purushotama Raj, Pearson Publications, New Delhi.
6. Soil Mechanics and Foundation Engineering (Geotechnical Engineering) by Dr. P. N. Modi, Standard Book House (Rajsons Publications Pvt Ltd) New Delhi-110002.
7. Essentials of Soil Mechanics and Foundations by McCarthy, D.F. Prentice-Hall, 2006.
8. Geotechnical Engineering – Principles and Practices by Coduto, D.P. PHI.Pvt.Ltd. New Delhi, 2010.

Course Outcomes:

On completion of the course, the student is expected to be able

CO1: To identify various types of soils and its properties, formulate and solve engg. problems
CO2: To determine compaction as well as flow through soil medium and its impact in Engineering application.
CO3: To solve engineering problems by drawing stress diagramswith the understanding of stress distribution in loaded soil medium.
CO4: To calculate the shear strength of soils and use it forthe design of foundations.
CO5: To evaluate settlement due to consolidation of soil.

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE205TPC13	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Environmental Engineering - I	3	0	0	15	15	30			

Course Learning Objectives:

The objective of this course is

1. To learn the water sources, demand and water quantity estimations technique.
2. To know the water characterization, and various physical and chemical treatment techniques.
3. To learn the basics of water supply, purification and treatment
4. To learn filtration, coagulation and softening techniques & mechanism for water treatment and distribution systems.
5. To study air and noise pollution.

Course Content:

UNIT 1: Introduction: Necessity and importance of water supply schemes. Water demand: Classification of water demands, Estimation of quantity of water required by a town, per capita demand, factors affecting per capita demand, design period and population forecasting, variation in water demand. Sources of water supply. Surface sources and underground sources, Intake works, site selection, type of intake works.

UNIT 2: Quality of water: Common impurities, physical, chemical and biological characteristics of water, water quality standards for municipal and domestic supplies. Water Processing: Object of water processing, flow diagrams of typical ground water system and surface water systems. Sedimentation Theory of sedimentation, sedimentation tanks and its types, design parameters related with sedimentation tanks, sedimentation with coagulations, coagulants and coagulant aids, Jar test for determining coagulant dosage.

UNIT 3: Filtration: Theory of filtration, slow sand and rapid sand filters, Construction and operation. Disinfection, Methods of disinfection, Chlorination, Types of chlorination, Break Point chlorination.

UNIT 4: Softening: Methods of Softening, Iron Removal, Fluoridisation. Distribution System: Methods of distribution, layout of distribution system, methods of analysis, pressure in the distribution system, distribution reservoirs, functions and its types, storage capacity of distribution reservoir.

UNIT 5: Air Pollution: Introduction, causes, sources, characteristics, effects of air pollution on plants, humans, animals and materials and atmosphere, air pollution control methods and equipment. Noise Pollution: Definition, sources, effects of noise pollution on humans, animals and non-living things, methods of noise control.

Text Books:

1. Water Supply Engineering – S.K. Garg (Khanna Publication).
2. Water Supply Engineering – B.C. Punmia (Laxmi Publication, New Delhi)
3. Environmental Engineering – Peavy& Rowe (Tata McGraw Hill, New Delhi).
4. Water Supply and Sanitary Engineering – G.S. Birdi (DhanpatRai Publications).
5. Introduction to Environmental Science – Y. Anjaneyulu (B.S. Publications)
6. Environmental Science and Engineering – Henry and Heinke (Pearson Education)

Course Outcomes:

At the end of the course the students shall be able

CO1: To determine the various sources and demand of water, design period etc.
CO2: To propose the uses of pumps, calculate its capacities, costing, head loss, etc. and plan distribution systems.
CO3: To evaluate the characteristicof water quality and determine the influence of the different parameter in the design of water treatment plant (water quality parameters).
CO4: To describe and analyse sedimentation, coagulation, flocculation, filtration, disinfection and water softening.
CO5: To identify the air and noise pollution and implement its control methods.

DEPARTMENT OF CIVIL ENGINEERING B.TECH. THIRD YEAR SYLLABUS W.E.F 2022-23

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE205TPC14	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Estimation and Costing	3	0	0	15	15	30			

Course Objective
To introduce students to the
- Classify Basic concepts, techniques and applications of Estimation and costing.
- Understand how to prepare a detailed estimate for a residential building and calculate the Quantities for various items of work like roads canals etc.
- Analyse the rates for various items of work and to prepare an abstract estimate
- Identify the preparation of bar bending schedule for reinforcement works and create various Tender documents for bidding purpose.
- Understand valuation and standard specification in construction.

Course Content:
UNIT – 1:
General items of work in buildings–Standard units – Principles of working out quantities for detailed and abstract estimates – Approximate method of estimating. Detailed estimates of buildings.
UNIT – 2:
Earthwork for Roads and Canals
UNIT – 3:
Rate Analysis - working out data for various items of work over head and contingent charges.
UNIT – 4:
Reinforcement bar Bending and bar requirement schedule; Contracts – Types of Contracts – Contract Documents – Conditions of Contract
UNIT – 5:
Valuation of Buildings, Standard specifications for different items of building construction
TEXTBOOKS:
1. Estimating and Costing by B. N. Dutta, UBS publishers, (2000).
2. Estimating and Costing by G. S. Birdie.
REFERENCE BOOKS:
1. Standard schedule of rates and standard data book by public works department.
2. I.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. National building code

Course Outcomes:
After completing this course the student must demonstrate the knowledge and ability to:
CO1: Understand the preparation of an Abstract Estimate for a Residential Building and demonstrate knowledge of professional and ethical responsibilities and the impact of engineering solutions on the society and also be aware of contemporary issues.
CO2: Demonstrate the calculation of earth work quantity for roads and canals and evaluate the rates for various items of work.
CO3: Analyse the units for various quantities of items of work.
CO4: Design and Prepare Bar bending schedule for reinforcement works and understand how to prepare a Notice inviting tender document for bidding.
CO5: Evaluate the valuation of building and preparation of standard specifications for different items of building construction and create new technologies to develop concrete estimating methods for more ethical and enhanced usage.

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE205PPC04	L	T	P	CT-I	CT-II	TOTAL	20	50	1
Subject:	Transportation Engineering Lab	0	0	2	-	-	30			

Course Learning Objectives:
The objective of this course is

- To study the physical properties of road aggregate & their laboratory test.
- Determine the properties of bitumen.
- Determine the CBR value for subgrade soil.

Course Content:
Minimum 10 experiments to be performed

1. To determine the crushing value of the given aggregate sample.
2. To determine 10% finer value of the given aggregate sample.
3. To determine the abrasion value of the given aggregate sample by los angles apparatus.
4. To determine the impact value of the given aggregate sample.
5. To determine the elongation index of the given aggregate sample.
6. To determine the flakiness index of the given aggregate sample.
7. To determine the water absorption of the given coarse aggregate.
8. To determine the specific gravity of the given coarse aggregate.
9. To determine the penetration value of the given bitumen material.
10. To determine the softening point of the given bitumen material.
11. To determine the ductility of the given bitumen material.
12. To determine the viscosity of the given bitumen material
13. CBR Test

Course Outcomes:
At the end of the course the studentshall be able

CO1: To recognise the knowledge about different physical properties of aggregates by performing different test on road aggregates.
CO2: To determine the various properties of bitumen by performingvarious tests on it.
CO3: To compute the strength of subgrade soil by CBR test.

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE205PPC05	L	T	P	CT-I	CT-II	TOTAL	20	50	1
Subject:	Soil Mechanics Lab	0	0	2	-	-	30			

Course Learning Objectives:

The objective of this Course is:

- To learn the basic tests for classification of different soils.
- To conduct compaction tests for laboratory and in –situ.
- To learn the sampling of soil.

Course Content:

Minimum 10 experiments to be performed

Determination of Index Properties

1. To determine the specific gravity of soil sample by , a) Pycnometer Bottle Method., b) Density Bottle Method.
2. To determine the particle size distribution of a soil by a) by Mechanical Analysis/IS Sieve Method., b) by Hydrometer apparatus.
3. Liquid limit and Plastic limit Tests.
4. Shrinkage limit and Differential free swell test.

Determination of In -Situ Density and Compaction Characteristics

5. To determine the minimum moisture content (OMC) at maximum dry density (MDD) of soil by, a) Light weight Proctor Test, b) Heavy Weight Proctor Test.
6. To determine in situ dry density of soil by a) Core cutter method. b) Sand replacement method.

Determination of Engineering Properties- Part A

7. To determine the permeability of soil by a) Falling Head Methods, b) Constant Head Methods.
8. To determine the shear strength parameters a) Direct shear test in cohesionless soil., b) Unconfined compression test in cohesive soil

Determination of Engineering Properties- Part B

9. To determine the shear strength parameters for a) Tri-axial compression test in c-φ Soil (Demonstration only). b) One dimensional consolidation test (Determination of co-efficient of consolidation only), c) Laboratory vane shear test in cohesive soil.
10. California Bearing Ratio Test.

TextBooks:

1. Soil Engineering Laboratory Instruction Manual" published by Engineering College Co- operative Society, Anna University, Chennai, 2010.
2. "Saibaba Reddy, E. Ramasastri, K. "Measurement of Engineering Properties of Soils", New age International (P) limited publishers, New Delhi, 2008.
3. Lambe T.W., "Soil Testing for Engineers", John Wiley and Sons, New York, 1951. Digitized 2008.
4. IS Code of Practice (2720) Relevant Parts, as amended from time to time, Bureau of Indian Standards, New Delhi.
5. G.Venkatappa Rao and Gowtham .K. Potabla, "Geosynthetics Testing – A laboratory Manual", Sai Master Geoenvironmental Services Pvt. Ltd., 1st Edition 2008.
6. BrajaM.Das., "Soil Mechanics: Laboratory Manual", Oxford University Press, eighth edition, 2012

REFERENCES:

1. Basic and Applied Soil Mechanics by GopalRanjan and A.S.R. Rao, New Age International (P) Limited, Publishers, New Delhi-110002.
2. Soil Mechanics and Foundations by Dr. B. C. Punmia, Ashok Kr. Jain &Arun Kr. Jain, Laxmi Publications (P) Ltd, New Delhi-110002

Course Outcomes

On completion of the course, the student is expected to be able to:

CO1: Conduct tests to determine the index properties of soils
CO2: Determine the density and compaction characteristics in laboratory as well as in situ.
CO3: Conduct tests to find permeability and shear strength of soils (c & φ)
CO4: Understand various tests to find c & φ parameters, compressibility and CBR value.

(SEMESTER VI)

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE206TPC15	L	T	P	CT-I	CT-II	TOTAL	70	100	04
Subject:	Design of Steel Structures	3	1	0	15	15	30			

Course Learning Objectives:

The objective of this course is

1. To list mechanical properties of structural steel and outline general aspect of design philosophies.
2. To design and classify the use of steel fastener.
3. To determine tensile and compressive strength of structural steel member.
4. To understand design examples of Beam, Beam Column, Column Splices and Column Base
5. To introduce the design of eccentric connections, plate girders.

Course Content:

UNIT 1: Introduction: General, types of Steel, mechanical behaviour of steel, measures of Yielding, measures of Ductility, types of Structural system, Structural Steel Sections.Methods of Structural design: Introduction- Design Philosophies-Working Stress method-Ultimate Strength method-Load and Resistant factor- Limit State Method-Partial safety factor Load combinations-Classification of Cross sections- General aspects in the design.

UNIT 2: Design of Steel fasteners: Types of fasteners – Riveted connections- Bolted connections- Assumptions-Failure of bolted joints – Strength of bolted joints – Design examples – Design of Welded connections – Butt weld-fillet weld – Design examples.

UNIT 3: Design of Tension Members: General – Modes of Failure of Tension member- Analysis of Tension members- Example - Design steps – Design examples – Lug angles – Design.Design of Compression Members: General – Strength of Compression members- Design Compressive strength- Example on analysis of Compression members – Design of Angle struts – Design Examples- Built up Columns- Design of Lacing – Design of Battens-Design Examples- Design of Roof members.

UNIT 4: Design of Beams: General- Lateral Stability of Beams- Bending Strength of Beams – Plastic Section Modulus - Design Examples.Design of Beam Columns: Behaviour of members under combined loading – Modes of Failures – Design Examples.Design of Column Splices and Column Base: Design of Column Splice-Design Examples- Design of Column Base- Slab Base- Gusseted Base- Design Examples.

UNIT 5: Design of Eccentric Connections: Design of Brackets- Type-1 and Type 2 – Moment Resistant connections - Design Examples.Design of Plate Girder: General- Components of Plate Girder- Optimum depth – Bending Strength – Shear Strength – Shear Buckling- Simple Post critical method- Tension Field method- Stiffeners-Bearing-Transverse stiffeners - Design Examples.

Text Books:

1. Limit state Design of Steel Structures – S K Duggal.
2. Design of Steel structures: By Limit State Method– S. S. Bhavikatti.
3. Design of Steel Structures- K. S. Sai Ram
4. Design of Steel Structures-Limit States Method-N. Subramanian
5. Comprehensive Design of Steel Structures – Dr B.C.Punmia, Ashok Kr.Jain, Arun Kr. Jain
6. Design of Steel Structures- S. Ramamrutham
7. Fundamentals of Structural Steel Design – M. L. Gambhir
8. Limit state Design of Steel Structures – S Kanthimathinathan
9. Design of Steel Structure Volume-I- Ramchandra
10. Design of Steel Structure Volume-II- Ramchandra
11. Design and Analysis of Connections in Steel Structures-Fundamentals and examples-Alfredo Boracchini
12. IS-800:2007- Indian Standard- General Construction in Steel-Code of Pr., & Steel Tables

Course Outcomes:

At the end of the course the studentshall be able

CO1: Define mechanical properties of structural steel and Implement the limit state design philosophy.
CO2: Design/Evaluate the riveted, bolted and welded connection in steel structure.
CO3: Design/Evaluate tension and compression members
CO4: Design/Evaluatebeam and column element.
CO5: Design/Evaluatean eccentric connection and a plate girder.

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE206TPC16	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Environmental Engineering - II	3	0	0	15	15	30			

Course Learning Objectives:

The objective of this Course is

1. To help students develop the ability to apply basic understanding of physical, chemical, and biological phenomena in the sewage
2. To understand the concept successful design, operation and maintenance of sewage treatment plant
3. To study about the Aerobic Treatment units.
4. To learn about the Anaerobic Treatment units.
5. To study the various process performed with Municipal Solid Wastes.

Course Content:

UNIT 1: Objective, design period, Physical, Chemical and Biological characteristics. Waste water sampling, self-purification of natural streams, effluents Standards, Oxygen Sag Curve, sources of sewage. Design of sanitary sewers, minimum size of sewer, velocities in sewers and gradient of sewers. Sewer appurtenances viz. manholes, street inlets, flushing devices, Vent pipes etc.

UNIT 2: Waste Water primary Treatment: characteristics of wastewater. Effluent discharge standards, Primary, secondary and tertiary treatment of wastewater. Types of screens, design of screen chamber, sources of grit, design of grit chamber, disposal of grit, oil and grease removing skimming tanks, design of PST with inlet and outlet details, primary sludge and its disposal

UNIT 3: Aerobic Treatment UNITs: Biological principle of ASP, SVI, sludge bulking and control; biological principle of Trickling filter, re-circulation, operational troubles; Rotating biological contactor. Low cost treatment methods: Principle of Oxidation pond, symbiosis, principle of Aerated Lagoons, aeration method, Principle of Oxidation Ditches, sewage farming, ground water recharge.

UNIT- 4: Anaerobic Treatment UNITs: Septic tanks, biological Principle, method of treatment and disposal of tank effluent. Anaerobic digester, principle of anaerobic digestion, Stages of digestion, bio-gas production. Sludge disposal methods, advantages and disadvantages, Design of STP.

UNIT 5: Municipal Solid Wastes: Characteristics, generation, collection & transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment & disposal), environmental & health implications, disposal of solid waste by land filling, composting and incineration methods. Hazardous waste management, environmental and health implications due to Exposure, incineration, landfill disposal, site remediation, disposal of refuse by Composting.

TEXT BOOKS:

1. Environmental Engineering – Peavy& Rowe (Tata McGraw Hill, New Delhi).
2. Waste Water Engineering – S.K. Garg (Khanna Publication).
3. Manual on sewerage & sewage Treatment published by Ministry of UrbanDev. GOI,Ministry of Urban development
4. Waste Water Engineering – Metcalf Eddy (Tata McGraw Hill, New Delhi).
5. Hazardous Waste management: M.D. LaGrega, P.L. Buckingham, J.C.Evans
6. Manual on Municipal Solid Waste Management: CPHEEO (Ministry of Urban Dev.)
7. Environmental Engineering-II P.Venugopala Rao Tata McGraw Hill
8. Water andWastewater Technology ,Hammer (PHI)

Course Outcomes:

At the end of the course the studentshall be able

CO1: To understand the basic phenomenon of Sewage and sewerage.
CO2: To estimate waste water quantity and can design the sewerage system.
CO3: To understand basic methodology for wastewater treatment (screening, grit chambers, sedimentation, biological treatment and chemical treatment) and to understand various processes of Aerobic & Anaerobic treatment units.
CO4: To design unit operations specific to wastewater treatment and to control & monitor wastewater treatment facilities.
CO5: To understand solid & hazardous wastes management, waste processing options and design

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE206TPC17	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Water Resources Engineering -I	3	0	0	15	15	30			

Course Learning Objectives:

The objective of this Course is

1. To understand the need of Irrigation, types of irrigation systems and Methods of Irrigation.
2. To understand the Canal Irrigation systems and design of stable channels in alluvium.
3. To understand Water Logging and its Control.
4. To know the Riverbehaviour, control and training.
5. To know the Reservoir Planning, Hydrograph and Flood Routing and it principle.

Course Content:

UNIT 1: Introduction: Need for Irrigation, advantages and disadvantages of irrigation, types of irrigation systems – Flow irrigation, lift irrigation. Methods of Irrigation: Introduction, requirement of irrigation methods, surface and sub-surface irrigation. Water Requirement of crops: Introduction, water requirement of crop, crop season and crops of India, crop period and base period, delta, duty of water, relationship between delta, duty and base period, factors affecting duty.

UNIT 2: Canal Irrigation: Classification of canal, parts of canal irrigation system, canal alignment, typical canal cross section, command areas, losses in irrigation systems. Design of stable channels in alluvium. Introduction, Kennedy's silt theory, Lacey's Theory, Lacey's regime equations, Lacey's shock theory; Design of channels by Kennedy's and Lacey's theories, maintenance of irrigation channels.

UNIT 3: Water Logging and its Control. Causes and ill effects of water logging, prevention and control, reclamation of water logged lands, surface drainage. Design of Lined Channels. Introduction, benefits of lining, types of lining, economics of lining, procedure and design of lined canals.

UNIT 4: River behaviour, control and training. Objects, river characteristics, classification of river training works, methods of river training embankments, bank protection, cut-offs, meandering causes and parameters. Flood Control; Introduction, channel improvement, flood ways evacuation and flood plain zoning.

UNIT 5: Reservoir Planning: Introduction, type of reservoirs, investigation for reservoir planning, site selection criteria for reservoir, basic terms and definitions of reservoir, storage zones of a reservoir, mass curve and demand curve, determination of reservoir capacity, reservoir losses, reservoir sedimentation, factors affecting sedimentation, type of sediment load, life of reservoir, safe field. Applications of GIS in Reservoir Planning.

TEXT BOOKS:

1. Irrigation Engineering and Hydraulic Structures – S.K. Garg (Khanna Publications)
2. Irrigation Engineering – B.C. Punmia (Laxmi Publications)
3. Irrigation, Water Resources and Water Power Engineering – Dr. P.N. Modi (Standard Book House)
4. Theory and Design of Irrigation Structures (Volume – I & II) – Varshney (Nem Chand & Bros.)
5. Irrigation and Water resources Engineering – Asawa G.L. (New Age International Publications)
6. Fundamentals of Irrigation Engineering – Bharat Singh (Nem Chand & Bros)
7. Water Resources Engineering Larry -W. Mays (Wiley, John & Sons)

Course Outcomes:

At the end of the course the studentshall be able

CO1: To describe about the types of Irrigation systems, and methods of irrigation.
CO2: To design irrigation canals and canal network
CO3: To propose solutions regarding water logging and drainage.
CO4: To plan and design river training works and flood control of river.
CO5: To evaluate the capacity of reservoir and use Flood Routing principle for Reservoir Planning.

DEPARTMENT OF CIVIL ENGINEERING B.TECH. THIRD YEAR SYLLABUS W.E.F 2022-23

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE206TPC18	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Soil Mechanics - II	3	0	0	15	15	30			

Course Learning Objectives:

1. To impart knowledge of site investigation programme and to design samplers to obtain different soil samples.
2. To learn the basic concept of earth pressure & different theories of calculation of earth pressure.
3. To familiarize the students for the geotechnical design of different type of foundations and calculate the bearing capacity of soils.
4. To impart knowledge about deep foundations and it group efficiency of pile foundations.
5. To impart basic knowledge of well foundations.

Course Content:

Unit 1: Soil Exploration: Introduction, Different Phases of Soil Explorations, Methods of Subsurface Exploration-Trail Pits, Boring Methods, Sounding Test and Geophysical Explorations, Samples and Samplers, Soil Exploration Reports and Bore Log.

Unit 2:Earth Pressures: Introduction, Effect of Wall Movement on Earth Pressure, Earth Pressure at Rest, Rankine's Earth Pressure Theory and its Limitations, Coulomb's Theory of Earth Pressure, Culmann's Graphical Method, Additional Earth Pressure due to Surcharge.

Unit 3: Shallow foundations: Types of shallow foundations and choice, basic requirements, significance of these foundations. Bearing capacity of foundation: Introduction, Bearing Capacity and its Different Forms, Modes of Shear Failure, Evaluation of Bearing Capacity- Prandtl's Method, Terzaghi's Bearing Capacity, Skempton's Method, Meyerhof's Method ,Hansen's and Vesic's Assumptions and IS Code Recommendations, Estimation of Bearing Capacity Based on Field Methods-Standard Penetration Test, Static Penetrations Test and Plate Load Test, Settlement of Shallow Foundations.

Unit 4: **Pile Foundations**: Introduction, Classifications of Piles, Cast in Situ Pile Construction, Selection of Pile Type, and Pile Load Capacity in Compression- Static Pile Load Formulae, Pile Load Test, Dynamic Pile Formulae, Group Action of Piles, Negative Skin Friction, Group Efficiency of Piles and Settlements.

Unit 5:**Well Foundation**: Introduction, Types of Well or Caissons, Components of Well Foundation, Shapes of Wells, Depth of Well Foundation, Forces Acting on Well Foundation, Construction and Sinking of a Well.

Text Books:

1. Basic and Applied Soil Mechanics by GopalRanjan and A.S.R. Rao, New Age International (P) Limited, Publishers, New Delhi-110002.
2. Textbook of Soil Mechanics and Foundation Engineering Geotechnical Engineering Series (PB 2018) by V. N. S. Murthy , CBS Publication, New Delhi.
3. Soil Mechanics and Foundations by Dr. B. C. Punmia, Ashok Kr. Jain &Arun Kr. Jain, Laxmi Publications (P) Ltd, New Delhi-110002.
4. Foundation Engineering by B. C. Chattopadhay&JoyanataMaity,PHI Learning Private Limited, Delhi-110092.
5. Soil Mechanics by Robert V. Whitman & T. William Lambe, Wiley India Pvt Ltd. New Delhi.
6. Soil Mechanics And Foundation Engineering byP.Purushotama Raj, Pearson Publications, New Delhi.
7. Geotechnical Engineering by B. M. Das, Bharat Singh, SamsherAlam.
8. Soil Mechanics and Foundation Engineering (Geotechnical Engineering) by Dr. P. N. Modi, Standard Book House (Rajsons Publications Pvt Ltd) New Delhi-110002 .

Course Outcomes:

On completion of the course, the student is expected to be able

CO1: To demonstrate an ability to plan of site investigation to select geotechnical design parameters and type of foundation.
CO2: To demonstrate an ability to calculate earth pressure on retaining walls.
CO3: To demonstrate an ability to design shallow foundations (combined footings and raft footings), its component or process as per the needs and specifications.
CO4: To demonstrate an ability to find group efficiency of pile foundations.
CO5: To evaluate well foundations and its sinking problems.

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE206TPE01A	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Structural Analysis by Matrix Methods	3	0	0	15	15	30			

Course Learning Objectives:

The objective of this course is

1. To understand the flexibility and stiffness matrices and their relationship between them
2. To understand the analysis of continuous beams by force (flexibility) and displacement (stiffness) methods
3. To understand the analysis of rigid and pin jointed plane frames by force and displacement methods
4. To differentiate the force and displacement methods

Course Content:

UNIT-1: Staticindeterminacy, kinematic indeterminacy;Matrix concepts and Matrix analysis of structures: Flexibility and Stiffness; Flexibility Matrix; Stiffness matrix; Relationship between Flexibility matrix and Stiffness matrix; Force displacement methods;Indeterminate Beams: Introduction; Analysis of indeterminate beams by flexibility and stiffness methods; Comparison of flexibility and stiffness methods;

UNIT-2: Rigid Joint Plane Frames: Introduction; Static indeterminacy; Analysis of rigid joint plane frames by flexibility method.

Unit-3: Rigid Joint Plane Frames: Introduction; Kinematic indeterminacy; Analysis of rigid joint plane frames by Stiffness matrix method.

UNIT-4: Pin-jointed Plane Frames (Trusses): Introduction; Static indeterminacy of pin joint truss; Analysis of pin joint plane frames (trusses) by flexibility method.

Unit-5: Introduction; Kinematic indeterminacy of a Pin-jointed plane frame; Analysis of pin joint plane frames (trusses) by stiffness method.

Text Books:

1. DevdasMenon, "Advanced Structural Analysis", Narosa Publishing House, 2009
2. AslamKassimali, "Matrix Analysis of Structures", Brooks/Cole Publishing Co., USA, 1999.
3. Weaver W. and Gere J. M., "Matrix Analysis of Framed Structure", CBS Publishers, Delhi.
4. Amin Ghali, Adam M Neville and Tom G Brown, "Structural Analysis: A Unified Classical and Matrix Approach", Sixth Edition, 2007, Chapman & Hall.
5. DevdasMenon, "Structural Analysis", Narosa Publishing House, 2008.
6. McGuire, W., Gallagher R. H. &Ziemian, R. D. "Matrix structure analysis", John Willey Publication
7. G S Pandit& S P gupta, "Structural Analysis-A Matrix Approach"

Course Outcomes:

At the end of the course the studentshall be able

CO1: To develop stiffness and flexibility matrix for prismatic members and analyses the indeterminate beams using the flexibility and the stiffness methods.
CO2: To apply and analyses the rigid joint plane frames by using the flexibility matrix method
CO3: To analyse the rigid joint plane frames using the stiffness matrix method
CO4: To compute the member forces in a plane truss using the flexibility matrix method.
CO5: To do the analysis of trusses by applying the stiffness matrix method

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE206TPE01B	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Advanced Surveying	3	0	0	15	15	30			

Course Learning Objectives:

The objective of this Course is

1. To understand about concepts of Astronomical Surveying.
2. To know the applications of cadastral surveying in different projects.
3. To be capable to compute the accuracy of observations made.
4. To learn the theory of triangulations surveying.
5. To learn about various advanced equipment of surveying

Course Content:

UNIT 1: Triangulation and Baseline Measurements: Triangulation figures or systems, station marks, signals, towers, baseline measurement by rigid bars, flexible apparatus, problems, satellite station and reduction to centre.

UNIT 2: Theory of Errors: Types and sources of errors, theory of least squares, method of weights, method of correlates, angle and station adjustment, figure adjustment. Land Surveys: Layouts, measurements.

UNIT 3: Aerial photogrammetry : Introduction, Principle, Uses, Aerial camera, Aerial 6 10 photographs, Definitions, Scale of vertical and tilted photograph., Ground Co-ordinates, Displacements and errors, Ground control, Procedure of aerial survey, Photomaps and mosaics, Stereoscopes, Parallax bar.

UNIT 4: Field Astronomy: Introduction, purposes, astronomical terms, determination of azimuth, latitude, longitude and time corrections to the observations.

UNIT 5: Remote Sensing Introduction, Principles of energy interaction in atmosphere and earth surface features, Image interpretation techniques, visual interpretation, Digital image processing, Global Positioning system.

Geographical Information System Definition of GIS, Key Components of GIS, Functions of GIS, Spatial data, spatial information system Geospatial analysis, Integration of Remote sensing and GIS and Applications in Civil Engineering.

Text Books:

1. Borden D. Dent, Jeffrey Torguson, Thomas W. Hodler, Cartography: Thematic Map Design, McGraw-Hill Higher Education, 2008.
2. Gopi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson Education India, 2007.
3. Hoffman.B, H.Lichtenegga and J.Collins, Global Positioning System - Theory and Practice, Springer -Verlag Publishers, 2001.
4. Punmia B. C, Ashok K. Jain, Arun K. Jain, Higher Surveying, Laxmi Publications, 2005.
5. Surveying Vol. I, II and III by Dr. B.C. Punmia, Laxmi Publishers, New Delhi
6. Surveying and Levelling Vol. I and II by T.P Kanetkar and S.V Kulkarni, Pune VidhyarthiGruh
7. Surveying Vol. I, II and III by Dr. K.R. Arora, Standard Book House, New Delhi
8. Surveying Vol. I and II by S. K. Duggal, Tata Mcgraw Hill, New Delhi
9. Surveying and Levelling by N.N. Basak, Tata Mcgraw Hill, New Delhi
10. Surveying and Levelling by R. Agor, Khanna Publishers, New Delhi
11. Advanced Surveying by R. Agor, Khanna Publishers, New Delhi
12. Fundamentals of Surveying by Roy, S.K., Prentice Hall India, New Delhi
13. Surveying and Leveling by Subramanian, R., Oxford University Press, New Delhi
14. Remote Sensing and GIS by B Bhatia, Oxford University Press, New Delhi.
15. Remote sensing and Image interpretation by T.M Lillesand,. R.W Kiefer,. and J.W Chipman, 5th edition, John Wiley and Sons India
16. Surveying theory and practice 7th Edition by James M Anderson and Edward M Mikhail Tata McGraw Hill Publication.

Course Outcomes:

At the end of the course the students shall be able

CO1: To implement the concept of triangulation surveying used in geodetic surveying.
CO2: To adopt the concept of Field Astronomykeeping in view its importance.
CO3: To use Remote sensing & GIS in advance methods of surveying.
CO4: To apply the corrections in observations knowing the theory of errors.
CO5: To analyse aerial photographs for the calculation of various surveying parameters.

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE206TPE01C	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Advanced Concrete Design	3	0	0	15	15	30			

Course Learning Objectives:

The objective of this course is

1. To understand the design procedures for combined footings.
2. To study the design of retaining walls
3. To know the design of different types of water tanks
4. To learn the design of flat slabs
5. To know the design of RCC chimneys

Course Content:

UNIT 1: Combined Footings: Simple Rectangular, trapezoidal footings (with and without central beam); Strap footing; raft foundation.

UNIT 2: Types of retaining walls; Cantilever Retaining wall design; Counterfort retaining wall (demonstration only)

UNIT 3: Water tanks resting on ground; Intze type water tank design.

UNIT 4: Large span concrete roofs, Introduction– classification- behaviour of flat slabs - direct design and equivalent frame method- Codal provisions - waffle slabs.

UNIT-5: Chimneys, analysis of stresses in concrete chimneys- uncracked and cracked sections- Codal provisions- design of chimney.

Text Books:

1. Purushothaman, P., Reinforced Concrete Structural Elements-, Tata McGraw Hill, 1986
2. Ashok K Jain, Reinforced Concrete –Nem Chand Bros. Roorkee , 1998
3. Jain and Jaikrishna, Plain and Reinforced Concrete – Vol I and II Nem Chand Bros., Roorkee, 2000.
4. Taylor C Pere, Reinforced Concrete Chimneys, Concrete publications, 1960
5. Design of deep girders, Concrete Association of India, 1960
6. Advanced Reinforced Concrete Design by N Krishna Raju
7. Mallick and Gupta, Reinforced Concrete, - Oxford and IBH, 1982
8. BIS codes (IS 456 , IS 2210, IS 4998, IS 3370, SP 16, SP 24, SP 34).
9. IRC Codes (IRC 5, IRC 6, IRC 21)
10. Reinforced Concrete Design by DevdasMenon and S U Pillai.

Course Outcomes:

At the end of the course the studentshall be able

CO1: To design different types of combined footings
CO2: To design cantilever retaining wall
CO3: To design Water tanks resting on ground and Intze tank with staging and foundation
CO4: To design flat slabs
CO5: To design RCC chimneys

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE206TPE01D	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Construction Engineering Materials	3	0	0	15	15	30			

Course Learning Objectives:

1. To introduce various construction materials on the basis of various classifications.
2. To understand about various mortar making materials & its classification.
3. To understand the emerging role of using polymers as construction material.
4. To introduce about various modern construction materials.

Course Content:

UNIT-1: Construction Materials

Classifications of Construction Materials. Consideration of physical, Mechanical, thermo-physical Properties, characteristics behaviour under stress, Selection criteria for construction materials, green building materials.

UNIT–2: Materials for making Mortar and concrete

Lime manufacture, properties, hardening of lime, types of lime, lime concrete uses. Cement, pozzolanic material, aggregates, water, admixtures - characteristics, properties and uses. Types of mortars, special mortars, their properties and applications.

UNIT-3: Polymers in civil engineering

Rubber and plastics, properties, effect of temperature on mechanical properties. Uses and application. Polymers, fibres and composites, Fibre reinforced plastic. Architectural use and aesthetics of composites. Adhesives and sealants. Structural elastomeric bearings and resilient seating. Moisture barriers, Polymer foams and polymers in Building Physics. Polymer concrete composites

UNIT- 4: Metals & Ceramics

Types of structural steels, special steel, alloy steel, stainless steel, light gauge steel, Corrosion of concrete and reinforcing steel in various environments. Ceramic Materials: Classification, Refractories, glass, glass wool, mechanical, thermal and electrical properties, fire resistance materials, Uses and application.

UNIT-V: Modern Materials

Glass – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fibre textiles– Geo-membranes and Geo-textiles for earth reinforcement.

Text Books:

1. Rangwala S.C. Engineering Materials Charter Publications 1991.
2. S.K. Duggal Building Materials, New Age International Publications 2006.
3. Brumley L.R Building Materials Technology Structural Performance & Environmental Impact McGraw Hill Inc 1995.
4. R.Chudley Construction Technology, Vol I - IV Longman Group Construction Ltd. 1973.

Course Outcomes-On completion of this course the student will be able:

CO1: To distinguish and applyvarious construction materialsas per their physical, mechanical, thermo-physical properties.
CO2: To analyse various materials and use in civil engineering applicationsas per their composition, microstructure, and engineering behaviour.
CO3: To develop mortar and concrete from the required ingredients materials.
CO4: To use polymers required for civil engineering applications.
CO5: To adopt steel, concrete, ceramics, glass, refractories, composites, geotextiles, as per their properties and requirement.

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE206TPE01E	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Basics of Computational Hydraulics	3	0	0	15	15	30			

Course Learning Objectives:

The objective of this Course is to

1. Provide knowledge on application of computational fluid mechanics to different Civil of engineering problems.
2. Provide knowledge on conservation law and the numerical approach to solve by converting different form of partial differential equations.
3. Provide some experience in the software engineering skills associated with the implementation of MATLAB computer programming and use of Computational Fluid Dynamics (CFD)software.
4. To study the analysis of Open Channel Flow
5. To learn about water surface profiles.

Course Content:

Unit1: Introduction, significance of computational hydraulics, discrete forms of the laws of conservation of mass, momentum and energy,examples of free surface flows.

Unit2: Continuous forms of the conservation laws, lateral inflow's 1-D expansions and contractions, homogeneous and stratified fluid flows.

Unit3: Introduction to computer programming and computation with MATLAB and using of Computational Fluid Dynamics (CFD)software.

Unit4: Pipe flow analysis, Open channel flow: Types of Open Channel Flow, Estimation of normal and critical depth, uniform flow computations

Unit5: Computation of water surface profile (WSP) gradually varied flow estimation using direct step methods.

Text Books:

1. SreenivasJayasri,Computational Fluid Dynamics for Engineers and Scientists, Springer, 2018.
2. J.D. Hoffman, Numerical Methods for Engineers and Scientists, CRC Press, Special Indian Edition, 2011.
3. K. A Hoffmann, Computational Fluid Dynamics, Engineering Education System, 2000.
4. M.H. Choudhary, Applied Hydraulic Transients, Van Nostrand Reinhold, New York, 1997.
5. M.B. Abbot & A.W. Minns, Computational Hydraulics, Ashgate Publication, 1994.
6. J.D. Anderson, Computational Fluid Dynamics, McGraw Hill, 1995.
7. C.B. Vreugdenhill, Computational Hydraulics: An Introduction, Springer-Verlag, Berlin, 1989.
8. M.B. Abbott & J.A. Gunga, Engineering Applications of Computational Hydraulics –Pitman Books Ltd., 1982.

Course Outcomes:

At the end of the course the students shall be able

CO1: To evaluate the governing equations based on conservation principals in fluid flow problems,
CO2: To apply finite difference method to the fluid flow problems.
CO3: To evaluate the output from numerical method as compared to the observed data
CO4: To analyse and model fluid dynamics using Matlab andCFD software.
CO5: To apply the computational methods in open channel flow.

SYLLABUS	(SEMESTER-VI)							
Subject Code:	CE206TOE01	CREDITS:3			SESSIONAL - TA			ESE
Subject:	Open Elective	L	T	P	CT-I	CT-II	TOTAL	
		3	-	-	15	15	30	70
CE06TOE01		Metro Systems and Engineering						

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE206TOE01	L	T	P	CT-I	CT-II	TOTAL			
Subject:	Metro Systems and Engineering	3	0	0	15	15	30	70	100	03

Course Learning Objectives:

1. To introduce concepts of different types of mode of transportation and associated facilities.
2. To understand the concept of urban transport scenario, traffic characteristics and transport development.
3. To study the Intelligence Transport System
4. To understand ITS user services and its components.
5. To understand the approach and utility of Environmental Impact Assessment for the urban infrastructural measures.

Course Content:

Unit 1: Modes of Transportation:Transportation parameters- Traffic and Transport Problems of a city, Mass transport system, Modes of transportation & characteristics, Public transport system, public private transport system, Advantages and disadvantages of Public transport system. Role of transportation in mass transportation, advanced modes.

Transportation Infrastructure- Green bays, control stations, mitigation buildings, separator lanes and safety islands.

Unit 2: Urban Public Transport SystemRapid transit systems: BRTS, Bus Lane system, Advantages and limitations in Indian Scenario, Rail System. Types of rail system, advantages and disadvantages of rail system, sky walk and under bridge and its advantages. Advances in infrastructure.Urban Pedestrian Safety- Skyways, Intersection subways, halt stations, crossing measures, flexibility in accessibility.

Unit 3: ITS Background and Telemetric systems:Definitions, features and objectives of ITS, History of ITS and its development over the world, telemetric concept, transport telemetric, telemetric structure, ITS taxonomy, ITS application areas, uses, and application overview; ITS implication through AI, ITS based regression models.

Unit 4:ITS components, tools and strategies:Components of user services; advanced traffic management system, advanced traveller information systems, advanced vehicle control system, commercial vehicle operational management, advanced public transportation system, electronic payment system, advanced rural transportation, security and safety systems, urban traffic control, benefits and limitations, traffic calming systems, freight management by ITS.

Unit 5: Environmental ImpactAssessment: Description of proposed activity, structural audits, analysis of site selection procedure, baseline conditions / major concerns, green building and its advantages, description of potential positive and negative environmental, social, economic and cultural impacts including cumulative, regional, temporal and spatial considerations, significance of mitigation plans and monitoring plans (impacts and mitigation efforts)

Text Books:

1. Kadialy L.R.," Traffic Engg. and Transport Planning", 8thedition, Khanna Publishers, 2011.
2. O. Flaherty C.A., "Traffic Engineering and Transport Planning", 2006.
3. AUSTROADS, The Implication of Intelligent Transport Systems for Road Safety, Austroads Incorporated, 1999.
4. Bob Williams, Intelligent Transport Systems Standards, Artech House Publishers, 2008.
5. Chowdhury, M. A. and Sadek, A. Fundamentals of Intelligent Transp. Sys. Planning, Artech House, 2003.
6. E. Bekiaris and Y.J. Nakanishi, Economic Impacts of Intelligent Transportation Systems: Innovations and Case Studies, Elsevier/JAI, 2004.
7. IET Intelligent Transport Systems and 15th International IEEE Conference on Intelligent Transportation Systems (ITSC), 16-19 September, 2012. (http://digital-library.theiet.org/content/journals/iet-its)
8. J.M. Sussman, Perspectives on Intelligent Transportation Systems (ITS), Springer, 2005
9. L. Vlacic, M. Parent, F. Harashima, Intelligent Vehicle Tech. – Theory and Appl., Butterworth-Heinemann, 2010.
10. M.A. Chowdhury and A. Sadek, Fundamentals of Intelligent Transport. Systems Planning, Artech House, 2010.

DEPARTMENT OF CIVIL ENGINEERING B.TECH. THIRD YEAR SYLLABUS W.E.F 2022-23

11. R. Stough, Intelligent Transport Systems: Cases and Policies, Edward Elgar, 2001, Artificial Intelligence and Intelligent Transportation Systems, National Academy Press, 2010.
12. Gonzalez R. C. and Woods R. C., "Digital Image Processing", 2nd Ed., Pearson Education, 2007.
13. Jain A. K, "Fundamentals of Digital Image Processing", Prentice Hall, 2007.
14. R.R. Barthwal "Environmental Impact Assessment" New Age International, January 2012.
15. A.R. Gajbhiye& S.R. Khandelwal N.S. Raman, "Environmental Impact Assessment", I.K. International, 2014

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

CO1: To implement the concept of urban transport scenario, traffic characteristics and transport development.
CO2: To adopt the concepts of different mode of transportation and associated facilitieswith advanced system.
CO3: To Identify and differentiate ITS user services and its components.
CO4: To plan and design appropriate ITS technology to solve real-life traffic problems.
CO5: To propose the mitigation plan for the EIA for the urban infrastructure.

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)	ESE	Grand Total	Credits
Subject Code:	CE206PPC06	L	T	P	IA	20	50	1
Subject:	Environmental Engineering Lab	0	0	2	30			

Course Learning Objectives:

The objective of this Course is

1. To understand about the equipment used to conduct the test procedures and Perform the experiments in the lab.
2. To determine the physical, chemical and biological characteristics of water and waste water through practical tests.
3. To determine optimum dosage of coagulant and other critical tests to find the quality of water.
4. To examine and Estimate water, waste water and create Develop a report on the quality aspect of the environment.
5. To compare the water with prescribed standards set by the local governments.

Course Content:

1. Determination of the following Parameters in the given Water Sample:
2. Turbidity by Nephelometer.
3. TDS and fixed solids by Gravimetric method.
4. pH using pH-meter.
5. Carbonate, Bi-Carbonate & Hydroxide Alkalinity.
6. Dissolved Oxygen [DO] using DO meter.
7. Concentration of Chlorides.
8. Optimum coagulant dose for coagulation by Jar test apparatus.
9. Chlorine Demand of Water.
10. Total Hardness and Calcium Hardness.
11. Study of Weather Monitoring Station.
12. Study of Sound Level Meter.

Course Outcomes

Students will be able:

CO1: To know about the equipment used to conduct the test procedures and perform the experiments in the lab.
CO2: To determine the physical, chemical and biological characteristics of water and waste water through practical tests.
CO3: To determine optimum dosage of coagulant and other critical tests to find the quality of water.
CO4: To Examine and Estimate water, wastewater and create Develop a report on the quality aspect of the environment.
CO5: To compare the water with prescribed standards set by the local governments.

DEPARTMENT OF CIVIL ENGINEERING B.TECH. THIRD YEAR SYLLABUS W.E.F 2022-23

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE206PPC07	L	T	P	CT-I	CT-II	TOTAL	20	50	1
Subject:	Computer Applications in Civil Engg. Lab	0	0	2	-	-	30			

Course Learning Objectives:

The objective of this Course is

1. To understand the need for software tools for analysis and design of Civil Engineering Structures.
2. To use the software tools for Modelling, Analysis and Design of Civil Engineering Structures

Course Content:

Minimum 10 problems to be solved either by using STAAD Pro/Excel Programming

USING MS EXCEL Programs

1. Analysis of simple beams
2. Design of simply supported RCC beams
3. Design of columns
4. Design of isolated footing (Flat, stepped and sloped)
5. Design of combined footings
6. Design of cantilever retaining walls
7. Design of slabs (one way and Two way)

USING STAAD Pro

8. Analysis of simple beams and Frames (2-D)
9. Analysis of multi storey frames for DL and LL
10. Analysis of multi storey frames for DL, LL, WL/EQL
11. Design of structural elements
12. Analysis and design of combined footing
13. Analysis and design of roof truss
14. Analysis of simple beams for rolling loads

Course Outcomes

At the end of the course the studentsshall be able

CO1: To analyse 2D and 3D frames using MS EXCEL
CO2: To design RCC beams, columns, footing, cantilever retaining walls and slabs using MS EXCEL
CO3: To analyse beams and frames (2-D),multi storey frames for DL, LL, WL/EQL using STAAD Pro
CO4: To design various RCC components of buildings using STAAD Pro
CO5: To analyse and design roof truss and simple beams for rolling loads using STAAD Pro

SEMESTER VII

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPC19	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Pre-stressed Concrete	3	0	0	15	15	30			

Course Learning Objectives:

- To introduce fundamental of pre stressing and develop understanding of pre stressing system.
- To determine loss of pre stress in pre tensioned and post tensioned members as per IS Code provision.
- To analyze simple and composite section in flexure.
- To evaluate deflection in beam and design simply supported beams as per IS Code provision.
- To design the members for shear reinforcement, Ultimate Shear Strength and end block design.

Course Content:

UNIT 1:Introduction: Fundamentals of Prestressing - Classification and types of Prestressing- Concrete Strength and strain characteristics - Steel mechanical properties - Auxiliary Materials like duct formers.

UNIT 2: Prestressing Systems: Principles of pretensioning and post tensioning - study of common systems of prestressing for wires strands and bars. Losses of Prestress: Losses of prestress in pre tensioned and post tensioned members - I.S. code provisions.

UNIT 3: Analysis of Sections: In flexure, simple sections in flexure, kern distance - cable profile - limiting zones - composite sections cracking moment of rectangular sections.

UNIT 4:Deflection of Beams: Long term and Short term deflectionand Design of Simply Supported Beams, Allowable stress as per I.S. 1343 - elastic design of rectangular and I-sections.

UNIT 5: Shear and Bond: Shear and bond is prestressed concrete beams - conventional design of shear reinforcement - Ultimate shear strength of a section - Prestress transfer in pretensioned beams-Principles of end block design.

Text Books:

1. Krishna Raju. N "Prestressed Concrete", Tata Mc Graw Hill.
2. Lin.T.Y, "Prestressed concrete", Mc Graw Hill Pub. Co.
3. Rajagopalan, "Prestressed concrete", Narosa Publishing House.

Course Outcomes:-

On completion of this course the student will be able

CO1: Describe mechanical properties of pre stressed concrete, types of pre stressing and its system.

CO2: Calculate losses in pre-tensioned and post tensioned members.

CO3: Analyze pre-stressed concrete members for flexure, shear and cracking moment.

CO4: Design pre stressed concrete beams of rectangular and I section and compute deflection.

CO5: Explain principle of end block design, pre stress transfer, shear and bond.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPC20	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Water Resources Engineering-II	3	0	0	15	15	30			

Course Learning Objectives:

- Introduce the types of dams and its failure criteria for structural stability
- Introduce the concepts of spillways and energy dissipaters
- Discuss the concept of diversion Head-works and understand design theory of seepage flow
- Introduce the concepts of regulation works, falls and hydraulic gates of spillways
- Know the concepts and design principles of Cross Drainage Works

Course Content:

UNIT 1: Dams: Types of Dams, Forces, failure of dams and criteria for structural stability, principle and shear stress, stability analysis, Elementary profile of a gravity dam, Profile from practical considerations, Openings in dams.

UNIT 2: Spillways and Energy Dissipaters: Introduction, essential requirements of a spillway, spillway capacity, components, Types of spillways, Ogee Spillway, Energy Dissipation below spillways, Types of Energy dissipater, USBR and Indian stilling basins.

UNIT 3: Diversion Head-works: Introduction, Types of diversion works, location and components, Weir and Barrage, Effect of construction of weir on the river regime, Bligh's creep theory, Theory of seepage flow, Khosla's theory, Vertical drop Weir.

UNIT 4: Regulation Works: Introduction, Definition of falls, necessity and location of falls, comparative study of the main types of falls. Hydraulic Gates: Spillway gates, types, tainter gates, Roller gates.

UNIT 5: Cross Drainage Works: Introduction, suitability, various types of C-D Works, Design principles of C-D Works

Text Books:

1. Irrigation Engineering and Hydraulic Structures – S.K. Garg (Khanna Publications)
2. Irrigation Engineering – B.C. Punmia (Laxmi Publications)
3. Irrigation, Water Resources and Water Power Engineering – Dr. P.N. Modi (Standard Book House)

Course Outcome

On completion of this course the student will be able:

CO1: Explain the various forces acting on gravity dam and its stability analysis

CO2: Design of ogee spillway and getting concept of energy dissipation

CO3: Explain the diversion head-works and the theory of seepage flow

CO4: Demonstrate the concept of regulation works, falls and spillways gates

CO5: Apply the basic design principles of Cross Drainage Works

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPE02A	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Environmental Geo-technology	3	0	0	15	15	30			

Course Learning Objectives:

- Learning various soil engineering for land reclamation purposes, conversion of degraded waste land in new land use.
- Understanding land degradation and soil pollution and their restoration.
- Integration of engineering techniques with ecological process for restoration of productivity.

Course Content:

UNIT-1 Soil and ground water pollutants - their sources, nature, composition and polluting effects. The physico-chemical aspects of soils contaminated by various pollutants. Effects of environment and wastes on the properties of soils.
UNIT–2 Solid and liquid wastes disposal method and management. land treatment systems.
UNIT-3 Man made changes in geotechnical environment - mining, embankments, pumping, reservoir, land fills and reclamation effects and control.
UNIT- 4 Control of contamination with use of clay barriers, geosynthetics, cut-off walls, leachate collection systems.
UNIT- 5Stabilization - different materials and techniques in control of ground pollution and treatment.
Text Books:

1. D.E.Daniel, Geotechnical Practice for Waste Disposal, Chaman & Hall, London, 1993
2. Hsai_Yang Fang and Daniels, J.L. Introductory Geotechnical Engineering an Environmental Perspective, Taylor & Francis, Oxon., 2006.
3. Lakshmi N. Reddy, Hilary. I. Inyang – Geo-Environmental Engineering – Principles and Applications – Makcel Dekker Ink, 2000
4. Mitchell, J.K. and Soga, K., Fundamentals of Soil Behaviour, John Wiley & Sons, Inc., New Jersey., 2005.
5. Mohamed, A.M.O. and Antia, H.E., Geo-environmental Engineering, Elsevier, Netherlands, 1998.
6. Reddy, L.N. and Inyang. H. I., Geo-environmental Engineering –Principles and Applications, Marcel Dekker, Inc., New York., 2000.
7. Yong, R. N., Geo-environmental Engineering: Contaminated Soils, Pollutant Fate and Mitigation", CRC press LLC, Florida., 2001.

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

CO1: Understanding causes of soil pollution.

CO2: Understand the fundamentals of soil behavior under varied environmental conditions.

CO3: Identify contaminant transport mechanisms in soils.

CO4: Specify site investigation techniques in the characterization of the contaminated site

CO5: Understand remediation techniques to reclaim degraded land for conversion in to various land uses.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPE02B	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Air and Noise Pollution and Control	3	0	0	15	15	30			

Course Learning Objectives:

- To comprehend the essential concepts of Air and Noise pollution Learning
- To understand, measure and evaluate the character &behaviour of air and noise pollutants
- To understand the measurement techniques and strategies to control their presence in the ambient atmosphere.

Course Content:

Unit I: Air pollution: composition and structure of atmosphere, global implications of air pollution. classification of air pollutants: particulates, hydrocarbon, carbon monoxide, oxides of sulphur, oxides of nitrogen and photochemical oxidants. Indoor air pollution. Effects of air pollutants on humans, animals, property and plants.

Unit II: Air pollution chemistry, meteorological aspects of air pollution dispersion; temperature lapse rate and stability, wind velocity and turbulence, plume behaviour, dispersion of air pollutants, the Gaussian Plume Model, stack height and dispersion.

Unit III: Ambient air quality and standards, air sampling and measurements; Ambient air sampling, collection of gaseous air pollutants, collection of particulate air pollutants, stack sampling. Control devices for particulate contaminants: gravitational settling chambers, cyclone separators, wet collectors, fabric filters (Bag-house filter), electrostatic precipitators (ESP).

Unit IV: Control of gaseous contaminants: Absorption, Adsorption, Condensation and Combustion, Control of sulphur oxides, nitrogen oxides, carbon monoxide, and hydrocarbons. Automotive emission control, catalytic convertor, Euro-I, Euro-II and Euro-III specifications, Indian specifications.

Unit V NOISE POLLUTION: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psycho-acoustics and noise criteria, effects of noise on health, annoyance rating schemes; special noise environments: Infra-sound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices.

Text Books:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering.
2. Martin Crawford: Air Pollution Control Theory.
3. Wark and Warner: Air Pollution: Its Origin and Control.
4. M.N.Rao& HVN Rao, Air Pollution, Tata McGraw-Hill Publishing Company Limited, New Delhi.
5. Environmental Pollution Control Engineering- CS Rao, Wiley Eastern Ltd., New Delhi, 1996.
6. Environmental Noise Pollution – PE Cunniff, McGraw Hill, New York, 1987
7. Mycock, McKenna and Theodore: Handbook of Air Pollution Control Engineering and Technology.
8. Suess and Craxford: W.H.O. Manual on Urban Air Quality Management

Course Outcomes:-

After studying the course, the students will be able to

CO1: Identify the major sources, effects and monitoring of air and noise pollutants.
CO2: Understand the key transformations and meteorological influence on air and noise.
CO3: Understand the behaviour of air pollutants in atmosphere.
CO4: Relate and analyse the pollution regulation on its scientific basis.
CO5: Application of various control equipment's for the abatement of air and noise.
CO6: Evaluate the engineering solutions for industrial and vehicular air & noise pollution problems.

Syllabus	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPE02C	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Solid and Hazardous Waste Management	3	0	0	15	15	30			

Course Learning Objectives:

- To define and characterize municipal solid wastes from technical and regulatory points of view.
- To provide comprehensive ways of collection, transportation and management of different types of solid wastes.
- To classify the waste and remove hazardous wastes; apply different methods of management.
- .To introduce the most common techniques for hazardous waste disposal.
- To use laboratorial tests in sampling & characterization of solid wastes.

Course Content:

UNIT-1:Municipal Solid Waste Management
Legal and Organizational foundation: Definition of Solid Waste, Waste Generation Technological Society, Major Legislation, Monitoring Responsibilities, Sources and Types of Solid Waste, Sampling and Characterization – Determination of Composition of MSW, Storage and Handling of Solid Waste ,Future Changes in Waste Composition.

UNIT-2:Collection and Transport of Solid Waste
Collection of Solid Waste: Type of Waste Collection Systems, Analysis of Collection System, Alternative Techniques for Collection System, Separation, Processing and Transformation of Solid Waste: UNIT Operations Usar for Separation and Processing, Materials Recovery Facilities, Waste Transformation through Combustion and Aerobic Composting, Anaerobic Methods for Materials Recovery and Treatment, Energy Recovery.
Incinerators Transfer and Transport
Need for Transfer Operation, Transport Means and Methods, Transfer Station Types and Design Requirements, Landfills, Site Selection, Design and Operation, drainage and Leachate Collection Systems , Requirements and Technical solution, Designated Waste Landfill Remediation, Integrated Waste Management Facilities.
UNIT-3:Hazardous Waste Management
Definition and Identification of Hazardous Wastes-Sources and Characteristics, Hazardous Wastes in Municipal Waste ,Hazardous Wastes Regulations ,Minimization of Hazardous Waste-Compatibility, Handling and Storage of Hazardous Waste-Collection and Transport, e-waste Sources, Collection, Treatment and Reuse Management.

UNIT-4:Hazardous waste treatment and Design
Hazardous Waste Treatment Technologies, Design and Operation , Facilities for Physical, Chemical and Thermal Treatment of Hazardous Waste –,Solidification, Chemical Fixation and Encapsulation, Incineration, Hazardous Waste landfills: Site Selection, Design and Operation, Remediation of Hazardous Waste Disposal Sites.

UNIT-5:Laboratory Practice: Sampling and Characterization of Solid Wastes; TCLP Tests and Leachate Studies.

Text Books:
1) Integrated Solid Waste Management by George Techobanoglous et al, McGraw-Hill Publication, 1993.
2) Hazardous Waste Management by Charles A. Wentz, McGraw Hill Publication, 1995.

Reference Books:
1) Solid and Hazardous Waste Management by S.C. Bhatia,Atlantic Publishers; Edition (1 December 2007).
2) Solid and Hazardous Waste Management by M.N Rao & Razia Sultana,BS Publications, Second Edition (2020)

Course Outcomes:- At the end of the course completion, the students shall be able to:

CO1: Ability to characterize municipal solid wastes from technical view.
CO2: Learn ways of collection, transportation and management of different types of solid wastes.
CO3: Apply different methods of managements for hazardous wastes.
CO4: Develop most suitable techniques for disposal of hazardous wastes.
CO5: Learn different laboratorial tests for solid wastes.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPE02D	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Urban Hydrology and Hydraulics	3	0	0	15	15	30			

Course Learning Objectives:

- To describe physical properties of urban area.
- To understand the elements of drainage systems.
- To study about urban water supply
- To know about the measures to control storm water pollution
- To learn urban watershed software.

Course Content:

UNIT 1: Urbanisation: Process of urbanisation, Trends of urbanisation and industrialisation, influence on hydrologic cycle, effects and consequences for drainage, Rainfall analysis in urban environment, design storm. Urban Runoff computations: Empirical, Time-area and unit hydrograph approaches. Urban storm water runoff: overland flow.

UNIT 2: Design of drainage system elements: Hydraulic fundamentals, infiltration and on-site detention of storm water, design of sewerage and drainage channels, design of appurtenances, road drainage, design of pumping stations

UNIT 3: Urban water supply: Estimate of demand, sources in surface and groundwater, Reservoir, capacity estimation.

UNIT 4: Control of storm water pollution: Pollution build-up and wash off process with reference to urban drainage systems. Source control in commercial and industrial complexes, storage options - dry and wet ponds, biological treatment of wastewater, chemical treatment of storm water

UNIT 5: Introduction to urban watershed software - Hydrologic Cistern, water conservation and ecological aspects, Water harvesting.

TEXT BOOKS:

1. Chow V T, Handbook of Applied Hydrology: A Compendium of Water resources technology, McGraw Hill, New York, 1964.
2. Gupta R S, Hydrology and Hydraulic Systems, Prentice Hall Publishers, New Jersey, 1989.
3. Geiger W F, Marsalek J Z, and Rawls G J, Manual on Drainage in Urban Areas, 2 Volumes, UNESCO, Paris, 1987
4. Hall M J, Urban Hydrology, Elsevier Applied Science Publishers, New York, 1984.
5. Stahre P, and Urbonas B, Stormwater Detention for Drainage, water quality and CSO Management, Prentice Hall Publishers, New Jersey, 1983.
6. Wanielista M P, and Yousef Y A, Stormwater Management, JohnWiley and Sons, New York, 1993.

Course Outcome: At the end of the course students shall be able to:

CO1: Understand and explain the effects of urbanization on rainfall and runoff.

CO2: Design various urban drainage system elements.

CO3: Estimate the demand of urban areas

CO4: Identify and apply the control required for storm water pollution

CO5: Use urban watershed software for simulation purpose.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPE02E	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Environmental Impact Assessment and Life Cycle Analysis	3	0	0	15	15	30			

Course Learning Objectives:

- Identify environmental attributes for the EIA study.
- Identify methodology and prepare EIA reports.
- Specify methods for prediction of the impacts.
- Formulate environmental management plans.
- Understand the concept of life cycle analysis (LCA) and the basic principles.

Course Content:

UNIT-1:Introduction: Historical development of Environmental Impact Assessment (EIA). EIA in Project Cycle. Legal and Regulatory aspects in India. – Types and limitations of EIA – Cross sectoral issues and terms of reference in EIA – Public Participation in EIA. EIA process- screening – scoping - setting – analysis – mitigation

UNIT–2: Components and Methods for EIA: Matrices – Networks – Checklists – Connections and combinations of processes - Cost benefit analysis – Analysis of alternatives – Software packages for EIA – Expert systems in EIA. Prediction tools for EIA - Mathematical modelling for impact prediction – Assessment of impacts – air – water – soil – noise – biological — Cumulative Impact Assessment – Documentation of EIA findings – planning – organization of information and visual display materials - Report preparation. EIA methods in other countries.

UNIT-3:Environmental Management Plan: Environmental Management Plan - preparation, implementation and review - Mitigation and Rehabilitation Plans – Policy and guidelines for planning and monitoring programmes – Post project audit - Ethical and Quality aspects of Environmental Impact Assessment.

UNIT- 4:An Introduction to Sustainability Concepts and Life Cycle Analysis (Introduction, Material flow and waste management, What it all means for an engineer? Water energy and food nexus). Risk and Life Cycle Framework for Sustainability (Introduction, Risk, Environmental Risk Assessment, Example Chemicals and Health Effects, Character of Environmental Problems)

UNIT- 5:Environmental Data Collection and LCA Methodology (Environmental Data Collection Issues, Statistical Analysis of Environmental Data, Common Analytical Instruments, Overview of LCA Methodology - Goal Definition, Life Cycle Inventory, Life Cycle Impact Assessment, Life Cycle Interpretation, LCA Software tools). Life Cycle Assessment – Detailed Methodology and ISO Framework (Detailed Example on LCA Comparisons, LCA Benefits and Drawbacks, Historical Development and LCA Steps from ISO Framework)

Text Books:

1) Anjaneyulu Y., and Manickam. V., Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad, 2007
2) Canter, L.W., Environmental Impact Assessment, McGraw Hill Pub. Co., New York. 1997
3) David P. Lawrence, Environmental Impact Assessment: Practical Solutions to Recurrent Problems, John Wiley & Sons, 2003
4) Environmental Assessment, 2001. Ravi Jain, LV Urban, GS Stacey, H Balbach, McGraw-Hill.
5) Handbook on Life Cycle Assessment : Operational guide to the ISO standards, Khuwer Academic Publishers, 2004
6) Howetti, B. B., Kumar A, Eds, Environmental Impact Assessment & Management, Daya Publishing House, 1998
7) Lawrence, D.P., Environmental Impact Assessment – Practical solutions to recurrent problems, Wiley-Inter science, New Jersey, 2003.
8) Petts, J., Handbook of Environmental Impact Assessment, Vol., I and II, Blackwell Science, London, 1999.

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

CO1: Identify environmental attributes for the EIA study.
CO2: Identify methodology and prepare EIA reports.
CO3: Specify methods for prediction of the impacts.
CO4: Understand EIA tools & methodologies, auditing and documentation of EIA
CO5: Formulate environmental management plans
CO6: Perform life cycle inventory analysis of products.
CO7: Develop strategies to bring energy efficiency in all stages of the product development cycle.
CO8: Formulate plans for comprehensive environmental protection, in order to comply with environmental laws

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPE03A	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Engineering Hydrology	3	0	0	15	15	30			

Course Learning Objectives:

- To develop the fundamentals of hydrology and Precipitation.
- To study various abstractions of precipitation.
- To understand the concepts of Rainfall-Runoff correlations
- To learn about the importance of Hydrographs and the basics of the flood.
- To understand the fundamentals of groundwater hydrology

Course Content:

UNIT-1 Introduction Description of Hydrologic Cycle, Overview of the applications of hydrology in engineering, Forms of precipitation, measurement, depth-area-duration, and intensity-duration frequency relations.

UNIT–2Abstraction from Precipitation, Evaporation - process, measurement, and estimation, Evapotranspiration measurement and estimation Infiltration process, measurement, and estimation.

UNIT-3 Runoff Surface Runoff and Stream Flow Measurements, Rainfall-Runoff relations.

UNIT- 4 Hydrograph Factors affecting flow hydrograph, Unit hydrograph, its analysis, and S-curve hydrograph, Synthetic and instantaneous unit hydrographs. Basics of Flood and Flood Routing.

UNIT- 5 Groundwater Occurrence of groundwater, types of aquifers, aquifer properties, Darcy's law, Conductivity and Transmissivity, the yield from a well under steady-state conditions, Laboratory and field measurement of permeability

Text Books:

1. Engineering Hydrology K.Subramanya, Tata McGraw-HillEducation
2. Hydrology Principles, Analysis and Design H.M.Raghunath, New AgeInternational
3. Hand BookofAppliedhydrologyV.T.Chow, McGraw-Hill Inc
4. VieramanWandLewisGL(2008)"IntroductiontoHydrology" PrenticeHallofIndia
5. Ojha,C.S.P. , Bhunya, P. and Berndtsson, R.- Engineering Hydrology, Oxford University PressCanada.
6. K. C. Patra, Hydrology and Water Resources Engg., Narosa Publishing house, New Delhi.
7. D. K. Todd, Groundwater Hydrology, John Wiley and Sons

Course Outcomes-Upon completion of this course students shall be able to

CO1: Describe the basic concepts of hydrology and precipitation to integrate them with the physical hydrological processes.

CO2: Understand and Explain the various process, measurements, and estimations of hydrological components

CO3: Formulate the rainfall-runoff relationship and apply it to engineering practices.

CO4: Explain and use the hydrographs for practical purposes and investigations.

CO5: Understand and explain the basics of groundwater hydrology.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPE03B	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Structural Dynamics	3	0	0	15	15	30			

Course Learning Objectives:

- To Introduce fundamentals of vibrations of SDOF system
- To Impart damped and undamped system
- To Present free and forced vibration
- To Acquaint with free and forced vibration of MDOF system
- To Present free and forced vibration of continuous system

Course Content:

UNIT- 1: INTRODUCTION: Comparison between static and dynamic analysis; Degrees of freedom; Undamped system; Newton's law of motion; 'D' Alembert's principle; Solution of the differential equation of motion.

UNIT-2: FREE VIBATION OF SINGLE DEGREE - OF - FREEDOM SYSTEM: Equation of motion for single degree - of - freedom system; free undamped vibration of the SDOF system; Damped single degree - of - freedom system -Viscous damping. Equation of motion, critically damped system, Over- damped system. Under-damped system and Logarithmic decrement.

UNIT-3: RESPONSE OF SDOF SYSTEM TO HARMONIC LOADING: Undamped harmonic excitation; Damped harmonic excitation; Evaluation of damping at resonance; Response to support motion; Force transmitted to the foundation. Response of SDOF system to general dynamic loading: Impulsive loading and Duhamel's integral; Numerical evaluation of Duhamel's integral — Undamped system;Numerical evaluation of Duhamel's integral -Damped system.

UNIT-4: GENERALIZED COORDINATES AND RAYLEIGH'S METHOD: Principle of virtual work; Generalized SDOF system - Rigid body; Generalized SDOF system - Distributed elasticity; Rayleigh's method; Improved Rayleigh's method.

UNIT-5: STRUCTURES MODELED AS SHEAR BUILDINGS: Stiffness equations for the shear building; Flexibility equations for the shear building; Free vibration of a shear building (Single bay two Storeyed) - Natural frequencies and normal modes. Forced motion of shear buildings (Two Storeyed): Modal superposition method; Response of a shear building to base motion; Harmonic forced excitation.

Text Books/Reference Books:

1. Dynamics of Structures by A.K.Chopra, Second edition (2001), Prentice Hall India Private Ltd
2. Dynamics of Structures by Clough, R.W. &Penzin, J., McGraw Hill, 1993.
3. Earthquake Resistant Design of Structures by Pankaj Agarwal, Manish Shrikhande , 1st edition (2006), Prentice Hall of India Private Ltd., New Delhi .
4. Dynamics of Structures by Humar, J.L., Prentice Hall, 1990.
5. Structural Dynamics by Mario, Paz, CBS Publ. New-Delhi, 1995.
6. Advanced Dynamics by Timoshenko, S., McGraw Hill Book Co, NY, 1948.
7. Elements of Vibration Analysis by Meirovitch, L., 2nd Edi. McGraw Hill Intr. Edi.,Singapore, 1986.
8. Introduction of Structural Dynamics, Biggs, J.M., McGraw Hill, NY, 1964
9. Principles and techniques of vibrations by L Meirovich, 1997, Prentice Hall, NJ.
10. Analytical methods in vibrations by L Meirovich, 1967, Macmillan, NY.
11. Theory of vibrations by W T Thompson, 1983, Prentice hall, New Delhi
12. Vibration: fundamentals and practice by C W de Silva, 1999, CRC Press, Boca Raton.
13. Mechanical Vibrations by S S Rao, 2004, 4th Edition, Pearson Education, New Delhi.

Course Outcomes:

On the completion of this course, the student will be able to

CO1: Convert a physical structure into SDOF system/model
CO2: Find response of free and force vibration (harmonic, periodic and transient) of SDOF system
CO3: Calculate natural frequency and mode shapes of MDOF system
CO4: Carry out modal analysis of MDOF system
CO5: Get the Response of structures by performing experiments and/or by computer simulation.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPE03C	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Foundation Engineering	3	0	0	15	15	30			

Course Learning Objectives:

- To introduction of different methods of soil exploration.
- To provide comprehensive studies of shallow foundation and calculate settlements.
- To analyze various types of footings & rafts.
- To introduction of various types of piles foundations and to calculate bearing capacity.
- To introduce Comprehensive studies of Retaining walls and determine stability.

Course Content:

UNIT-1 Site Investigation And Selection Of Foundation: Scope and Objectives, Methods of Exploration , Auguring and Boring ,Wash Boring and Rotary Drilling ,Depth and Spacing of Bore Holes ,Soil Samples ,Representative and Undisturbed, Sampling Methods Split Spoon Sampler, Thin Wall Sampler, Stationary Piston Sampler ,Penetration Tests (SPT and SCPT) ,Data Interpretation ,Strength Parameters ,Bore Log Report and Selection of Foundation.

UNIT–2 Shallow Foundation: Location and Depth of foundation, Codal Provisions, Bearing Capacity of Shallow Foundation onHomogeneous Deposits ,Terzaghi's Formula and BIS formula ,Factors Affecting Bearing Capacity Bearing Capacity from In-Situ Tests (SPT, SCPT and Plate Load) ,Allowable Bearing Pressure , Seismic Considerations in Bearing Capacity Evaluation, Determination of Settlement of Foundations on Granular and Clay Deposits ,Total and Differential Settlement , Allowable Settlements , Codal Provision , Methods of Minimizing Total and Differential Settlements.

UNIT-3 Footings And Rafts: Types of Isolated Footing, Combined Footing, Mat Foundation, Contact Pressure and Settlement Distribution, Proportioning of Foundations for Conventional Rigid Behavior, Minimum Thickness for Rigid Behavior, Applications, Compensated Foundation, Codal Provisions.

UNIT- 4 Pile Foundation: Types of Piles and Functions ,Factors Influencing the Selection of Pile , Carrying Capacity of Single Pile in Granular and Cohesive Soil , Static Formula ,Dynamic Formulae (Engineering News and Hileys) ,Capacity from In-Situ Tests (SPT and SCPT) , Negative Skin Friction , Uplift Capacity, Group Capacity by Different Methods (Feld's rule, Converse — La-Barrae formula and Block Failure Criterion) ,Settlement of Pile Groups , Interpretation of Pile Load Test (Routine Test Only), Under Reamed Piles, Capacity under Compression and Uplift , Cohesive -Expansive ,Non Expansive — Cohesionless Soils , Codal Provisions.

UNIT- 5 Retaining Walls: Plastic Equilibrium in Soils ,Active and Passive States , Rankine's Theory for Cohesionless and Cohesive Soil ,Coulomb's Wedge Theory , Condition for Critical Failure Plane ,Earth Pressure on Retaining Walls of Simple Configurations , Culmann's Graphical method ,Pressure on the Wall due to Line Load ,Stability Analysis of Retaining Walls ,Codal Provisions.

Text Books:

1) Foundation Analysis and Design by J. E. Bowels, McGraw Hill. Companies, Inc. 6th Ed. 2001.
2) Principles of Foundation Engineering by B. M. Das, CENGAGE Learning, Seventh Edition.
3) Foundation Engineering Handbook by R. W. Day, McGraw Hill. ConstructionASCE Press. Ed. 2006.
4) Basic and Applied Soil Mechanics by Gopal Ranjan & A.S. R. Rao, New Age International (P) Limited Publishers, New Delhi-110002.
5) Textbook of Soil Mechanics and Foundation Engineering –Geotechnical Engineering Series (PB 2018) by V.N. S. Murthy, CBS Publications, New Delhi
6) Soil Mechanics by Robert V. Whitman & T. William Lambe, Wiley India Pvt Ltd., New Delhi.
7) Soil Mechanics and Foundation Engineering (Geotechnical Engineering) by Dr. P.N. Modi, Standard Book House(Rajsons Publications Pvt Ltd), New Delhi-110002

Course Outcomes-At the end of the course completion, the students shall be able to:

CO1: Understand different methods of soil exploration.
CO2: Analyze various shallow foundations and calculate different types of settlements.
CO3: Understand various types of footings & rafts.
CO4: Analyze bearing capacity of piles with different methods
CO5: Design stability of Retaining walls.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPE03D	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Rock Mechanics	3	0	0	15	15	30			

Course Learning Objectives:

- To understand the basics of rock mechanics and able to analysis stress.
- To calculate strain and determine physical properties of rocks.
- To determine mechanical properties of rocks by different methods.
- To analyse different models of stress–strain in rocks.
- To determine the static & dynamic elastic constants of rocks.

Course Content:

UNIT – 1: INTRODUCTION TO ROCK MECHANICS

Definition, Scope, Importance & Development, Application in Mining, Discontinuities; Description of Discontinuities, Introduction to Mapping and Hemispherical Projection of Discontinuities, Barton's Shear Strength of Joints.
Analysis of Stress: Introduction, Definition and Basic Concepts, Stress in a Plane(2-D), Mohr's Circle of Stress, Secondary Principal Stress, Equations of Equilibrium, Plane Stress Equations.

UNIT – 2: ANALYSIS OF STRAIN

Introduction, Definition and Basic Concepts, Strain in a Pane (2-D), Mohr's Circle of Strain, Equations of Compatibility, Stress-Strain Relationship, Basic Equations in Elastic Theory, Pain Strain Equations, Elasto Plastic Behaviour of Rocks, Stress – Strain Curves of Various Rocks.
Physical Properties: Definition and Determination of Density, Hardness, Porosity, Permeability, Moisture Content, Degree of Saturation. Electrical and Thermal Properties of Rocks.

UNIT – 3: MECHANICAL PROPERTIES

Definition and Determination of Compressive Strength, Tensile Strength, Shear Strength, Triaxial Testing. Time Dependent Properties, Scaling of Laboratory Data to In-Situ Values.
Rock Indices: Protodyakanov Strength Index, Point Load Strength Index, RQD, In-Situ Strength Properties of Rocks, Necessity and Requirement, Methods of In-Situ Stress Measurements, Plate Load Test, Cable Jack Test, Bore Hole Test, Dilatometer Test, Flat Jack Test, Hydraulic Fracture and Velocity Propagation.

UNIT – 4: RHEOLOGICAL MODELS

Relationship and Rate of Change of Stress-Strain for Idealizing Materials – Models Representing Elastic, Plastic, Viscous, Elasto-Plastic, Non-Elastic and Brittle Rock Properties.

UNIT – 5: STATIC AND DYNAMIC ELASTIC CONSTANTS OF ROCKS

Static Elastic Constants of Rocks: Introduction, Definition, Instrument, Measurement of Deformation, Mechanical, Optical, Electrical Gauges, LVDT, Calculation of Elastic Constants of Rocks.
Dynamic Elastic Constants of Rocks: Introduction, Elastic Wave, Calculation of Modulus of Elasticity.

TEXT BOOKS:

1) Rock Mechanics for Engineers - B. P. Varma, 2nd edition, Khanna Publishers, 1989.
2) Strata Mechanics in Coal Mining - Jeremic, K. L. Jeremic, Rotterdam, Balkema, 1985.
3) Fundamentals of Rock Mechanics - Jager & Cook, Methuen andco. London, 1969.
4) Handbook on Mechanical Properties of rocks - R.D. Lama, V. S. Vutukuri, Vol. I to IV, Transtech Publications,1978.
5) Rock Mechanics for Underground Mining - 2nd edition, Brady and Brown, Khuwer AcademicPublishers, 1993.

Course Outcomes: At the end of the course completion, the students shall be able to:

CO1: Learn basics of rock mechanics and calculate stresses.
CO2: Determine physical properties of rocks and strain.
CO3: Evaluate mechanical properties of rocks.
CO4: Compare stress strain in rocks by different methods.
CO5: Determine the static & dynamic elastic constants of rocks.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPE03E	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Water Resources Planning & Management	3	0	0	15	15	30			

Course Learning Objectives:

- To learn how to assess water resources
- To study how to develop suitable plans for water resources development and management
- To understand various types of water resources systems.
- To learn managing the water resources quality and quantity
- To understand water quantity and quality modelling.

Course Content:

UNIT 1: Introduction: Role of water in national development, assessment of water resources of country, scope of water resources development vis-a-vis environment, Irrigation development in India, utilisation of Irrigation potential.

UNIT 2: Planning: Water resources planning process; planning for single purpose and multipurpose projects, estimation of different water needs and project formulations, comparison of alternatives, cost-benefit analysis.

UNIT 3: Water Resources Systems: Definition, types of system, optimization techniques, system approach, system analysis, linear programming, and formulation of a linear programming problem, formulation with different types of constraints, graphical analysis, graphical solution, simplex method, optimization techniques and systems approach.

UNIT 4: Management: Evaluation and monitoring of water quantity and quality, managing water distribution networks for irrigation, flood control and power generation, inter-basin transfer of water, conjunctive use of surface and ground water.

UNIT 5: Modelling: Water quantity and quality modelling, evaluation of impacts of water resources projects on river regimes and environment, reservoir sedimentation and watershed management.

Text Books:

1. Principles of Water Resources Planning – Good Man, A.S., (Prentice Hall, Inc., Englewood Cliffs, N.J. 1984.)
2. Water Resources Systems -S Vedula and P P Mujumdar, Tata McGraw-Hill Education, 2005
3. James, L. Douglas, and Robert R. Lee, Economics of Water resources Planning, McGraw-Hill Book Company, 1971.
4. Quentin Grafton, R. and Karen Hussey, Water Resources Planning and Management, Cambridge University Press, 2011.
5. Water Resources System, Planning and Management – M.C. Chaturvedy (Tata McGraw Hill)
6. Water Resources System, Planning and Management – Helwig O.J. (John and Wiley & Sons)

Course Outcomes- after completion of the course the students shall be able to

CO1: Describe the potential of assessing water resources
CO2: Prepare master and strategic water resources planning
CO3: Apply the optimization techniques for water resources systems.
CO4: Exercise the management of water resources in different real life situations
CO5: Solve various water resources problems using modelling.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPE04A	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Industrial Structures	3	0	0	15	15	30			

Course Learning Objectives:
The purpose of this course is to:

- Develop an in-depth knowledge in the area of design of industrial structure with the latest code of practice as per the Indian Standard.
- To introduce the students about planning & functional requirement of industries
- To analyse& design the industrial buildings, bunkers & Silos
- To understand the design concept of chimneys
- To understand the principles of cylindrical shells

Course Content:

UNIT: I Planning and functional requirements- classification of industries and industrial structures- planning for layout- requirements regarding lighting ventilation and fire safety- protection against noise and vibrations

UNIT-II Thin Walled / Cold Formed Steel Members: Definitions – Local Buckling of Thin-Elements-Post Buckling of Thin-Elements – Light Gauge Steel Columns and Compression Members – Form-Factor for Columns and Compression Members – Behaviour of Stiffened Elements Under Uniform Compression – Multiple Stiffened Compression Elements –Effective Length of Light Gauge Steel Compression Members – Light Gauge Steel Tension Members.

UNIT-III RC Bunkers & Silos: Introduction – Janssen's Theory – Airy's Theory – Design of Square, Rectangular and Circular Bunkers; Design of Silos.

UNIT-IV RC Chimneys: Introduction – Wind Pressure – Stresses in Chimney Shaft Due to Self-Weight and Wind – Stresses in Horizontal Reinforcement Due to Wind Shear – Stresses Due to Temperature Difference – Combined Effect of Self Load, Wind and Temperature – Temperature Stresses in Horizontal Reinforcement Problems.

UNIT-V Design Principles of Cylindrical Shells & Design Problems.

TEXT BOOKS

1) Advanced Reinforced Concrete Design, By N. Krishna Raju (CBS Publishers & Distributors) 2005
2) Design of Steel Structures, By Ram Chandra and Virendra Gehlot vol-II, 2007.
3) Design of Steel Structures, By Duggal - Tata McGraw-Hill publishers – 2010
4) Handbook on Machine Foundations by P. Srinivasulu and C. V. Vaidyanathan, Structural Engineering Research Center
5) Tall Chimneys- Design and Construction by S. N. Manohar Tata Mc Grawhill Publishing Company

REFERENCES:

1) Transmission Line Structures by S. S. Murthy and A. R. Santakumar McGraw Hill
2) SP 32: 1986, Handbook on functional requirements of Industrial buildings
3) Design of steel structures by N. Subramanian

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

CO1: Plan the functional requirements of structural systems for various industries.
CO2: Get an idea about the materials used and design of industrial structural elements.
CO3: Realize the basic concepts and design of power plant structures.
CO4: Design power transmission structures.
CO5: Possess the ability to understand the design concepts of Chimneys, bunkers and silos

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPE04B	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Airport Planning and Design	3	0	0	15	15	30			

Course Learning Objectives:

- To familiarize students with of airport planning.
- To develop the knowledge for design and analysis of airport runway, taxiway and airport pavement crust.
- To understand air traffic control system.

Course Content:

UNIT-1 Airport Planning: Significance of transport, Different modes of transportation, Airport master plan-FAA recommendation. Regional planning, airport site selection, survey for site selection, Estimation of future air traffic, Characteristics of aircraft, Environmental consideration.

UNIT–2Runway Design: Orientation of runway , Basic runway length, Corrections for basic runway length, Runway geometric design

UNIT-3 Taxiway Design: Controlling factors of taxiway, Geometric design for taxiway, Design for exit taxiways.

UNIT- 4 Airport Pavement Design: Design factors, Design of flexible pavement, Design of rigid pavement, design of overlay pavements

UNIT- 5Air Traffic Control and Visual Aids: Air traffic control objectives, control system. Visual aids-airport markings and lighting

Text Books:

1. Dr. S. K. Khanna, M.G. Arora and S.S. Jain, Airport Planning & Design, Nem Chand &Bros.,Roorkee
2. G.V. Rao Airport Engineering, Tata McGraw Hill Pub. Co., New Delhi
3. S.C. Rangwala and K.S, Rangwala, Airport Engineering, Charotar Publishing House Pvt. Ltd, Anand

Course Outcomes-

After learning the course the students should be able to:

CO1: Understand the fundamentals of airport planning.

CO2: Familiarize with design of runway.

CO3: Recognize design of taxiway

CO4: Understand airport pavement design

CO5: Analyse air traffic control system.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPE04C	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Railway Engineering	3	0	0	15	15	30			

Course Learning Objectives:
The objective of this Course is

- Comprehend the history of indian railway and basic study required with respect to construction of railway track.
- To make aware of the different components of railway track and the recent updation in indian railway with respect to the components.
- Comprehensive understanding of the factors involved in designing of the various alignment elements.
- Explain essential features, requirements and components of different types of point, crossings, turnouts, switches, crossovers etc.
- Detailed study and understanding of the signalling and station yard system of railway.

Course Content:

UNIT 1: Introduction to Railways in India: Role of Indian Railways in National Development Railways for Urban Transportation –LRT & MRTS. Alignment of Railway Lines: Engineering Surveys for Track Alignment. Permanent Way: Components and their Functions

UNIT 2: Rails - Types of Rails, Length of rail, Weight of Rail, Rail Joints, Creep of rail, Buckling of rail, Kinks of Rail Fastenings, Coning of Wheels & tilting of rails.
Sleepers –Types, Functions, sleeper density
Ballasts- Types, function, advantage & disadvantage of each type.

UNIT 3: Geometric Design of Railway Tracks: Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal Curves.

UNIT 4: Points and Crossings, Turnouts: Working Principles, Cross overs.

UNIT 5: Signalling: Types and their function. Station and Yards: Types, Requirements, factors for site selection.

Text Books:

1. Chandra S. and M.M. Agarwal, Railway Engineering, Oxford University Press, New Delhi, India, 2007.
2. Saxena, S.C. and S.P. Arora, Railway Engineering, Dhanpat Rai and Sons, New Delhi, India, 1997.
3. Agarwal, M.M., Indian Railway Track, Prabha and Co., New Delhi, India, 1988.
4. Rangwala, S.C., Principles of Railway Engineering, Charotar Publishing House, Anand, India, 1988.
5. J. S. Mundrey, "Railway Track Engineering", McGraw Hill Publishing Co., 2009

Course Outcomes:

At the end of the course the students shall be able to:

CO1: The students are expected to prepare the detailed project report for the construction, design and operation of mass transit systems that use a fixed guide way.
CO2: The students understands the basic requirents of the components of the railway tracks and also got global updation about the railway track components.
CO3: The students are expected to handle the tasks that include determining horizontal alignment and vertical alignment design.
CO4: The students are able to design various components of point, crossing, turnouts etc.
CO5: The students understand the requirements and also differntiate the signalling system for particular track. Also understand the basic factors and requirtemnet of station yards.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPE04D	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Contracts Management	3	0	0	15	15	30			

Course Learning Objectives:

- To introduce about various Authorities, indulge in construction contract management.
- To impart knowledge on municipal bye-laws related to construction.
- To elaborate about construction contracts, arbitration, and litigation procedures

Course Content:

UNIT-1 Introduction and concepts of Construction law-public law-government departments and local authorities.

UNIT–2 Private law-contracts-torts-property law and building law-concepts-salient features sections

UNIT-3 Construction contracts-contracts specifications-types of contract documents used for construction.

UNIT- 4 Contract procurement- selection of contractor-contract procedure-salient features.

UNIT- 5Arbitration and litigation procedure-preparation, settlement, evidence, price adjustment-need for the formulae-civil engineering and building formulae- practical implications.

Text Books:

1. Gajaria G. T., laws relating to building and engineering contracts in India, M. M Tripathi Private Ltd., Bombay, 1982.
2. Jimmie Hinze, construction contracts, 2nd edition. McGraw hill, 2001.
3. Joseph T. Bockrath, contracts and the legal environment for engineers and architects, 6th edition, McGraw Hill, 2000.

Course Outcomes-

CO1: To remember about various Authorities, indulge in construction contract management.

CO2: To understand about municipal bye-laws related to construction.

CO3: To remember & understand about various classifications of construction contacts.

CO4: To review about various steps of contract procurement in construction industry.

CO5: To evaluate the role of Arbitration and litigation procedure in settlement of contract related disputes.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE207TPE04E	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Construction Projects Planning & Systems	3	0	0	15	15	30			

Course Learning Objectives:

- To understand the project management and different scheduling techniques.
- To expertise in PERT network analysis.
- To learn CPM network analysis and compared with PERT.
- To understand time-cost analysis and resource scheduling.
- To understand the factor for equipment selection and cost of owing and operating and expertise in evaluation and analysis of different equipment life.

Course Content:

UNIT 1: Introduction: Objectives and functions of project management, project feasibility reports, Planning for construction projects: Steps, factors, advantages and disadvantages for different stake holder.

Scheduling: Scheduling Job layout and Line of balance, project management through networking, Bar Chart, Linked bar chart, Work-break down structures, Activity-on-arrow diagrams.

UNIT 2: PERT: Network analysis, critical path, probability of project.

UNIT3: CPM: Network analysis, Critical Path, Difference between CPM and PERT.

UNIT 4: Time-Cost Trade-off, Resource Scheduling

UNIT 5: Time and motion studies, Standard and special equipment, factors affecting selection of construction equipment, cost of owning and operating the construction Equipment, Equipment Life and Replacement Analysis

Text Books:

1. Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw-Hill Publishing Co., New Delhi, 1998.
2. Srinath,L.S., "PERT and CPM Principles and Applications ", Affiliated East West Press, 2001
3. Chris Hendrickson and Tung Au, "ProjectManagement for Construction – Fundamentals Concepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
4. Moder.J., C.Phillips and Davis, "Project Management with CPM", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., Third Edition, 1983.
5. Construction Planning and Equipment - R.L.Peurifoy - Tata McGraw Hill, New Delhi Willis., E.M., "Scheduling Construction projects", John Wiley and Sons 1986.
6. Halpin,D.W., "Financial and cost concepts for construction Management", John Wiley and Sons, New York, 1985.

Course Outcomes:- At the end of the course students will be able to:

- **CO1:** To apply the knowledge in managing and handling of different civil engineering project and also able to schedule the project.
- **CO2:** To do PERT analysis and able to find the project completion time and its probability.
- **CO3:** To do CPM analysis and able to find the project completion time and compare with PERT analysis.
- **CO4:** To do cost and time analysis and also resource allocation, scheduling and crashing for different activities of the network.
- **CO5:** To apply the knowledge in equipment selection and able to find cost of owing and operating and able to find the equipment life, which help in comparisons of different equipments.

SYLLABUS (SEMESTER-VII)								
Subject Code:	CE207TOE02	CREDITS:3			SESSIONAL - TA			ESE
Subject:	Open Elective	L	T	P	CT-I	CT -II	TOTAL	70
		3	-	-	15	15	30	
CE207TOE02		Green Building and Sustainable Materials						

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE07TOE02A	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Green Building and Sustainable Materials	3	0	0	15	15	30			

Course Learning Objectives:

- To understand the basics of Green Buildings.
- To learn the concept of site selection and planning.
- To study the use of efficient energies.
- To understand the types of sustainable building materials.
- To learn about maintenance of Indoor environmental quality.

Course Content:

UNIT-I
Green Buildings: Introduction, Definition, sustainable development, typicalfeatures of green buildings, benefits,key Requisites for Constructing a Green Building,Greenbuildingrating systems – GRIHA, IGBC and LEED.

UNIT- II
Site selection and building planning: Criteria for site selection, preservation of landscape, soil erosion control,minimizing urban heat island effect, maximize comfort by proper orientation of building facades, daylighting, ventilation, etc.
Water conservation and efficiency: Rainwater harvesting methods for roof & non-roof,water demand, water efficient plumbing systems, water metering, waste water disposal, recycle and reuse systems.

UNIT-III
Energy Efficiency: Environmental impact of building constructions, Concepts of embodied energy,operationalenergy and life cycle energy. Methods to reduce operational energy: Energy efficientbuildingenvelopes, efficient lighting technologies, energy efficient appliances for heating and airconditioningsystems in buildings, zero ozone depleting potential (ODP) materials, wind and solarenergyharvesting,energy metering and monitoring, concept of net zero buildings. Optimum EnergyEfficiency, Typical Energy Saving Approach in Buildings Use of Renewable Energy Sources

UNIT-IV
Sustainable Building materials: local building materials, natural and renewable materials like bamboo, timber,

rammed earth, stabilized mud blocks, materials with recycled content such as blended cements, pozzolana cements, fly ash bricks, vitrified tiles, materials from agro and industrial waste. Reuse of waste and salvaged materials

UNIT-V

Indoor Environmental Quality for Occupant Comfort and Wellbeing: Daylighting, air ventilation,exhaust systems, low VOC paints, materials & adhesives, building acoustics. Codes related to greenbuildings: NBC, ECBC, ASHRAE, UPC etc.Rapidly renewable building materials and furniture, Environment Quality And Occupational Health: Air conditioning, air quality, Sick building syndrome, Tobacco smoke control, Minimum fresh air requirements avoid use of asbestos in the building, improved fresh air ventilation, Measure of IAQ, Reasons for poor IAQ, Measures to achieve Acceptable IAQ levels,

Text Books

1. IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian Green Building Council Publishers.
2. GRIHA version 2015, GRIHA rating system, Green Ratins for Integrated Habitat Assessment.
3. Alternative building materials and technologies by K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao.
4. Non-Conventional Energy Resources by G. D. Rai, Khanna Publishers.
5. Sustainable Building Design Manual, Vol.1 and 2, TERI, New Delhi 2004.
6. Mike Montoya, Green Building Fundamentals, Pearson, USA, 2010.
7. Charles J. Kibert, Sustainable Construction – Green Building Design and Delivery, John Wiley & Sons, New York, 2008.
8. Regina Leffers, Sustainable Construction and Design, Pearson / Prentice Hall, USA, 2009.

Course Outcomes- At the end of the course students will be able to:

CO1: To apply the knowledge of Green Building in handling any physical projects.

CO2: To conduct a site selection process with respect to green buildings.

CO3: To make use of technologies with efficient energies.

CO4: To select and work with various sustainable materials.

CO5: To apply the knowledge in maintaining the indoor environmental quality.

DEPARTMENT OF CIVIL ENGINEERING B.TECH. FOURTH YEAR SYLLABUS W.E.F 2023-24

SYLLABUS	(SEMESTER VII)					
Subject Code:	CE207PPC08	CREDITS: 1			SESSIONAL - TA	ESE
Subject:	Seminar	L	T	P	IA	
		-	-	2	50	-

SYLLABUS	(SEMESTER VII)					
Subject Code:	CE207PPC09	CREDITS:3			SESSIONAL - TA	ESE
Subject:	Minor project	L	T	P	IA	
		-	-	6	60	40

SEMESTER VIII

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE208TPC21	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Earthquake Resistant Design of Structures	3	0	0	15	15	30			

Course Learning Objectives:

- To introduce Engineering seismology and functional planning and the effects of configurations of buildings for earthquakes.
- To introduce the requirements for conceptual design for earthquake safety and the analysis methods.
- To acquaint with IS code-based design lateral forces for earthquake resistant design of structures.
- To identify the behavior of structural and nonstructural elements for seismic resistance and impart design of shear walls.
- Introduce Capacity Design as per IS 13920: 2016, Capacity Design for Beams, Columns, beam column joints and structure as a whole.

Course Content:

UNIT 1: 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-Seismoscope, Seismograph, accelerograph-Characteristics of strong ground motions- Seismic zones of India. Introduction-Functional Planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength - Seismic design requirements-regular and irregular configurations-basic assumptions.

UNIT 2: Conceptual Design - Horizontal and Vertical Load Resisting Systems - System and Members for Lateral Loads and High Rise / Tall Structures. Twisting of Buildings – Flexible Building and Rigid Building Systems. Strength and Stiffness – Ductility – Definition – Ductility Relationships – Choice of construction Materials – Unconfined Concrete & Confined Concrete – Masonry, Steel Structures. Design Earthquake Loads – Basic Load Combinations – Permissible Stresses. Seismic Methods of Analysis – Static Method – Equivalent Lateral Force Method. Dynamic Analysis – Response Spectrum Method – Modal Analysis Torsion.

UNIT 3: Introduction to Earthquake Resistant Design – Seismic Design Requirements and Methods. RC Buildings – IS Code based Method. - Vertical Irregularities – Mass Irregularity Torsional Irregularity - Plan Configuration Problem - Design Lateral Force, Base Shear Evaluation – Lateral Distribution of Base Shear –.

UNIT 4: Structural Walls Strategies and the Location of Structural Walls – Sectional Shapes – Behaviour of Unreinforced and Reinforced Masonry Walls – Behaviour of Walls Box Action and Bands – Behaviour of infill Walls - Non Structural Elements – Failure Mechanism of Nonstructural Elements – Effects of Nonstructural Elements on Structural System – Analysis – Prevention of Damage to Nonstructural Elements – Isolation of Non-Structures, Design of Shear walls: Classification according to Behavior, Loads in Shear walls, Design of Rectangular and Flanged Shear walls.

UNIT 5: 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. Behavior of beams, columns and joints in RC buildings during earthquakes-Vulnerability of open ground storey and short columns during earthquake- Seismic Evaluation and Retrofitting. Capacity Based Design: Introduction to Capacity Design, Capacity Design for Beams and Columns-Case studies.

Text Books/References:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd
3. Earthquake Resistant Design for Engineers & Architects by Dowrick, D. J., John Willey & Sons, 2nd Edition; 1987.
4. Earthquake Resistant Design of structures by S. K. Duggal, Oxford University Press.
5. Concrete Structures in Earthquake Regions by Booth, E., Longman Higher Education, 1994.

6. Reinforced Concrete Structures by Park, R. &Paulay, T., John Willey & Sons, 2nd Edition; 1975.
7. Masonry and Timber structures including earthquake Resistant Design –Anand S.Arya, Nemchandi& Bros.
8. Earthquake –Resistant Design of Masonry Building –Miha Tomazevic, Imperial College Press.
9. Design of Reinforced Concrete Structures by N. Subramanian. Oxford University Press.
10. Dynamics of Structures by A.K.Chopra, Second edition (2001), Prentice Hall India Private Ltd
11. Handbook on Seismic Analysis and Design of Structures by Farzad Naeim, Kluwer Academic Publisher, 2001.

Reference Codes:

1. IS 1893 (Part-1): 2016, "Criteria for Earthquake Resistant – Design of structures." B.I.S., New Delhi.
2. IS 4326: 2013, "Earthquake Resistant Design and Construction of Building", Code of Practice, B.I.S., New Delhi.
3. IS 13920: 2016, "Ductile design and detailing of reinforced concrete structures subjected to seismic forces" – Code of practice, B.I.S., New Delhi.

Course Outcomes:

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

CO1: Identify the causes of earthquakes, its propagation, and measurement and can quantify the hazard at the location of the structure and quantify the forces based on the source.

CO2: Adopt a suitable structural system to resist earthquake forces considering safe behavior of structural and nonstructural elements with different material properties and load combinations.

CO3: Design seismically safe structures in accordance with the provisions of Indian code IS 1893.

CO4: Implement design of shear wall elements for earthquake safety of structures.

CO5: Design or retrofitting of structures by detailing the elements, beams, columns, beam-column joints as per capacity-based design adopting ductility provisions as per IS 1893, IS 13920, to mitigate the vulnerability of earthquake damages of elements and structures.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE208TPE05A	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Offshore Engineering	3	0	0	15	15	30			

Course Objective:

- To introduce basics of offshore structures and its historical development.
- To characterize static and dynamic loads coming on offshore structure.
- To study about general layout consideration of deck and oil & gas processing system.
- To understand method involving platform installation.
- To learn about material used in design and construction of offshore structure.

Course Content:

UNIT I HISTORICAL DEVELOPMENT OF OFFSHORE STRUCTURES: Introduction – Definition of Offshore Structures – Historical Developments – Deep water challenges, Functions of Offshore Structures, selection of Offshore Structure and its Configurations, Bottom Supported Fixed Structures, Compliant Structures, Floating Structures – Novel offshore design – Field development concepts

UNIT 2 LOAD AND RESPONSES: Introduction, Gravity Load, Hydrostatic Loads, Resistance Loads, Current loads on Structures, Current Drag and Lift Force, Steady and Dynamic Wind Loads on Structures, Wave Loads on Structures, Varying Wind Load, Impulse loads and Introduction to design

UNIT 3TOPSIDE FACILITIES AND LAYOUT: Introduction - General layout Considerations - Areas and Equipment - Deck Impact Loads - Deck Placement and Configuration - Float over Deck Installation - Helipad - Platform Crane - Living quarters - Oil and gas treatment - Oil and gas storage, offloading and export - Utility and process support systems - Drilling facilities

UNIT 4 OFFSHORE INSTALLATION: Introduction – Installation of Fixed Platform Substructures - Floating Structures – Foundations - Subsea Templates – load outs - transportation - Platform Installation Methods and installation criteria – Installation of Pipelines and Risers.

UNIT 5: MATERIALS FOR OFFSHORE APPLICATIONS: Material for Construction-Structural Steel, Topside Materials, Advanced Composite materials, Corrosion Control, Material Reliability and Monitoring and Fracture Control.

Textbooks:

1. Dawson, T.H., "Offshore Structural Engineering", Prentice Hall, 1983
2. B.C Gerwick, Jr. "Construction of Marine and Offshore Structures", CRC Press, Florida, 2000.
3. Subrata K Chakrabarti, "Handbook of Offshore Engineering", Vol 1, Vol 2, Elsevier Publishers, 1 st edition, 2005.

Reference Books:

1. API RP 2A., "Planning Designing and Constructing Fixed Offshore Platforms", API
2. McClelland, B &Reifel, M.D., "Planning & Design of fixed Offshore Platforms", VanNostrand, 1986
3. Graff, W.J., "Introduction to Offshore Structures", Gulf Publ. Co. 1981.
4. Reddy, D.V &Arockiasamy, M., "Offshore Structure" Vol.1 & 2,

Course Outcomes:

CO1: To classify types of offshore structure and know its basic fundamental knowledge.
CO2: To analyze various loads and their response on the structure.
CO3: To describe process involving deck layout and oil & gas treatment.
CO4: To outline key feature of platform, foundation and pipelines installation.
CO5: To identify and select appropriate material for construction.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE20STPE05B	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Surface Hydrology	3	0	0	15	15	30			

Course Learning Objectives:

- To understand the fundamentals of hydrology and concepts of watershed
- To study the analysis of rainfall and its components.
- To understand the estimation techniques of evapo-transpiration and infiltration
- To learn various types of Hydrographs and its uses.
- To know the Flood estimation and Flood routing methods

Course Content:

UNIT 1: Introduction: Scope and importance of hydrology, Hydrologic cycle, Global and India's Water resources, Applications of hydrology, Formation of precipitation, Climate and Weather seasons in India. Watershed concept and modeling: Catchment-topographic and ground water divide, Description of the catchment, catchment processes, demarking a catchment, stream patterns.

UNIT 2: Location of rain-gauges and optimum number of rain-gauges, Analysis of rainfall data, Rainfall mass curve and hyetograph, Intensity-Duration analysis, Intensity-Frequency-Duration analysis, Depth-Area-Duration analysis, Double mass curve. Abstractions from precipitation: Evaporation-Process, measurement, empirical equations and Estimation by water budget method and Energy budget method.

UNIT 3: Evapo-transpiration-AET & PET, Estimation by Penman's equation, Reference Crop Evapo-transpiration by Blaney Criddle formula, Infiltration-Process, Factor affecting infiltration, Measurement, Horton's equation and Philip's equation. Infiltration indices, Probability and Statistics-Introduction, Probability and Random variables, PDF and CDF, Distribution functions, Selection of distribution function and its parameter estimation.

UNIT 4: Hydrograph and its features, Unit hydrograph and its derivation, Unit hydrographs from complex storms and for various durations, S-curve hydrograph and its uses, Synthetic unit hydrograph.

UNIT 5: Flood: Design flood and its estimation- Rational method, Frequency analysis Gumbel's and Log-Pearson's type III distribution, Selection of design return period. Flood routing- Reservoir routing: Channel routing- Prism and Wedge storage, Muskingum method. Flood control: Structural and Non-structural measures.

Text Books:

1. Engineering Hydrology K.Subramanya, Tata McGraw-HillEducation
2. Hydrology Principles, Analysis and Design H.M.Raghunath, New AgeInternational
3. Hand BookofAppliedhydrologyV.T.Chow, McGraw-Hill,Inc
4. ViessmannWandLewisGL(2008)"IntroductiontoHydrology" PrenticeHallofIndia
5. Ojha,C.S.P. Bhunya, P. and Berndtsson, R.- Engineering Hydrology, Oxford University PressCanada.
6. K. C. Patra, Hydrology and Water Resources Engg., Narosa Publishing house, New Delhi.

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

CO1: Describe the basic concepts of hydrology and watershed to incorporate into physical hydrological processes.

CO2: Relate and analyze the various components involved in rainfall analysis.

CO3: Explain the various process, measurement, and estimation of hydrological components

CO4: Formulate the hydrograph's estimation and apply into engineering practices.

CO5: Examine the various statistical methods for Flood studies and can investigate historical datasets.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE208TPE05C	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Bridge Engineering	3	0	0	15	15	30			

Course Learning Objectives:

- To understand the IRC Loadings and Standards for bridge design and to know the important hydrological parameters necessary for bridge design
- To learn the design of slab bridges under various IRC loading cases
- To understand the behaviour of T-beam slab bridge and the design of T-beam bridges
- To evaluate the stresses due to various loads and design of RCC box-culverts
- To study the various forces acting on bridge piers and abutments and the design of abutment and bridge piers

Course Content:

UNIT-1: Brief historical review, Different types of Bridges and span range, Bridge codes, Importance of hydrologic factors in bridge design, Hydraulic geometry, linear water ways, economic span, afflux and scour.

UNIT-2: Design of Reinforced concrete deck slab bridges.

UNIT-3: Design of Reinforced Concrete Tee beam bridges.

UNIT-4: Design of Box culverts.

UNIT-5: Design of Piers and Abutments.

Text Books:

1. Xanthakos, P. P. (1993) Reinforced Concrete Bridges, in Theory and Design of Bridges, John Wiley & Sons, Inc., Hoboken, NJ, USA. doi: 10.1002/9780470172889.ch3
2. Design of Bridge Structures by M A Jayaram, Prentice-Hall Of India Pvt. Limited, 01-Aug-2004 - Bridges - 292 pages
3. Design of Bridges by N. Krishna raju , Oxford and IBH Publishing, ISBN 8120417410, 9788120417410
4. Essentials Of Bridge Engineering, 6/E, Vikctor , Oxford and IBH Publishing, 2007, ISBN 8120417178, 9788120417175

Course Outcome: At the end of the course the students will be able:

CO1: To explain and apply various IRC loadings as per the IRC standards in the design of bridges and also explain the importance of hydrological parameters in bridge design

CO2: To design the slab bridges under various IRC loadings

CO3: To analyse and design the T-beam girder bridges

CO4: To explain the behaviour and design the box-culverts

CO5: To describe the various forces to be considered on pier and abutment and design the bridge abutments and piers

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE208TPE05D	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Traffic Engineering	3	0	0	15	15	30			

Course Objectives:

- To develop the basic knowledge of Traffic Engineering.
- To define Traffic flow characteristic.
- To develop knowledge about traffic control system.
- To understand the parking and highway lighting
- To develop the knowledge of different pollution occurring and its remedial measures.

Course Content:

UNIT 1: Introduction To Traffic Engineering-Definition and Scope of Traffic Engineering. Functions, Organization and Importance of Traffic Engineering. Elements of Traffic Engineering: Vehicular, Driver and Road Characteristics.

UNIT 2: Traffic Flow Parameters -Traffic flow parameters: volume, density, speed and related terms, Relationship between various parameters, Study and analysis of vehicle arrivals, headways, and gap acceptance in traffic flow. Highway Capacity and Level of Service.

UNIT 3: Traffic Control-Definition, functions and importance of traffic control. Methods of traffic control: Traffic signs, Road Markings, and other traffic controls aids. Traffic Regulation. Intersection control and design of traffic signals.

UNIT 4: Parking- Parking survey, types of parking, design of parking places. Lighting-Lantern arrangement, Types of lamp

UNIT 5: Traffic and Environment- Pollution problems of cities, Detrimental effects of traffic on environment, Noise pollution, Air pollution, Vibration, Environmental Impact Assessment.

Text Books:

1. Kadialy L.R., "Traffic Engg. and Transport Planning", 8th edition, Khanna Publishers.
2. Parthachakroborty&Animesh Das, "Principles of Transportation Engineering", PHI.
3. C. JotinKhisty, B. Kent Lal, "Transportation Engineering – An Introduction", PHI.

Course Outcomes:

At the end of this course the student will be able to

CO1: Estimate the basic characteristics of traffic stream

CO2: Conduct traffic flow studies and analyze traffic data

CO3: Design traffic signal systems

CO4: Analyze the parking and highway lighting

CO5: Manage controlling the different pollution occurring in road.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE208TPE05E	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Construction Equipment & Automation	3	0	0	15	15	30			

Course Learning Objectives:

- To understand the factor for equipment selection and cost of owning and operating.
- To expertise in evaluation and analysis of different equipment life.
- To learn the engineering fundamentals of excavating equipments.
- To learn fundamentals of the pile driving and lifting equipments.
- To understand the concreting equipments and techniques and the advanced instruments like GIS etc. In construction.

Course Content:

UNIT 1: Introduction to course & Planning Process of Equipment Factors affecting equipment selection.Cost of Owning and Operating Construction Equipment Elements of ownership cost, Depreciation accounting methods, Cost Estimation using Average Annual Investment method. Use of compounding factors in Equipment cost estimation based on time value method, Operating cost components, Caterpillar method and Peurifoymethod.

UNIT 2: Equipment life and replacement analysis determination of economic life of equipment. Minimum cost method, Maximum profit method, Time value concept

UNIT3: Engineering Fundamentals of Moving Earth Machine Performance-Required power, Available power, Usable power, Performance chart.
Earthmoving and Excavating equipment Bull Dozers, Scrapers, Front end loaders, Excavators, Trucks, Productivity estimation and balancing of interdependant machines

UNIT 4 Piles and Pile driving equipment Pile types, pile hammers, principle of pile hammer, factors affecting pile hammer selection, Types of pile hammer: Drop hammer, Single acting and double acting steam hammers, Diesel hammers, Vibratory pile drivers.
Lifting equipment Cranes, Principles of lifting mechanism of crane, types of cranes-lattice boom crawler crane, lattice boom truck mounted cranes, telescopic boom crane, Tower cranes, Factors affecting lifting capacity of crane, Range diagram.

UNIT 5 Concreting equipment Steps in concrete making process, types of concrete mixer machines, Methods of handling and transporting concrete, Consolidation of concrete, Methods of finishing and curing of concrete.
Aerial and Satellite Surveying: GIS and GPS in Construction; use of Drones for spread out sites; Use of robots for repetitive activities.

Reference Books:

1. Construction Planning and Equipment - R.L.Peurifoy - Tata McGraw Hill, New Delhi
2. Construction Equipment & Planning and Application. - Mahesh VermaAztec Publication.
3. GPS satellite surveying- Alfred Leick, Wiley

Course Outcomes:- At the end of the course students will be able to:

CO1: To apply the knowledge in equipment selection and able to find cost of owning and operating.
CO2: To find the equipment life, which help in comparisons of different equipments.
CO3: To select the earth excavating equipment on the basis of output and different selection factors.
CO4: To decide the pile driving equipment and lifting equipment based on safe working load determination
CO5: To decide the concreting equipment based on the construction project and relate the knowledge on Surveying to the new frontiers of science like GIS, GPS and Remote Sensing.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE208TPE06A	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Low Cost Housing Techniques	3	0	0	15	15	30			

Course Learning Objectives:

- To introduce various housing technique adopted in different zones in country.
- To study various uses of cost effective Technologies.
- To learn needs and innovations of building techniques for low cost construction.
- To learn space norms for low cost construction.
- To learn about building materials and costing of low cost construction.

Course Content:

UNIT-1 An introduction to the subject to understand the various building techniques adopted in different climatic zones of the country, which resulting in varied vernacular expressions.

UNIT–2 Use of cost effective technologies through the use of local materials, up gradation of traditional technologies, prefabrication etc.

UNIT-3 Need for low cost construction, both in the rural and the urban sectors. Innovations of building techniques for low cost construction.

UNIT- 4 Analysis of space norms for low cost buildings. Study of usages pattern of low cost buildings by the habitants.

UNIT- 5 Comparative analysis of building materials and costing.Works of Laurie Baker, Hassan Fathy and other prominent architects.

Text Books:

1. "Building Systems for Low Income Housing", Ashok Kumar Jain; Management Publishing House, 1992
2. "Low Cost Housing in Developing Countries", Guru Charan Mathur; For Centre for Science & Technology of the Non-Aligned and Other Developing Countries, Oxford & IBH Publishing Company, 1993

Course outcomes:

Upon completion of this course students will be able to

CO1: To classify various housing techniques adopted in different zones in country.

CO2: To identify various uses of cost effective Technologies.

CO3: To understand needs and develop innovations of building techniques for low cost construction.

CO4: To explain space norms for low cost construction.

CO5: To analysis about building materials and costing of low cost construction.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE20STPE06B	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Water and Air Quality Modelling	3	0	0	15	15	30			

Course Objectives:

- Understand the idea, methodology and basic tools of water and air quality modelling
- Understand the different modelling approaches, their scope and limitations.
- Understand the fate and transport of pollutants in different water bodies and ambient air.
- Become mindful of a wide range of applications of modelling for the water quality and air pollution.
- Understand Water quality indexing parameters and its application.

COURSE CONTENT:

UNIT I MODELING CONCEPTS: Causal and statistical models-Characteristics- Steps in model development - Importance of model building. - conservation of mass and mass balance – calibration and verification of models; Transport phenomena – Advection, diffusion, dispersion, simple transport models; chemical reaction kinetics – Law of mass action, Rate constants, reaction order, types of reactions, equilibrium principles.

UNIT II WATER QUALITY MODELING: Water quality models – Historical development – Mass balance equation – Streeter - Phelps Equation – Modification to Streeter – Phelps Equation – Waste load allocations – Dissolved oxygen in Rivers and estuaries; Lake Water Quality Models; Models for Nitrogen, Bacteria, Phosphate and toxicants - Ground Water Quality Modeling - Contaminant solute transport equation, Numerical methods.

UNIT III AIR POLLUTION MODELING: Chemistry of air Pollutants - Atmospheric reactions, sinks for air pollution – Transport of air Pollutants - Meteorological settling for dispersal of air pollutants – Vertical structure of temperature and stability, atmospheric motions, Wind and shear, self-cleaning of atmosphere; transport and diffusion of stack emissions – atmospheric characteristics significant to transport and diffusion of stack emission – stack plume characteristics.

UNIT IV AIR QUALITY MODELS: Types of modeling technique, modeling for non-reactive pollutants, single source, short term impact, multiple sources and area sources, Fixed box models- diffusion models – Gaussian plume derivation-modifications of Gaussian plume equation- long term average-multiple cell model- receptor oriented and source-oriented air pollution model performance, accuracy and utilization.

UNIT V Water Quality Index: Categories of water quality index. Determination of water quality index (WQI): Industrial and municipal effluent index, ambient water quality index, combined water quality index and Delphi method. Air Quality Index: Categories of air quality index. Determination of air quality index (AQI): National AQI, Extreme value indices, regional indices.

Reference Books:

1. Arthur C. Stern, Air Pollution, Air Pollutants, their transformation and Transport, (Ed.), (Third Ed.) Volume I., Academic Press, 2006.
2. Chapra, S.C. Surface Water-Quality Modelling, McGraw-Hill, International Edition, 2008
3. Deaton and Wine Brake, Dynamic Modeling of Environmental Systems, Wiley & Sons, 2002
4. E.V. Thomson, Principles of Surface Water Quality Modeling and Control, Happer and Row Publishers New York, 1987.
5. Hadlock, C.R., Mathematical Modelling in the Environment. The Mathematical Association of America.
6. Rastogi A.K. (2008) Numerical Groundwater Hydrology, Penram International Publishing Pvt. Ltd., Bombay.
7. Steven C. Chapra, Surface Water Quality Modeling, Tata McGraw-Hill Companies, Inc., New Delhi, 1997.
8. Wainwright, J and Mulligan, M., Environmental Modelling Finding simplicity in complexity, John Wiley and Sons Inc., New York, 2013.

Course outcomes:

CO1: To provide basic knowledge on mathematical and statistical concepts required for mode development.
CO2: To Develop models based on the mass-balance approach
CO3: To Perform data exploration and visualization
CO4: To Predict the impact of the of external waste loading on different water bodies
CO5: To Design and model of air & water quality and its applicability in the Control of pollution
CO6: To Determine and evaluate the water quality index

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE208TPE06C	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Repair and Rehabilitation of Structures	3	0	0	15	15	30			

Course learning objectives:

- To learn about various distress and damages in concrete and steel structures.
- To learn about assess the damage to structures using various methods.
- To study the various methods of rehabilitation.
- To study the various methods of repairs of structures.
- To learn importance of repair and maintenance of structures.

Course Content:

UNIT 1: Aging of structures – performance of structures – need for rehabilitation. Distress in concrete / steel structures – damage – source – cause – effects – case studies.

UNIT 2: Damage assessment and Evaluation models – Damage testing methods – NDT – Core samples.

UNIT 3: Rehabilitation methods – grouting – detailing – imbalance of structural stability – case studies.

UNIT 4: Methods of repairs – shotcreting – guniting – epoxy – cement mortar injection – crack ceiling.

UNIT 5: Repair and maintenance of buildings – IS standards – Bridge repairs – Seismic strengthening.

Reading/Textbooks:

1. Diagnosis and treatment of Structures in Distress – R.N Raikar.
2. Bridge Rehabilitation – V.K Raina.
3. Building Failures – Diagnosis and Avoidance – W.H Ransom.
4. Forensic Engineering – Kennethe and Carper.

Course outcomes:

Upon completion of this course students will be able to:

CO1: Analyze distress and damages in concrete and steel structures.

CO2: Understand about assess the damage to structures using various methods.

CO3: Classify the various methods of rehabilitation.

CO4: Classify the various methods of repairs of structures.

CO5: Understand the importance of repair and maintenance of structures.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE208TPE06D	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Finite Element Analysis	3	0	0	15	15	30			

Course Objectives:

- To introduce the fundamentals of FEM,
- Understand how it works,
- Implement (code) the method,
- Understand the capabilities of FEM

Course Content:

UNIT 1: Matrix Methods of Structural Analysis – Review of concepts – Actions and displacements – compatibility – indeterminancy – Member and joint loads – Flexibility Matrix formulation - Stiffness Matrix formulation.

UNIT 2: Analysis of Beams- Finite Element formulation and Analysis of beams by Finite Element method.

UNIT 3: Analysis of Rigid Jointed Plane Frame- Finite Element formulation and Analysis of rigid jointed plane frame by Finite Element method.

UNIT 4: Analysis of Pin Jointed Plane Frame- Finite Element formulation and Analysis of pin jointed plane frame by Finite Element method.

UNIT 5: Introduction to Plate and Shell Elements- Analysis of plane stress / strain and ax symmetric solids- triangular, quadrilateral and isoperimetric elements, Analysis of plate bending, basic equations of thin plate theory, Reissinner-Mindlin theory, plate elements and applications. Analysis of shells, degenerated shell elements.

Text Books:

1. Chandrupatla T.R., Belegundu A.D., Introduction to Finite Elements in Engineering, Prentice Hall of India Private Limited, New Delhi.
2. Desai C.S., Abel J.F., Introduction to the Finite Element Method, CBS Publishers & Distributors, Delhi.

Reference Books:

1. Krishnamurthy, C.S., Finite Element Analysis – Theory and Programming, Tata McGraw Hill Publishing Company Limited, New Delhi.
2. Finite Element Analysis – Theory and Programming by Cook R.D. et.al., Concepts and Applications of Finite Element Analysis, John Wile

Course outcomes:

Upon successful completion of this course, you should be able to:

CO1: Understand the concepts behind formulation methods in FEM.

CO2: Identify the application and characteristics of FEA elements such as bars, beams, plane.

CO3: Analyze the rigid and pin jointed plane frame using finite element method.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE208TPE06E	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Design of Hydraulic Structures	3	0	0	15	15	30			

Course Learning Objectives:

- Recognise the different types of dams, identify its purpose and function and to select the most appropriate dam.
- To introduce and give explanation the Principles of Design of Hydraulic Structures.
- To develop understanding for Analysis of gravity dam.
- To develop understanding about Earth dam and stability analysis.
- To introduce the importance of Spillways and energy dissipation systems.

Course Content:

UNIT 1: Introduction - Classification of dams, Gravity dams, Earth dams, Arch dam, Buttress dam, Steel dams, Timber dams, selection of site for dam, selection of type of dam, investigations of dam sites, Engineering surveys, Geological investigations, Types of hydropower plants, site selection for power plant, General arrangement of a hydropower project.

UNIT 2: Principles of Design of Hydraulic Structures - Hydraulic structures on permeable foundations, Theories of subsurface floor, Khosla's method of independent variables, Exit gradient, Location of Hydraulic jump, water surface profiles, scour due to subsurface flow, Design Principles, Energy dissipation principles.

UNIT 3: Gravity Dams - Types of storage head works, Forces acting on gravity dams, Analysis of gravity dams, Profile of a gravity dam, Finite Element Method, Design of gravity dam, joints in gravity dam, Galleries in gravity dam, Adits and shafts, Construction of gravity dam, Foundation Grouting, Instrumentation of gravity dams.

UNIT 4: Earth dams - Types of earth dams, Causes of failure of earth dams, Seepage analysis, phreatic line, flow net construction, criteria for safe design of gravity dams, typical cross sections of earth dams, Stability analysis, Seepage control, and design of filters.

UNIT 5: Spillways and energy dissipation systems - Essential requirements of spillways, Required spillway capacity, component parts of spillway, Types of spillways, Design of Ogee spillway, Design of shaft spillway, Design of siphon spillway, Design of stilling basins. Hydropower structures - Storage power plant, Runoff River plant, Pumped storage plant, Water conveyance systems, Tunnels and Penstocks, Gates, Surge tanks, Power house layout.

Text Books:

1. Golze, A. R., Handbook of Dam Engineering, Von Rostrand Reinhold Co., 1977
2. Sharma, H.D., Concrete Dams, CBIP Publication, 1998.
3. Siddiqui, I H, Dams and Reservoirs: Planning, Engineering, Oxford University Press, USA, 2009.
4. Novak, P., Moffat, A. I. B., Nalluri, C and Narayan, R., Hydraulic Structures, Taylor & Francis, 2006.
5. Modi P.M., Irrigation Water Resources and Hydropower Engineering, Standard Publishing Company, New Delhi, 2000.
6. Arora K.L. Irrigation Water Resources Engineering, Standard Book Publishing Co., Delhi, 1996.

Course Outcomes-

CO1: Define different types of dams.
CO2: Describe the Principles of Design of Hydraulic Structures.
CO3: Explain the concept of Gravity Dams.
CO4: Explain the concept of Earth dams and its stability analysis.
CO5: Describe the concept of spillways and energy dissipation systems.

SYLLABUS	(SEMESTER-VIII)						
Subject Code:	CE208TOE03	CREDITS: 3			SESSIONAL - TA		
Subject:	Open Elective	L	T	P	CT-I	CT-II	TOTAL
		3	-	-	15	15	30
CE208TOE03	Infrastructure Planning and Management						

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE208TOE03	L	T	P	CT-I	CT-II	TOTAL	70	100	03
Subject:	Infrastructure Planning and Management	3	0	0	15	15	30			

Course Learning Objectives:

The students will be able to:

- Understand and explain concepts of infrastructure
- Understand private involvement in infrastructure
- Learn about challenges to successful infrastructure planning and implementation
- Study strategies for successful infrastructure project implementation
- Understand sustainable development of infrastructure

Course Content:

UNIT I AN OVERVIEW OF BASIC CONCEPTS RELATED TO INFRASTRUCTURE: Introduction to Infrastructure, an overview with regards to Indian sectors(i) Power Sector , (ii) Water Supply and Sanitation Sector in India., (iii) Road, Rail, Air and Port Transportation Sectors, (iv) Telecommunications , (v) Urban Infrastructure ,(vi) Rural Infrastructure.

An Introduction to Special Economic Zones, Organizations and layers in the field of Infrastructure, The Stages of an Infrastructure Project Lifecycle,

UNIT II PRIVATE INVOLVEMENT IN INFRASTRUCTURE: A Historical Overview of Infrastructure Privatization. The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization, Challenges in Privatization of Water Supply, Privatization of Infrastructure in India.

UNIT III CHALLENGES TO SUCCESSFUL INFRASTRUCTURE PLANNING AND IMPLEMENTATION: Mapping and Facing the Landscape of Risks in Infrastructure Projects, Economic and Demand Risks, Socio-Environmental Risks, Cultural Risks in International Infrastructure Projects, Legal and Contractual Issues in Infrastructure, Challenges in Construction and Maintenance of Infrastructure.

UNIT IV STRATEGIES FOR SUCCESSFUL INFRASTRUCTURE PROJECT IMPLEMENTATION: Risk Management Framework for Infrastructure Projects, Shaping the Planning Phase of Infrastructure Projects to mitigate risks, Designing Sustainable Contracts, Introduction to Fair Process and Negotiation, Negotiating with multiple Stakeholders on Infrastructure Projects.

UNIT V SUSTAINABLE DEVELOPMENT OF INFRASTRUCTURE: Information Technology and Systems for Successful Infrastructure Management, - Innovative Design and Maintenance of Infrastructure Facilities, Infrastructure Modeling and Life Cycle Analysis Techniques, Capacity Building and Improving the

Government Role in Infrastructure Implementation, An Integrated Framework for Successful Infrastructure Planning and Management - Infrastructure Management Systems and Future Directions.

TEXT BOOKS

1. Grigg, Neil, Infrastructure engineering and management, Wiley, (1988).

2. Haas, Hudson, Zaniewski, Modern Pavement Management, Krieger, Malabar, (1994).

3. Hudson, Haas, Uddin, Infrastructure management: integrating design, construction, maintenance, rehabilitation, and renovation, McGraw Hill, (1997).

Course Outcomes:-
After course completion the students shall be able to:

CO1: Explain the basic concepts related to Infrastructure Projects
CO2: Explain the role of private sector in infrastructure growth.
CO3: Describe the strategies for successful Infrastructure Project implementation.
CO4: Develop Infrastructure modeling and Life Cycle Analysis Techniques.
CO5: Explain Sustainable development of Infrastructure

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE208PPC11	L	T	P	CT-I	CT-II	TOTAL	80	200	08
Subject:	Major Project	0	0	15	-	-	120			