VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE



CIVIL ENGINEERING [VR23] SCHEME OF INSTRUCTIONS B.Tech. PROGRAMME [VR23]

B.Tech. Degree Programs Applicable for the batch of students admitted from the Academic Year 2023-24

VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE (Autonomous, Accredited with 'A+' grade by NAAC) Affiliated to Jawaharlal Nehru Technological University Kakinada Approved by AICTE & ISO 21001: 2018 Certified Kanuru, Vijayawada -520 007, Andhra Pradesh \Box : 0866 2582333

www.vrsiddhartha.ac.in

VELAGAPUDIRAMAKRISHNASIDDHARTHAENGINEERINGCOLLEGESCHE MEOF INSTRUCTIONFOR FOURYEAR UG PROGRAMME [VR23] GROUP-A(AI&DS, AI&ML,CSE,IT)(with effect from 2023-24)

SEMESTER I

CONTACTHOURS:27

S. No	Course Code	Course Category	Course Name	L	Т	Р	Credits
1.	23BS1101	Basic Science	Linear Algebra & Calculus	3	0	0	3
2.	23BS1102	Basic Science	Engineering Physics	3	0	0	3
3.	23ES1103A	Engineering Science	Basic Civil and Mechanical Engineering	3	0	0	3
4.	23ES1104	Engineering Science	Introduction to Programming	3	0	0	3
5.	23HS1105	Humanities and Social Science	Communicative English	2	0	0	2
6.	23BS1151	Basic Science	Engineering Physics Lab	0	0	2	1
7.	23ES1152	Engineering Science	Computer Programming Lab	0	0	3	1.5
8.	23HS1153	Humanities and Social Science	Communicative English Lab	0	0	2	1
9.	23ES1154	Engineering Science	Engineering Workshop	0	0	3	1.5
10.	23ES1155	Engineering Science	IT Workshop	0	0	2	1
11.	23BS1156	Basic Science	NSS/NCC/Community Service	-	-	1	0.5
			Total :	14	0	13	20.5
12.	23MC1106	Mandatory Course	Induction Program				

Category	Credits
Basic Science Courses	3 +3+1 + 0.5 =7.5
Engineering Science Courses	3+3+1.5+1.5+1=10
Humanities and Social Science Courses	2+1=3
Mandatory Courses	0
TOTALCREDITS	20.5

SEMESTER II

CONTACTHOURS:26

S.No	Course	Course Category	Course Name	L	Т	Р	Credits
	Code						
1.	23BS2101	Basic Science	Differential Equations & Vector Calculus	3	0	0	3
2.	23BS2102B	Basic Science	Chemistry	3	0	0	3
3.	23ES2103B	Engineering Science	Basic Electrical and Electronics Engineering	3	0	0	3
4.	23PC2104A	Professional Core	Data Structures	3	0	0	3
5.	23ES2105	Engineering	Engineering Graphics	1	0	4	3
		Science					
6.	23BS2151B	Basic Science	Chemistry Lab	0	0	2	1
7.	23PC2152A	Professional Core	Data Structures Lab	0	0	3	1.5
8.	23ES2153	Engineering	Basic Electrical and Electronics Workshop	0	0	3	1.5
		Science					
9.	23BS2154B	Basic Science	Health and wellness, Yoga and Sports	-	-	1	0.5
			Total	13	0	13	19.5

Category	Credits
Basic Science Courses	3+3+1+0.5=7.5
Engineering Science Courses	3+3+1.5=7.5
Professional Courses	3+1.5 = 4.5
Humanities and Social Science Courses	0
Mandatory Courses	0
TOTALCREDITS	19.5

VELAGAPUDIRAMAKRISHNASIDDHARTHAENGINEERINGCOLLEGESCHE MEOF INSTRUCTIONFOR FOURYEAR UG PROGRAMME [VR23] <u>GROUP-B</u> (CE,ME, ECE,EEE, EIE) (with effect from2023-24)

SEMESTER I

CONTACTHOURS: 26

S.No	Course Code	Course Category	Course Name	L	Т	Р	Credits
1.	23BS1101	Basic Science	Linear Algebra & Calculus	3	0	0	3
2.	23BS1102A	Pasia Science	Engineering Chemistry (CE,ME)	3	0	0	3
	23BS1102B	Basic Science	Chemistry (ECE, EEE, EIE)				
3.	23ES1103B	Engineering Science	Basic Electrical and Electronics	3	0	0	3
			Engineering				
4.	23ES1104	Engineering Science	Introduction to Programming	3	0	0	3
5.	23ES1105	Engineering Science	Engineering Graphics	1	0	4	3
6	23BS1151A	Basic Science	Engineering Chemistry Lab (CE,ME)	0	0	2	1
0.	23BS1151B	Dasic Science	Chemistry Lab (ECE, EEE, EIE)				
7.	23ES1152	Engineering Science	Computer Programming Lab	0	0	3	1.5
8.	23ES1153	Engineering Science	Basic Electrical and Electronics Workshop	0	0	3	1.5
9.	23BS1154B	Basic Science	Health and wellness, Yoga and Sports	-	-	1	0.5
			Total :	13	0	13	19.5
10.	23MC1106	Mandatory Course	Induction Program				

Category	Credits
Basic Science Courses	3+3+1+0.5=7.5
Engineering Science Courses	3+3+3+1.5+1.5=12
Humanities and Social Science Courses	0
Mandatory Courses	0
TOTALCREDITS	19.5

SEMESTER II

CONTACTHOURS: 27

S.No	Course Code	Course Category	Course Name	L	Т	Р	Credits
1.	23BS2101	Basic Science	Differential Equations & Vector Calculus	3	0	0	3
2.	23BS2102	Basic Science	Engineering Physics	3	0	0	3
3.	23ES2103A	Engineering Science	Basic Civil and Mechanical Engineering	3	0	0	3
4.	23PC2104B		Engineering Mechanics (CE, ME)	3	0	0	3
	23PC2104C	Professional Core	Network Analysis (ECE, EIE)				
	23PC2104D		Electrical Circuit Analysis - I (EEE)				
5.	23HS2105	Basic Science	Communicative English	2	0	0	2
6.	23BS2151	Basic Science	Engineering Physics Lab	0	0	2	1
7.	23PC2152B		Engineering Mechanics & Building Practices (CE)	0	0	3	1.5
	23PC2152C	Professional Core	Network Analysis & Simulation Lab (ECE, EIE)				
	23PC2152D	FIOLESSIONAL COLE	Electrical Circuit Analysis Lab (EEE)				
	23PC2152E		Engineering Mechanics Lab (ME)				
8.	23HS2153	Basic Science	Communicative English Lab	0	0	2	1
9.	23ES2154	Engineering Science	Engineering Workshop	0	0	3	1.5
10.	23ES2155	Engineering Science	IT Work shop	0	0	2	1
11.	23BS2156	Basic Science	NSS/NCC/Community Service	-	-	1	0.5
			Total :	14	0	13	20.5

Category	Credits
Basic Science Courses	3 +3+ 1+0.5=7.5
Engineering Science Courses	3+1.5+1=5.5
Humanities and Social Sciences	2+1=3
Mandatory Courses	0
Professional Core	3 + 1.5 = 4.5
TOTALCREDITS	20.5

SEMESTER III

CONTACT HOURS: 27

S.No	Course Code	Course Category	Course Name	L	Т	Р	Credits
1	23BS3101A	BS	Mechanics of Solids	3	0	0	3
2	23HS3102	BS & H	Universal Human Values 2	2	1	0	3
			Understanding Harmony				
3	23ES3103A	ES	Engineering Geology	1	0	2	2
4	23CE3304	PC	Surveying and Geomatics	3	0	2	4
5	23CE3305	PC	Fluid Mechanics	3	0	0	3
6	23TP3106	Soft Skills-1	Logic and Reasoning	0	0	2	1
7	23MC3107B	Audit Course	Environmental Science	2	0	0	-
8	23CE3308	PC	Concrete Technology	2	0	2	3
9	23CE3651	Skill Enhancement	Computer Aided Civil	0	0	2	1
		Course	Engineering Drawing				
Total					1	10	20

Category	Credits
Basic Science Courses	3
Engineering Science Courses	2
Humanities and Social Sciences	3
Mandatory Courses	0
Skill Enhancement Courses	2
Professional Core	4+3+3
TOTALCREDITS	20

SEMESTER IV

CONTACT HOURS: 29

S.No	Course Code	Course Category	Course Name	L	Т	Р	Credits
1	23HS4101	Management Course	Engineering Economics and	2	0	0	2
			Management				
2	23BS4102A	ES/BS	Probability and Statistics for	3	0	0	3
			Engineers				
3	23CE4303	PC	Structural Analysis	3	0	0	3
4	23CE4304	PC	Geotechnical Engineering	3	0	2	4
5	23CE4305	PC	Hydraulics and Hydraulic	3	0	2	4
			Machines				
6	23TP4106	Soft Skills-2	English for Professionals	0	0	2	1
7	23MC4107A	MC	Building Materials and	2	0	0	-
			Construction				
8	23CE4651	Skill Enhancement	Autodesk, Rivet and Excel for	0	0	2	1
		Course	Engineers				
9	23ES4152	ES	Design Thinking & Innovation	1	0	2	2
10	23CE4353	PC Lab 1	Strength of Materials Lab	0	0	2	1
			Total	17	0	12	21

Mandatory Community Service Project Internship of 08 weeks duration during summer vacation					
Category	Credits				
Basic Science Courses	3				
Engineering Science Courses	2				
Management Courses	2				
Mandatory Courses	0				
Skill Enhancement Courses	1+1				
Professional Core	3+4+4+1				
TOTALCREDITS	21				

SEMESTER V

CONTACTHOURS: 33

S.No	Course Code	Course Category	Course Name	L	Т	Р	Credits
1	23CE5301	Program Core	Water Resources	3	0	0	3
			Engineering				
2	23CE5302	Program Core	Environmental Engineering	2	0	2	3
3	23CE5303	Program Core(Group B)	Design of Concrete	3	0	0	3
			Structures				
4	23CE5404	ProgramElective1		3	0	0	3
5	23CE5205	Open Elective/Job oriented	A) Geospatial Technologies	2	0	2	3
		elective-1	B) Building Services				
			Engineering				
6	23CE5351	ProgramCoreLab1	Computer Applications in	0	0	3	1.5
			Civil Engineering Lab1				
7	23CE5352	Program Core Lab 2	Advanced Surveying Lab	0	0	3	1.5
8	23TP5106	SoftSkills–3	Personality Development	0	0	2	1
9	23CE5354	Internship/Project(6weeks)	EPICS/Internship	0	0	4	2.0
10	23CE5607	SkillOrientedcourse-2	Building Information	0	0	2	1.0
			Modeling(BIM)				
11	23MC5108 B	Mandatory Course (AICTE	Biology for Engineers /				
		suggested)	Foreign Languages	2	0	0	-
			(German/French)/Law for				
			Engineers/Sanskrit Bhasa/				
			Yoga & Meditation/				
			Psychology		-		
			Total	15	0	18	22
		Honors/Minor Cours	es	3	0	0	3

Category	Credits
Program Core Courses	12.0
Humanities and Social Sciences	0
Program Elective Courses	3
Open Elective Courses	3
Skill Oriented courses	2
Internship/Project	2.0
Mandatory Course	0
TOTALCREDITS	22

SEMESTER VI

CONTACTHOURS: 30

S. No	Course Code	Course Category	Course Name	L	Т	Р	Credits
1	23CE6301	Program Core	Design of Steel Structures	3	0	0	3
2	23CE6302	Program Core	Transportation Engineering	3	0	2	4
3	23CE6403	ProgramElective2		3	0	0	3
4	23CE6404	Program Elective 3		3	0	0	3
5	23CE6205	Open Elective /Job oriented elective-2 (NPTEL)		3	0	0	3
6	23CE6408	Program Elective 4		3	0	0	3
7	23CE6351	ProgramCoreLab1	STAAD and ETABS	0	0	2	1
8	23HS6152	Humanities & Social Science	English and Communication Skills Lab	0	0	2	1
9	23TP6106	SoftSkills-4	Quantitative Aptitude	0	0	2	1
10	23CE6554	Internship/Project	Mini Project–I	0	0	2	1
11	23MC6107 B	Mandatory Course (AICTE suggested)	Technical Paper Writing & IPR	2	0	0	0
			Total	20	0	10	23

Industrial/Research Internship six weeks(Mandatory) during summer vacationHonors/Minor Courses3003

Note: Open Elective Courses 2 is self-learning. Students may opt from any MOOCS platform. They have to submit the certificate before the last instruction day of VI Semester.

Category	Credits
Program Core Courses	8
Humanities and Social Sciences	0
Program Elective Courses	9
Open Elective Courses	3
Skill Oriented courses	2
Mandatory Course	0
Internship/Project	1
TOTALCREDITS	23

SEMESTER VII

CONTACTHOURS: 29

S.No	Course Code	Course Category	Course Name	L	Т	Р	Credits
1.	23CE7301	Program Core	Estimation, Specifications and Contracts	3	0	2	4
2.	23CE7302	Program Core	Foundation Engineering	3	0	0	3
3.	23CE7403	ProgramElective5		3	0	0	3
4.	23CE7205	Open Elective/ Job Oriented Elective-3	 A) Green Buildings and Sustainability B) Advanced Construction Materials C) Quality Control and Quality Assurance 	3	0	0	3
5.	23CE7206	Open Elective/ Job Oriented Elective-4 (NPTEL/ SELF LEARNING)		3	0	0	3
6.	23CE7607	Advanced Skill Course	Computer Aided Construction Management	2	0	2	3
7.	23CE7551	Internship/Project	Mini Project-II	0	0	3	1.5
8.	23CE7552	Internship/ Project	Industrial/Research Internship	0	0	3	1.5
9.	23MC7108B	Audit Course	Constitution of India	2	0	0	0
			Total	19	0	10	22

Note: Open Elective Courses 4 is self-learning. Students may opt from any MOOCS platform. They have to submit the certificate before the last instruction day of VII Semester.

Category	Credits
Program Core	7
Program Electives	3
Open Electives	6
Skill Oriented Courses	3
Internship/Project	3
TOTALCREDITS	22

SEMESTER VIII

CONTACTHOURS:24

S.No	Course Code	Course Category	Course Name	L	Т	Р	Credits
1.	23CE8551	Internship/Project	Major Project and Internships (6 Months)	0	0	24	12
			Total	0	0	24	12

LIST OF OPEN ELECTIVES:

SEMESTER – V

23CE5205: Open Elective/Job oriented elective - 1

- A) Geospatial Technologies
- B) Building Services Engineering

SEMESTER – VI

23CE6205: Open Elective /Job oriented elective - 2

SEMESTER - VII

23CE7205: Open Elective /Job oriented elective - 3

- A) Green Buildings and Sustainability
- B) Advanced Construction Materials
- C) Quality Control and Quality Assurance

23CE7206: Open Elective /Job oriented elective - 4

- Note: Open Elective Courses 2 is self-learning. Students may opt from any MOOCS platform. They have to submit the certificate before the last instruction day of VI Semester.
- Note: Open Elective Courses 4 is self-learning. Students may opt from any MOOCS platform. They have to submit the certificate before the last instruction day of VII Semester.



DEPARTMENT OF CIVIL ENGINEERING V. R. SIDDHARTHA ENGINEERING COLLEGE (Autonomous) VIJAYAWADA – 520 007

LIST OF COURSES OFFERED UNDER WINORS									
S.No	Course Code	Course Name	L	Т	Р	Credits			
Fourt	h Semester								
1	23CEM4701	Introduction to Civil Engineering – Concepts and Materials	3	0	0	3			
Fifth	Semester								
2	23CEM5701	Methodology for Civil Engineering Construction	3	0	0	3			
Sixth	Semester								
3	23CEM6701	System Design For Sustainability	3	0	0	3			
4	23CEM6702	Ecology And Environment	3	0	0	3			
Seven	th Semester								
5	23CEM7701	Infrastructure And Transportation System Planning	3	0	0	3			
6	23CEM7702B	NPTEL-Mandatory (Course Based on Availability)	3	0	0	3			

LIST OF COURSES OFFERED UNDER MINORS

Note: 5 courses, 5x3=15 credits, One Mandatory NPTEL Course- 3 credits, total 18 credits

LIST OF COURSES OFFERED UNDER HONORS

S. No.	Course Code	COURSE NAME		Т	Р	Credits
FOUR	FH SEMESTER					I
1	23CEH4801A	Stability of Structures	3	0	0	3
2	23CEH4801B	Sustainable Construction Methods	3	0	0	3
3	23CEH4801C	Design of Formwork	3	0	0	3
FIFTH	SEMESTER					I
4	23CEH5801A	Engineering Rock Mechanics	3	0	0	3
5	23CEH5801B	Advanced Steel Design	3	0	0	3
6	23CEH5801C	Geospatial Data Processing	3	0	0	3
SIXTH	SEMESTER					
7	23CEH6801A	Traffic Analysis and Design	3	0	0	3
8	23CEH6801B	Transportation Economics	3	0	0	3
9	23CEH6801C	Advanced Foundation Engineering	3	0	0	3
10	23CEH6801B1	NPTEL Mandatory (Course Based on Availability)	3	0	0	3
SEVEN	TH SEMESTER					
11	23CEH7801A	Geo Synthetics and Reinforced Soil Structures	3	0	0	3
12	23CEH7801B	Intelligent Transportation Systems	3	0	0	3
13	23CEH7801C	Environmental Impact Assessment	3	0	0	3
14	23CEH6802B1	NPTEL Mandatory(Course Based on Availability)	3	0	0	3

Note:

Can opt One course in Each Semester, 4x3=12 Credits, additionally **2 Mandatory NPTEL Courses**, 2x3=6 Credits, total 18 Credits. For Eligibility & Registration: Must follow all the academic regulations related to Honors & Minors

PROGRAMELECTIVES:

SEMESTER V(P.E-I)

S.No	Course Code	Course	Subject	L	Т	P	Credits
1	23CE5404/A	ProgramElective-1	Advanced structural analysis	3	0	0	3
2	23CE5404/B	ProgramElective-1	Town planning & Architecture	3	0	0	3
3	23CE5404/C	ProgramElective-1	Air pollution and Control	3	0	0	3
4	23CE5404/D	ProgramElective-1	Environmental Geotechnology	3	0	0	3
5	23CE5404/E	ProgramElective-1	Forensics in Civil Engineering	3	0	0	3

SEMESTER VI(P.E-II)

S.No	Course Code	Course	Subject	L	Т	Р	Credits
1	23CE6403/A	ProgramElective-2	Advanced Design of concrete	3	0	0	3
			structures				
2	23CE6403/B	ProgramElective-2	Advanced Environmental	3	0	0	3
			Engineering				
3	23CE6403/C	ProgramElective-2	Railway and Tunnel Engineering	3	0	0	3
4	23CE6403/D	ProgramElective-2	Groundwater Hydrology	3	0	0	3
5	23CE6403/E	ProgramElective-2	Plumbing - Water and Sanitation	3	0	0	3

SEMESTER VI (P.E-III)

S.No	Course Code	Course	Subject	L	Т	P	Credits
1	23CE6404/A	ProgramElective-3	Analysis and Design of High	3	0	0	3
			Rise Building				
2	23CE6404/B	ProgramElective-3	Solid Waste Management	3	0	0	3
3	23CE6404/C	ProgramElective-3	Ground Improvement Techniques	3	0	0	3
4	23CE6404/D	ProgramElective-3	Urban Transport Planning	3	0	0	3
		C					
5	23CE6404/E	ProgramElective-3	Open channel flow & River	3	0	0	3
		-	Engineering				

SEMESTER VI(P.E-IV)

S.No	Course Code	Course	Subject	L	T	P	Credits
1	23CE6408/A	ProgramElective-4	Prefabricated Structures	3	0	0	3
2	23CE6408/B	ProgramElective-4	Construction Equipment and Automation	3	0	0	3
3	23CE6408/C	ProgramElective-4	Instrumentation and Sensor Technology in Civil Engineering	3	0	0	3
4	23CE6408/D	ProgramElective-4	Airport and Harbour Planning	3	0	0	3
5	23CE6408/E	ProgramElective-4	Design and Drafting using REVIT	3	0	0	3

SEMESTERVII-(PE-V)

S.No	Course Code	Course	Subject	L	Т	Р	Credits
1	23CE7403/A	ProgramElective-5	Design of Prestressed Concrete	3	0	0	3
2	23CE7403/B	ProgramElective-5	Repair and Rehabilitation of	3	0	0	3
			Structures				
3	23CE7403/C	ProgramElective-5	Disaster Preparedness & Planning	3	0	0	3
			Management				
4	23CE7403/D	ProgramElective-5	Pavement design and	3	0	0	3
			Construction				
5	23CE7403/E	ProgramElective-5	Rural Water Supply and	3	0	0	3
			Sanitation				

S.No	Specialization		Program Electives								
		Elective1	Elective2	Elective3	Elective4	Elective5					
1	Structural	Advanced	Advanced		Prefabricated	Design of Prestressed					
	Engineering	Structural	Design of		Structures	Concrete					
		Analysis	Concrete								
			Structures								
2	Geotechnical	Environmental		Ground							
	Engineering	Geotechnology		Improvement							
				Techniques							
3	Environmental	Air pollution and	Advanced	Solid Waste		Rural Water Supply					
	Engineering	Control	Environmental	Management		and Sanitation					
			Engineering								
4	Transportation		Railway and	Urban	Airport and	Pavement Design and					
	Engineering		Tunnel	Transport	Harbour	Construction					
			Engineering	Planning	Planning						
5	Hydrology &Water		Groundwater	Open channel							
	Resources		Hydrology	flow & River							
	Engineering			Engineering							
6	Industry			Analysis and	Design and						
	Oriented			Design of	Drafting using						
	Courses			High Rise	REVIT						
				Buildings							
7	Miscellaneous	Town planning	Plumbing - Water		Construction	Repair and					
		&Architecture	and Sanitation		Equipment and	Rehabilitation					
					Automation	Of Structures					
8		Forensics in Civil			Instrumentation and	Disaster Preparedness					
		Engineering			Sensor Technology	& Planning					
					in Civil	Management					
					Engineering						

	BS	ES	HS	PC	PE	OE	SC/SO	PROJ	Total
Sem-1	7.5	12	0	0	0	0	0	0	19.5
Sem-2	7.5	5.5	3.0	4.5	0	0	0	0	20.5
Sem-3	3	2.0	3.0	10	0	0	2	0	20
Sem-4	3	4	0	12.0	0	0	2	0	21
Sem-5	0	0	0	12.0	3	3	2	2.0	22
Sem-6	0	0	0	8.0	9	3	2	1	23
Sem-7	0	0	0	7	3	6	3	3	22
Sem-8	0	0	0	0	0	0	0	12	12
Total	21	23.5	6.0	53.5	15	12	11	18	160

CREDIT DISTRIBUTION - Category wise and Semester wise

SCHEME OF INSTRUCTIONS

23BS3101A

MECHANICS OF SOLIDS

Course Category:	Basic Science	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:	Engineering Mechanics	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon	on successful completion of the course, the student will be able to :												
		CO1	Und	erstan	d the c	oncept	s of st	esses,	strain	s and p	rincipl	es stre	sses a	ind stra	ins.
		CO2	Dete	Determine the shear forces and bending moments Determine the bending stresses and deflection at any point subjected to loads. Determine the shear stress in beams, torsion in shafts, strain energy.											
		CO3	Dete												
		CO4	Dete												
		CO5	Dete	Determine the compound stresses and behavior of columns.											
Contribution of Course Outcomes towards		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	P O 12	PSO 1	PSO 2
achievement of Program	CO1	3	2	2		3						2		1	3
Outcomes	CO2	3	2	2		3						1		1	3
Medium, 3– High)	CO3	3	2	2		3						1		1	3
	CO4	3	2	2		3						1		1	3
	CO5	3	2	2		3						1		1	3
Course Content	UNIT STRI Stress Poiss them probl SHE	T – I ESSES s and on's r – Ba ems. C AR FC	AND strain atio an urs of Concep DRCE	STRA STRA	AINS ooke's umetri ng sec incipa BEND g Mon	law c strai tion – l Stress ING M nent di	-tensic n – E compo ses and IOMEI agrams	on -cc lastic bsite b l Strain NT s of sta	ompress moduli ars – ns. tically	sion a i and t Tempo deterr	nd sh he rel erature ninate	ear-L ations stre beam	ateral ship be sses- S	strain, tween Simple	

	UNIT – II FLEXURAL STRESSES Theory of simple bending – Assumptions – Derivation of bending equation - Neutral axis –Determination of bending stresses – Section modulus of across various beam sections.
	SLOPE AND DEFLECTION Relationship between moment; slope and deflection; Macaulay's method; Moment area method; Use of these methods to calculate slope and deflection for determinant beams– Simple problems;Castigliano's theorem.
	UNIT – III SHEAR STRESSES AND TORSION
	Derivation of formula of shear stress– Shear stress distribution across various beam sections - Derivation of torsion equation and its assumptions; Applications of the equation of the hollow and solid circular shafts; Torsional rigidity; Simple problems.
	STRAIN ENERGY
	Introduction; Derivation of expressions for elastic strain energy in uni -axial stress; elastic strain energy in pure bending; elastic strain energy for shearing stresses; elastic strain energy of a bar in pure torsion.
	UNIT – IV
	COMPOUND STRESSES Introduction; Principle of superposition and its limitation; Stress distribution on various cross sections of members due to eccentric loads; Middle third rule; Core or Kernel of a section.
	COLUMNS Introduction, Stability of equilibrium; The Euler's formula for columns with different end restraints; Limitations of the Euler's formulas; Generalized Euler buckling – load formulas;
Text books	 [T1] Er.R.K.Rajput, "Strength of Materials(Mechanics of solids)", S.Chand& Company Ltd, New Delhi. [T2] S.Ramamrutham& R Narayan, "Strength of Materials", DhanpatRai Publishing
	Co.(P) Ltd, New Delhi.
Reference books	 [R1] S SBhavikatti, "Structural Analysis", V K Publishers. [R2] S P Timoshenki& D H Young, "Theory of structures". [R3] E P Popov, "Mechanics of materials", Prentice-hall of India Pvt. Ltd., New Delhi.
E-resources and other digital material	http://nptel.ac.in/courses/105105108/

23HS3102	UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY

Course Category:	Humanities and Social Sciences	Credits:	3
Course Type:	Mandatory course (suggested by AICTE)	Lecture - Tutorial - Practice:	2-1-0
Prerequisites:	None. Universal Human Values 1 desirable.	Continuous Evaluation: Semester end Evaluation: Total Marks:	50 50 100

Course outcomes		Upon successful completion of the course, the students will be able to:													
		CO1	unde natur	nderstand and aware of themselves and their surroundings(family, society and ature).											
		CO2	hand huma	Indle problems with sustainable solutions, while keeping human relationships and Iman nature in mind.											
	CO3	exhil unde	whibit critical ability and become sensitive to their commitment towards their nderstanding of human values, human relationship and human society.												
	CO4	apply life.	apply what they have learnt to their own self in different day-to-day settings in real life.												
Contribution		PO	PO	PO	PO	PO	PO	РО	PO	PO	PO	PO	PO	PSO	PSO
of Course Outcomes		1	2	3	4	5	6	7	8	9	10	11	12	1	2
towards achievement	CO1						1			2					
of Program Outcomes	CO2			3											
(1 – Low, 2 - Medium, 3 –	CO3						2								
High)	CO4								3				2		

Course Content	UNIT – I:
	COURSE INTRODUCTION, NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION:
	PART-1: Purpose and motivation for the course, recapitulation from UHV-I, Self-exploration: what is it?, its content and process, 'Natural acceptance' and experiential validation- as the process for self-exploration. Continuous Happiness and Prosperity – A look at basic Human Aspirations
	PART-2: Right understanding, Relationship and Physical Facility – the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly – A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels. (Practice sessions are to be included to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking).
	UNIT – II: UNDERSTANDING HARMONY IN THE HUMAN BEING – HARMONY IN MYSELF: PART-1: Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' – happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). PART-2: Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health. (Practice sessions are to be included to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs. dealing with disease).
	UNIT – III: UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY – HARMONY IN HUMAN-HUMAN RELATIONSHIP: PART-1: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. PART-2: Understanding the harmony in the society (society being an extension of family); Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society–Undivided Society, Universal Order–from family to world family. (Practice sessions are to be included to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education, etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives).
	UNIT – IV: PART-1:UNDERSTANDING HARMONY IN NATURE & EXISTENCE – WHOLE EXISTENCE AS COEXISTENCE: Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of Nature – recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence. PART-2: IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS: Natural acceptance of human values, Definitiveness of ethical human conduct, Basis for humanistic education, humanistic constitution and humanistic universal order, Competence in professional ethics: a) ability to utilize the professional competence for augmenting universal human order, b) ability to identify the scope and

	characteristics of people-friendly and eco-friendly production systems, c) ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) at the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) at the level of society: as mutually enriching institutions and organizations. (Part-1:Practice sessions are to be included to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology, etc. Part-2: Practice exercises and case studies are to be taken up in practice (tutorial) sessions eg. to discuss the conduct as an engineer or scientist, etc.)
Text books	[T1] Human values and professional ethics, R. R. Gaur, R. Sangal and G. P. Bagaria, Excel Books Private Limited, New Delhi (2010).
Reference books	 [R1] JeevanVidya: EkParichaya, A. Nagaraj, JeevanVidyaPrakashan, Amarkantak (1999). [R2] Human Values, A. N. Tripathi, New Age International Publishers, New Delhi (2004). [R3] The Story of Stuff: The impact of overconsumption on the planet, our communities, and our health and how we can make it better, Annie Leonard, Free Press, New York (2010). [R4] The story of my experiments with truth: Mahatma Gandhi Autobiography, Mohandas Karamchand Gandhi, B. N. Publishing (2008). [R5] Small is beautiful: A study of economics as if people mattered, E. F. Schumacher, Vintage Books, London (1993). [R6] Slow is beautiful: New Visions of Community, Cecile Andrews, New Society Publishers, Canada (2006). [R7] Economy of Permanence, J. C. Kumarappa, Sarva-Seva-SanghPrakashan, Varanasi (2017). [R8] Bharat Mein Angreji Raj, PanditSunderlal, PrabhathPrakashan, Delhi (2018). [R9] Rediscovering India, Dharampal, Society for Integrated Development of Himilayas (2003). [R10] Hind Swaraj or Indian Home Rule, M. K. Gandhi, Navajivan Publishing House, Ahmedabad (1909). [R11] India Wins Freedom: The Complete Version, MaulanaAbulKalam Azad, Orient Blackswan(1988). [R12] The Life of Vivekananda and the Universal gospel, Romain Rolland, AdvaithaAshrama, India (2010). [R13] Mahatma Gandhi: The Man who become one with the Universal Being, Romain Rolland, Srishti Publishers & Distributors, New Delhi (2002).
E-resources and other digital material	https://www.youtube.com/channel/UCo8MpJB_aaVwB4LWLAx6AhQ https://fdp-si.aicte-india.org/download.php#1

23ES3103A

ENGINEERING GEOLOGY

Course Category:	Engineering Science	Credits:	2
Course Type:	Theory & Practice	Lecture - Tutorial - Practice:	1-0-2
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon	Upon successful completion of the course, the student will be able to:												
		CO1	analy prop	ze and erties.	l class	ify var	ious r	ninera	ls and i	rocks	on the l	oasis o	of thei	r engin	eering
		CO2	apply quantitative skills and frame work for solving basic engineering geology problems related to geological features and geological hazards												
	CO3	unde decis	understand the importance of geo physical methods making engineering decisions specially site selection of engineering projects.												
		CO4	evalı majo	ate g r civil	eolog engin	ical p eering	robleı proj	ns for ects an	a mear d their	ningful enviro	solutionment	on in t al imp	he co pact.	ntext of	Ĩ
Contribution of Course Outcomes		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
towards achievement	CO1	3													3
of Program Outcomes	CO2	3													3
(1 – Low, 2 - Medium, 3–	CO3	3	3		3										3
High)	CO4	3	3		3										3
Course Content	UNIT GEOI 1. INT in Introd proper LAB 1 a.	LOGI FROD var uction rties of EXCE Quar	CAL N UCTIC rious tomine rock f RCISE tz Gro	AATE DN TC eralog Formin -I. Ide up b. 1	E RIAL) ENG Civil y,Mine ag mine entifica Feldspa	S INEE ralIde erals ation c ar gro	RING engin entifica of Com up c. N	GEOL eering utionby umon R Mica G	OGY Physic cock fo roup d	- Scop projec calprop orming . Carbo	be of gets; erties group ponate (geolog N o of M Group	gical stu Vineral Phy linerals	idies ogy- sical	

2. PETROLOGY -Rock cycle Igneous rocks – Formation –Classification and Textures

Sedimentary rocks – Formation –Classification and Textures, Metamorphic rocks and metamorphism – Formation –Classification and Texture, Engineering concerns of rocks

LAB EXCERSISE- II Identification of common rocks

a) Granite b) Basalt c) Diorite d) Sandston e Shale f) Limestone g) Gneiss h) Schist i) Marble

UNIT-II

EARTH PROCESS

1. INTRODUCTION: Weathering, Engineering classification of weathered rocks : Importance of weathering in Civil Engineering. Earth quakes - Causes and effects of earthquakes Earthquake Magnitude and intensity scales. seismic zones of India: Landslides -Classification -Preventive measures

2.Structural geology – Stress –strain behavior of rock, Concept of rock deformation Rock outcrops- Types- strike and Dip; Folds- Types-Effects on construction; Faults-Types-Effects on construction: Joints-Types- Effects on construction

LAB EXCERSISE-III- Identification of structural features on Models.

UNIT-III

GEOLOGICAL AND GEOPHYSICAL INVESTIGATION METHODS

1. MAPS AND THEIR INTERPRETATION- Topographic Map and Geological Map

LAB EXCERSISE-IV- Practicing topographic map cross section, Practicing geological maps and cross section

2. GEOPHYSICAL METHODS- Principles of exploration geophysical Methods Electrical Resistivity method- Interpretation, Seismic refraction method- Interpretation

LAB EXCERSISE-V-Electrical Resistivity survey for civil engineering application

UNIT-IV

GEOLOGICAL INVESTIGATIONS FOR MAJOR PROJECTS

1. DAMS - Types and purpose of Dams , Geological investigation methods for dams:Reservoirs- Failure of reservoirs, Reservoir suitable rocks, Reservoir induced seismicity Tunnels- Site selection for tunnels, Geological investigation methods for Tunnels.

2.ENVIRONMENTAL GEOLOGY—Environmental impact on mining construction materials- aggregate waste disposal- Impact of environment on the construction of dams, reservoirs.

Text books	[T1] F.G. Bell, Fundamental of Engineering Geology, BS Publications PVT Ltd, Hyderabad
	[T2] Parbin Singh, " Engineering and General Geology ", Katson Publication House,
	1987.
	[T3] Principals of Engineering Geology by K.V.G.K. Gokhale – B.S publications
	[T4] Engineering Geology by N.Chennkesavulu, Mc-Millan, India Ltd. 2005.
	[T5] Environmental Geology by K.S Valdia, TaTaMcGraHill, NewDelhi
Reference books	 [R1] Krynine and Judd, "Engineering Geology and Geo techniques "McGraw Hill Book Company, 1990. [R2] Legeet, "Geology and Engineering ", McGraw Hill Book Company, 1998. [R3] Blyth, "Geology for Engineers ", ELBS, 1995. [R4] GoodmanR.F-Introduction to rockmechanics, JohnWiley, Chichestor [R5] S.K Duggal et.al Engineering Geology –McGraw Hill Education, 2002.
E-resources and other	NPTEL Courses
aighaí materiaí	

23CE3304

SURVEYING & GEOMETICS

Course Category:Program CoreCredits:						lits:	4										
Course Type	:	Theory					Lectur	e - Tu	torial ·	Pract	ice:			3 - 0- 2			
Prerequisites	:	Basic N	lathe	matics	-				C	ontinu	ous Ev	aluati	ion:	30	30		
							Semester end Evaluation: Total Marks:							70 100			
Course outcon	mes	Upon	succe	ssful c	omplet	ion of	the cou	rse, the	e stude	nt will	be able	e to:	I				
		CO1	Und usin	Understand the basic principles of surveying and measure linear distances and areas using chain and compass surveying.													
		CO2	Understand and apply the concept of levelling to determine the elevations and contours.														
		CO3	Und angl	Understand the principles of theodolite survey and measure horizontal and vertical angles using theodolite survey.													
		CO4	Eval	Evaluate areas and volumes of various sections													
CO5 Understand various modern field equipments																	
Contribution of Course Outcomes		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		
towards achievement	CO1	2	2	1	1	3			1	3	3	1	1	2	2		
of Program Outcomes	CO2	2	2	1	1	3			1	3	3	1	1	2	2		
(1– Low, 2- Medium, 3	CO3	2	2	1	1	3			1	3	3	1	1	2	2		
– High)	CO4	2	2			2			1	3	3	1	1	2	2		
	CO5	1				2							3				
Course Conte	nt U E	JNIT – I BASICS	OF SU	JRVE	YING:								1				
Surveying definition; Primary divisions; Classification; Principles; Plan and map; Scales us for maps and plans; Accuracy; Precision; Sources of errors; Types of errors.									es used								
CHAIN SURVEYING: Principles of chain surveying; Basic definitions; Different methods; Instruments for Chaining and taping; ranging out; Chaining a line on a flat ground; Chaining on an uneven or a sloping ground: Chain & Tape corrections.										haining sloping							

LABORATORY TESTS:

Determine the area of a given parcel of land by using cross staff and chain survey

• Determine the distance between two points with obstacles in between

UNIT – II LEVELLING:

Basic definitions; Bench marks; Different methods of leveling; Classification of direct leveling methods; Auto level; Leveling staff; Terms used in levelling; Theory of differential Levelling; Levelling field book; Missing entities; Height of Instrument and rise and fall method; Profile leveling; Cross sectioning; Sources of errors in leveling.

CONTOURING:

Contouring; contour interval; Characteristics of contours; Methods of locating contours; Interpolation and Sketching of contours; Uses of contour maps.

LABORATORY TESTS:

• Determination of elevations of various points remote from each other

(Differential leveling)

- Survey and plot the longitudinal and cross sections of a given embankment
- Prepare a contour map of existing ground using an auto level.

$\mathbf{UNIT} - \mathbf{III}$

THEODOLITE SURVEYING:

Main parts of a vernier theodolite; Basic definitions; Fundamental lines; Temporary adjustments; Measurement of a horizontal angle by repetition and reiteration. Measurement of vertical angle; Errors in theodolite surveying.

CIRCULAR CURVES:

Basic definitions; Designation of a curve; Relationship between radius and degree of curve; Elements of a simple curves; setting out of simple curve

LABORATORY TESTS:

- Measurement of horizontal angle by using Repetition method.
- Measurement of horizontal angles by using Reiteration method.
- Measurement of vertical angles using a Vernier theodolite.

UNIT-IV

AREAS & VOLUMES:

Introduction; Area of a tract with straight irregular boundaries; Boundaries with offsets at irregular intervals; Coordinates method; Planimeter: working; Area of cross sections: two level sections only; Volume of a prismoid: Trapezoidal rule; Prismoidal formula; Capacity of a reservoir.

MODERN FIELD SURVEY SYSTEMS EDM:

Principle, Types of EDM instruments; Total Station: Fundamental parameters, Field equipment, Setup, Advantages, Uses; GPS: Functioning, Applications in Civil Engineering.

	 LABORATORY TESTS: Measurement of bearings of an open traverse with prismatic compass and computation of correct included angles. Measurement of bearings of a closed traverse with prismatic compass and computation of area.
Text books	[T1] Surveying, Volume-1 by K. R. Arora; Standard Book House.[T2] Advanced Surveying by SatheeshGopi, R. Sathikumar, N. Madhu; Pearson Education
Reference books	[R1] Surveying, Volime-1 by B.C.Punmia; McGraw Hill Education (India) Private Limited
E-resources and other digital material	https://nptel.ac.in/courses/105/107/105107122/

23CE3305

FLUID MECHANICS

Course Catego	ory:	Pro	Programme Core							Credits: 3						
Course Type:	- v	The	ory						Lectu	re - Tu	ıtorial	- Pra	ctice:	3 - 0-	0	
Prerequisites:		Mat Eng	thema gineer	atics, I ing M	Engine echan	ering ics	Physic	S	Continuous Evaluation: Semester end Evaluation: Total Marks:				tion: ition: arks:	30 70 100		
Course Outcomes	Upon successful completion of the course, the student will be able to:															
	CO1	Evaluate the pressure of the flowing fluid.														
	CO2	Understand the kinematic and dynamic behavior of flow.														
	CO3	App	Apply the principles to measure the flow of fluid through pipes and Orifices.													
L	CO4	Ana	lyze tl	ne flov	v throu	ıgh pip	es.									
Contribution		РО	PO	РО	PO	PO	PO	PO	РО	PO	PO	PO	РО	PSO	PSO	
of Course Outcomes towards		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
	CO1	3	2	3											3	
of Program	CO2	3	2	3											3	
Outcomes	CO3	3	2	3										2	3	
(1 – Low, 2 - Medium, 3 – High)	CO4	3	2	3										2	3	
Course	UNIT I:															
Content	PROPERTIES OF FLUID: Introduction; Properties of Fluid; Units of measurement; Fluid Continuum; Newtonian and Non - Newtonian fluids; Vapour pressure.															
	FLUID Law; A and inc	FLUID STATICS: Variation of static pressure; Pressure the same in all directions – Pascal's Law; Atmospheric, Absolute and gauge pressure; Hydrostatic pressure on horizontal, vertical and inclined plane surfaces.														
	UNIT II:															
	KINEM Steady, onedim Continu	IATI unste ensio uity e	CS OI eady, nal fl quatio	F FLU unifor ows;] on; Vel	ID FL m and Irrotati locity p	OW: N non-ur lonal a potenti	vethod niform nd rot al and ع	s of d flows ationa	lescribi ; Lami 1 flow 1 functi	ng flui nar and s; Stre ion.	d moti d turbu am lir	ion; Cl llent fl ne; Pa	lassific lows; T th line	ation o Three, t ; Strea	of flow; wo and k line;	

	DYNAMICS OF FLUID FLOW: Euler's equation of motion; Bernoulli's equation; Momentum principle; Application of Momentum equation; Force exerted on a pipe bend.
	UNIT III:
	MEASUREMENT OF FLOW THROUGH PIPES: Measurement of flow through Pipes – methods and various devices; Discharge through Venturi meter; Discharge through orifice meter; Measurement of velocity by Pitot tube.
	MEASUREMENT OF FLOW THROUGH ORIFICES: Flow through orifices; Determination of coefficients for an orifice; Flow through small orifice and large rectangular orifice.
	UNIT – IV
	ANALYSIS OF FLOW THROUGH PIPES: Energy losses in pipelines; Darcy – Weishbach equation; Minor losses in pipelines; Pipes in series and parallel.
	LAMINAR FLOW: Relation between shear and Pressure Gradients in Laminar Flow; Reynold's experiment; Critical velocity; Steady laminar flow through a circular pipe – Hagen Poiseuille's Law; Laminar Flow between Parallel Plates – Both plates at rest.
Text books	 [T1] P.N. Modi& S.N. Seth, "Hydraulics & Fluid Mechanics", 18th ed., Standard Book House, New Delhi, 2015. [T2] A.K. Jain, "Fluid Mechanics", 11th ed., Khanna Publishers, New Delhi, 2014.
Reference books	[R1] R. K. Bansal, "Fluid Mechanics and Hydraulic Machines", 9thet., Laxmi Publications; New Delhi, 2015.
	[R2] Rajput R.K., "Fluid Mechanics and Hydraulic Machines", 3 rd ed., S.Chand and Company Ltd., New Delhi, 2014.
	[R3] K. Subramanya, "Theory and Applications of Fluid Mechanics", 3 rd ed., Tata McGraw Hill Publishing Company, New Delhi, 2013.
E-resources	www.nptel.ac.in / courses/ 105101082/
digital material	www.nptel.ac.in/courses/105103095/

23CE3308 CONCRETE TECHNOLOGY

Course Category:	Programme Core	Credits:	3
Course Type:	Theory & Practice	Lecture - Tutorial - Practice:	2-0-2
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcome	Upor	Upon successful completion of the course, the student will be able to:													
				O1 Understand the manufacturing process of cement, types of cements and chemical composition of cement.											
	CO2	Ap	Apply properties of the constituent materials in concrete												
	CO3	An	Analyze and Compare the Properties of fresh and hardened concrete.												
	CO4	. Un	Understand effects of various chemical actions on concrete.												
		CO5	Evaluate various special concretes and concreting methods based on the scenario.												
		CO6	CO6 Evaluate an appropriate concrete mix deign using Indian Standard.												
Contribution of Course Outcomes		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
towards achievement	CO1							2						1	3
of Program Outcomes	CO2	1					1	2						1	3
	CO3			2										1	3
(1 - Low, 2 - Medium, 3 - Uich)	CO4				2		1	2						2	2
nign)	CO5						2	2						2	2
	CO6	1	3	3	2		3	3	2		1		1	2	2

Course Content	UNIT – I
	CEMENT: Introduction to concrete as a structural material,Uses of cement, Chemical Composition of Ordinary Portland Cement, Functions of cement ingredients; Manufacturing process of cement(wetandDry Processes),Hydration of Cement, Heat of Hydration, Water requirements for hydration, Types of cementsOrdinary, Rapid hardening, low-heat, sulphate resisting, Portland slag, Portland pozzolana, High alumina cement, white cement and colored cement properties and their applications;Storage of cement;Field tests for cement.
	LABORATORY TESTS (As per IS Specifications): Fineness of cement, consistency, initial and final setting time, Specific gravity and compressive strength of cement.
	AGGREGATES: Classification of Aggregates; Properties of aggregates Grading of Aggregates; IS: 383 requirements for aggregates; Alkali – Aggregate reaction.
	LABORATORY TESTS (As per IS Specifications): Sieve analysis, specific gravity, bulk density of both fine and coarse aggregate, bulking of sand.
	UNIT – II WATER: Concrede Quality of waters Use of see waters IS: 456 requirements
	wATER. General, Quanty of water, Use of sea water, 15: 456 requirements.
	MORTAR: Functions of sand in mortar; Classification of mortars;Uses of mortar; Properties of good mortar mix and mortar; Selection of mortar.
	ADMIXTURES IN CONCRETE: General; Air–entraining agents; Plasticizers; Accelerators; Retarders; Miscellaneous admixtures for damp proofing and Surface hardening; Introduction to mineral admixtures.
	CONCRETE: Definition;Future demand of concrete - advantages of concrete structures ; Proportioning of concrete; Water – cement ratio; Properties of Fresh Concrete – Workability, Factors Affecting Workability, Segregation; Bleeding; Yield of Concrete.
	LABORATORY TESTS (As per IS Specifications): workability tests on fresh concrete: slump cone, compaction factor.
	UNIT – III MANUFACTURE OF CONCRETE: Batching of concrete; Mixing; Transporting Concrete; Placing concrete; Compaction of concrete; Curing of concrete; Finishing.
	HARDENED CONCRETE: General; Gel / space ratio; Gain of strength with age; Maturity concept of concrete; Elastic properties of concrete; Relation between modulus of Elasticity and strength; Factors affecting modulus of elasticity; Creep; Factors affecting creep; Shrinkage; Plastic shrinkage; Mechanism of shrinkage; Factors affecting shrinkage.
	LABORATORY TESTS (As per IS Specifications): Compressive strength, Effect of height / diameter ratio on strength and failure patterns, flexural strength, split tensile test, Relation between Compressive and Tensile Strength; Introduction to Non-Destructive Tests(Demo on Rebound Hammer Test, Ultrasonic Pulse Velocity Test).
	UNIT – IV DURABILITY OF CONCRETE: Permeability of concrete; Sulphate attack; Methods of controlling sulphate attack; Durability of concrete in sea water; Corrosion mechanism of reinforcement in concrete, Environmental considerations, concrete durability and sustainability, technology for sustainable development.

	 SPECIAL CONCRETES & CONCRETING METHODS: Light weight concrete and No fines concrete; High strength and high performance of concrete; Polymer concrete and Fiber reinforced concrete; Gunite or shotcrete; Ferro cement; Vacuum concrete, Vacuum Dewatered Concrete, Self compacting concrete, Self healing Concrete. CONCRETE MIX DESIGN: Concept of mix design; List of Mix design methods; Indian standard method of mix design (IS10262-2019).
Text books	[T1] Concrete Technology by M. S. Shetty; S. Chand & Company (Pvt.) Ltd., New Delhi.[T2] Properties of Concrete by A. M. Neville; Published by Dorling Kindersley (India) Pvt. Ltd. Licensees of Pearson Education in south Asia, New Delhi.
Reference books	[R1] Concrete Technology by A.R.Santhakumar; Oxford University press,New Delhi[R2] Concrete Technology by M. L. Gambhir; Tata McGraw – Hill Publishing Company Ltd., New Delhi.
E-resources and other digital material	http:/nptel.ac.in/courses/105102012

23CE3651

COMPUTER AIDED CIVIL ENGINEERING DRAWING

Course Category:	Skill Enhancement Course	Credits:	1
Course Type:	Laboratory	Lecture - Tutorial -	0-0-2
		Practice:	
Prerequisites:	Engineering Graphics	Continuous	30
		Evaluation:	70
		Semester end	100
		Evaluation:	
		Total Marks:	

Course outcomes	Upon successful completion of the course, the student will be able to :															
	CO1	app bui	ly the lding	e knov comj	wledg poner	geofVa nts	arious	smeas	urem	entsa	nd dii	nensi	onsofa	l		
	CO2	understandprinciplesofplanning,principlesofarchitectureandbuildin g Bye-laws.														
	CO3	apply the principles of planning to secure building plansasper Building bye-laws														
	CO4	analyze the requirements of user to draw the plan, elevation, sectional view of the building as per principles of planning and NBC														
Contribution of Course Outcomes towards achievement of Program Outcomes		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	
	CO1	1		2												
	CO2	1		2												
(1 – Low, 2-	CO3	1		2										2	2	
High)	CO4	1		2										2		
Course	PARTA															
Content	INTRODUCTION AND THEORY CONCEPTS EXPLANATION FOR THE FOLLOWING:															
	Principlesofplanning&architecture															
	Buildingbye-laws & National BuildingCode															
	Conver	Conventionalsigns and Symbols &Line diagrams														
	Plan, E	levati	on,Se	ctiono	f aBu	ilding	and s	ite pla	n							
	Standar structu	rddimo ral co	ensior mpor	nsofDo nents	oors, v	windo	ws an	dmeas	sureme	entsof	differe	entroo	ms and	l vario	ous	

	(MANUALDRAWING)
	1. Drawing practice of conventional signs and symbols
	2. Drawing practice of Door, window and ventilator (Elevations only with standard measurements
	3. Drawing practice of section of a wall including foundation with specifications
	DESIGN LINE DIAGRAMS AND DRAW PLAN, ELEVATION & SECTION OF THE FOLLOWING:
	4.Residentialbuilding Drawing- Single bedroom,Living room, Kitchen(Load bearingwall structure)
	5. Elevations of various types of Buildings in explanation
	PART-B
	AUTOCAD DRAWING 1. AutoCAD Commands introduction and practice
	Design Line Diagrams and Prepare the approval drawings for local authority with setbacks by drawing Plan, Elevation, Sectionofthefollowing
	 Single storied ResidentialDoublebedroom building (Load bearing structure) Dog legged Stair case RCC Two storied framedstructurebuildingwithstaircase Single storied Rural hospital building/school building Plan
Text books	[T1] Buildingplanning, designing and scheduling by Gurucharan Singh and Jagdish Singh. -Standard Publishers-Delhi.
	[T2] BuildingDrawingbyM.G. Shah, C.M. Kale andS.Y.Patki; TataMcGrawHillPublishingCo.Ltd., New Delhi.
Reference books	 [R1] National Building Code, Bureau of Indian Standards, New Delhi, 2005. [R2] Planning & Designing Buildings by Yashwant S. Sane; Allies Book Stall, Pune [R3]Residential Interior Design: A Guide To Planning Spaces 3rd Edition by Maureen Mitton (Author), Courtney Nystuen (Author)
E-resources and other digital material	www.floorplanner.com

23TP3106

LOGIC & REASONING

Course Category:		Institu	tional	Core					Credits: 1								
Course Type:		Learn	ing by	Doin	g				Lecture - Tutorial - Practice: 0- 0- 2								
Prerequisites:								Continuous Evaluation: Semester end Evaluation: Total Marks:							100 0 100		
Course outco	Upon	Upon successful completion of the course, the student will be able to:															
		CO1	Think reason logically in any critical situation														
		CO2	Analyze given information to find correct solution														
		CO3	To reduce the mistakes in day to day activities in practical life														
		CO4	Develop time management skills by approaching different shortcut methods														
		CO5	Use mathematical based reasoning to make decisions														
	CO6	Apply logical thinking to solve problems and puzzles in qualifying exams for companies and in other competitive exams															
Contributio n of Course Outcomes towards achievemen		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		
	CO1						2										
t of Program	CO2		2														
Outcomes $(1 - Low 2)$	CO3								2								
- Medium, 3– High)	CO4									2							
	CO5	2													<u> </u>		
	CO6	1															
Course Content		UNIT	-I														
		1. 2. 3. 4.	Seri Cod Bloo Puzz	es Con ing-De od Rela zles tes	npletic ecodin ation, st	on, g,											

	UNIT-II
	 Direction sense test, Logical Venn diagrams, Number test, ranking test, Mathematical operations
	 UNIT-III 1. Arithmetical Reasoning, 2. Inserting missing character, 3. Syllogism. 4. Binary logic. 5. Data sufficiency
	UNIT-IV 1. Water images, 2. Mirror images, 3. Paper folding, 4. Paper cutting, 5. Embedded Figures, 6. Dot situation, 7. Cubes & Dice
Text books	 [T1] R. S. Aggarwal, "Verbal and non-verbal reasoning", Revised Edition, S Chand publication, 2017 ISBN:81-219-0551-6, [T2] Reasoning Guru Verbal & Non-Verbal Reasoning by Vikramjeeth, Multilingual Edition-2023. ISBN :978-9358706000
Reference books	
E-resources and other digital material	

Course Category:	Mand		Credit	5:													
Course Type:	Theor	·у]	Lectur Practic	e-Tut :e:	orial-		2-	2-0-0					
Prerequisites :	Conso make	iousne it a be	to (Contin	uous	Evalu	ation:	4(40+40+3+17								
	1					S	Semest	er en	d Eval	uatior	ı:						
							Fotal N	Aarks	5:		1(100					
Course Outcomes	Upon successful completion of the course, the student will be able to: CO1 identify various factors causing degradation of natural resource, (remember, understar apply) CO2 identify various ecosystem and need for biodiversity(apply) CO3 realize and explore the problems related to environmental pollution and its management(analyze, evaluate) CO4 apply the information and technology to analyze social issues, use acts associated with											and,					
Contribution		PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO		
of Course		1	2	3	4	5	6	7	8	9	10	11	12	1	2		
Outcomes towards	CO1	1							1					1			
achievement of Program	CO2		1	1							1			1			
Outcomes	CO3				1	1							1	1			
(1-Low, Medium-2, 3- High)	CO4						1	1	1					1			

Course	UNITI										
Content	The Multidisciplinary Nature of Environmental StudiesDefinition, scope and importanceNeed for public awareness.										
	NATURAL RESOURCES :										
	RENEWABLE AND NON-RENEWABLE RESOURCES: Natural resources and associated problems.										
	(a)FOREST RESOURCES: Use and over-exploitation, deforestation. Timber extraction, mining dams and their effects on forests and tribal people.										
	(b)WATER RESOURCES: Use and over-utilization of surface and ground water, floods, drought conflicts over water, dams-benefits and problems.										
	(c)MINERAL RESOURCES: Use and exploitation, environmental effects of extracting and usi mineral resources.										
	(d)FOOD RESOURCES: World food problems, changes caused by agriculture and overgrazing effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.										
	(e)ENERGY RESOURCES: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.										
	(f)LAND RESOURCES: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.										
	UNIT II										
	ECOSYSTEMS										
	Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers an decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs an ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: (a) Forest ecosystem (b)Grassland ecosystem (c)Desert ecosystem										
	(d)Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)										
	BIODIVERSITY AND ITS CONSERVATION										
	Introduction, definition: genetic, species and ecosystem diversity. Biogeographically classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.										

UNIT III

ENVIRONMENTAL POLLUTION

Definition ,Causes, effects and control measures of (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards

SOLID WASTE MANAGEMENT: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.

DISASTER MANAGEMENT: Floods, earthquake, cyclone and landslides.

UNIT IV

SOCIAL ISSUES AND THE ENVIRONMENT:

From unsustainable to sustainable development. Urban problems related to energy.

Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns.

ENVIRONMENTAL ETHICS Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. Consumerism and waste products.

ENVIRONMENT PROTECTION ACT

Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation.

PUBLIC AWARENESS

Human Population and the Environment, Population growth, variation among nations, Population explosion—Family Welfare Programme.

ENVIRONMENT AND HUMAN HEALTH

Human rights, Value education, HIV/AIDS, Women and Child Welfare.

Role of Information Technology in environment and human health.

FIELD WORK/ CASE STUDIES

Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain. Visit to a local polluted site—Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems—pond, river, hill slopes, etc.

Self-StudyWater resources, soil resources, mineral resource: radioactive elements, Threats to biodiversity,
Solid waste management, Role of Information Technology in environment and human health.

Text books[T1] Erach Bharucha. 2004, Environmental Studies for undergraduate courses, University Grants
Commission, New Delhi, Bharati Vidyapeeth Institute of Environment Education and Research.
Reference	[R1] AnjaneyuluY. Introduction to Environmental sciences, B S Publications PVT Ltd,
books	Hyderabad
	[R2] Anjireddy.M Environmental science & Technology, BS Publications PVT Ltd, Hyderabad.
	[R3] Benny Joseph, 2005, Environmental Studies, The Tata McGraw- Hill publishing company limited, New Delhi.
	[R4] Principles of Environmental Science. & Engg. P. Venu Gopala Rao, 2006, Prentice-Hall of India Pvt. Ltd., New Delhi.
	[R5] Ecological and Environmental Studies – Santosh Kumar Garg, Rajeswari Garg (or) Rajani Garg, 2006, Khanna Publishers, New Delhi.
	[R6] Essentials of Environmental Studies, Kurian Joseph & R Nagendran, Pearson Education publishers, 2005.
	[R7] A.K Dee – Environmental Chemistry, New Age India Publications.
	[R8] BharuchaErach-Biodiversity of India, Mapin Publishing Pvt.Ltd
E-resources	https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf
and other	
digital	
material	

23HS4101	ENGINEERING ECONOMICS AND MANAGEMENT

Course Category:	Management Course	Credits:	2
Course Type:	Theory	Lecture - Tutorial - Practice:	2 - 0 - 0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course	Upon	succes	ssful c	omplet	ion of	the cou	irse, th	e stude	ent wil	l be abl	le to:				
outcomes	CO1	unde	erstand	the pr	inciple	s of ec	onomi	cs, inco	ome an	id good	ls and s	service	e tax.		
	CO2	appl	y the c	oncept	s of m	anagen	nent ar	nd dem	and for	recastii	ng.				
	CO3	eval	uate ti	me val	ue of 1	noney	and va	rious f	orms c	of decis	ion ma	ıking.			
	CO4	appl	y the	concep	t of fir	ancial	impor	tance ii	n proje	cts and	l budge	eting p	rocess.		
Contributio n of Course		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
Outcomes towards	CO1	2					1		2						2
achievement of Program	CO2	3	1	2		2				1					2
Outcomes	CO3	2	2			2	2		2				2		2
(1 – Low, 2 - Medium, 3 – High)	CO4	3	2	2		2				1	1	2	2		2
Course Content	UNIT ECON Introd Law o MAN TAX Introd Manag Goods UNIT CONC Chara Manag Huma DEMA Introd Metho	 I I I I	CS 1 to En ply, Ind I AL I 1 to N Econd Service S IN M ics of it, Ski ource I FORE(1 to D easonal	igineer differen ECONO Manage omics, es Tax. IANAC Manag Ils of Manage CASTI emand I Adjus	ing Ec nce Cu OMICS erial E Appli GEME gement Mana ement, NG foreca	onomi rves, E S, MO Econon cations NT & I t, Scop gemen Huma asting, s, Fored	cs, The Budget NEY, nics, S s of M HUMA be of M t, Man n Reso Foreca casting	eory of Line. NATIO Scope Manage Manage nageria ource P asting Perfor	Dema DNAL of Ma rial E SOUR ement, 1 Role lanning Horize	INCO INCO anageri conom CE MA Functi es, Ad g, Recr ons, Sta	asticity ME, C al Ec ics, M ANAGI ons of ministr uitmer eps to ures, B	on of De GOOD onomid Ioney, Mana ration at and S Forec reak -E	emand, S ANI cs, Te Natio T and M Selection asting, Even An	Suppl D SER chniqu nal Ind nt, Lev Manage on. Forect nalysis	y and VICE es of come, els of ement, asting

	UNIT – III TIME VALUE OF MONEY Introduction to time value of money, Simple Interest, Compound Interest, Present Worth Analysis, Future Worth Analysis, Annual Cash Flow Analysis, Rate of Return Analysis, Normal and Effective Interest Rate, Perpetual Payment. DECISION MAKING Types of Decision-Making Environments, Decision Tree Analysis, Multiple Criteria Decision Making.
	UNIT – IV FINANCIAL STATEMENT & FINANCIAL RATIOS Financial Analysis, Financial Statement, Trading Account, Profit and Loss Account, Balance Sheet Requirements, Distinction between Profit and Loss Account and Balance Sheet. CAPITAL BUDGETING Capital Financing and Allocation Functions, Sources of Capital Funds, Capital Asset Pricing Model, Weighted Average Cost of Capital, Leasing Decisions, Capital Allocation.
Text books	 [T1] Pravin Kumar, "Engineering Economy and Management", 1st ed., Willey India, New Delhi, 2012. [T2] R. Pannerselvam, "Engineering Economics", 13th ed., PHI Learning Pvt. Ltd., New Delhi, 2012. [T3] M. Mahajan, "Industrial Engineering and Production Management" 2nd ed., Dhanpat Rai Publications.
Reference books	 [R1] Philip Kotler & Gary Armstrong "Principles of Marketing", Pearson Prentice Hall, New Delhi,2012 Edition. [R2] IM Pandey, "Financial Management" 11th ed., Vikas Publications. [R3] B.B Mahapatro, "Human Resource Management", New Age International publishers, 2011.
E-resources and other digital material	https://www.toppr.com/guides/fundamentals-of-economics-andmanagement/supply/supply- function/ https://keydifferences.com/difference-between-personnel-management-and-humanresource- management.html http://productlifecyclestages.com/ https://speechfoodie.com/cash-flow-diagrams/

23BS4102A

PROBABILITY AND STATISTICS FOR ENGINEERS

Course Category:	Basi	c Scie	ence						Credi	ts:					3
Course Type:	Theory													3-0-0	
									Lectu	re-Tu	torial	-Pract	tice:		
Prerequisites:									Conti	nuous	s Eval	uation	1:		30
									Semes	ster ei	nd Ev	aluatio	on:		70
									Total	Mark	s:				100
Course	Upon	succe	ssful	compl	etion	of the	course	e, the	studen	t will	be abl	e to:			
Outcomes	CO1	find	proba	bilitie	s usin	g axio	ms an	d und	erstan	d rand	om va	riable	S.		
	CO2	estin	nate P	robabi	ility d	ensity	functi	ons.							
	CO3	appl	y rand	lom pł	nenom	iena o	f samp	ole to	estima	te erro	ors				
	CO4	analyze correlation, regression and quality improvement, control charts.													
Contribution of		PO	PO	РО	РО	PO	PO	PO	PO	РО	PO	РО	PO	PSO	PSO
Course		1	2	3	4	5	6	7	8	9	10	11	12	1	2
towards	CO1	3	2			1								1	
achievement of Program	CO2	3	2			1								1	
Outcomes	CO3	3	2			1								1	
(3-HIGH,	CO4	3	2			1								1	
2-MEDIUM,															
1-LOW)															
Course Content	UNIT	I:													
	PROE Addit Bayes	BABII ion ru ' theo	LITY: le of p orem.	Samp probab	le Spa ility, (ice and Condi	d even tional	its, Pr proba	obabil: bility,	ity, Tł Multi	ne Axi plicat	oms o ion rul	f proba e of pr	bility, obabilit	у,
	PROE Standa	BABII ard de	LITY I viatio	DISTF n of d	RIBUT	FIONS e rand	S: Disc om va	creteF riable	andor , Binc	n Vari omial (able , distrib	Expec ution,	tation, Poisso	Varian n distri	ce and bution.

	UNIT II:
	PROBABILITY DENSITIES: ContinuousRandom Variable, Expectation, Variance and Standard deviation of continuous random variable, Normal distribution, Normal approximation to the Binomial distribution.
	OTHER PROBABILITY DENSITIES - Uniform distribution, Log normal distribution, Gamma distribution, Beta distribution, Weibull distribution.
	UNIT III:
	SAMPLING DISTRIBUTIONS: Introduction, Populations and Samples, Sampling distribution of the mean (SD known and SD unknown) – Sampling distribution of the variance.
	ESTIMATION OF MEAN: Point Estimation, Maximum error of estimate, Interval Estimation.
	UNIT IV:
	REGRESSION AND CORRELATION: Types of Correlation, Scatter diagram, Karl Pearson's coefficient of correlation, Rank Correlation, Regression analysis.
	THE STATISTICAL CONTENT OF QUALITY IMPROVEMENT PROGRAMS: Quality Control- Control Charts for Measurements - Control Charts for Attributes.
Text books	[T1] Probability and Statistics for Engineers ,Eighth edition by Richard A. Johnson Prentice Hall of India.
	[T2] Probability and statistics by K.Murugesan, P.Guruswamy, AnuRadha Publications.
Reference books	[R1] Probability & Statistics for Engineers & Scientist by R.E. Walpole,R.H.Myers&S.L.Myers, Sixth Edition, Prentice Hall of India / Pearson Education.
	[R2] Probability and Statistics, Purna Chandra Biswal, Pearson Education Prentice Hall of India 2007.
	[R3] Probability and Statistics by T.K.V.Iyengar, B.Krishna Gandhi, S.Ranganatham, M.V.S.S.N.PrasadS.Chand.
E-resources and	https://onlinecourses.nptel.ac.in/noc22 mg31/preview
other digital material	https://nptel. ac.in/courses/111105041

23CE4303

STRUCTURAL ANALYSIS

Course Category:	Program Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:	Mechanics of Solids	Continuous Evaluation:	30
	20BS3101A	Semester end Evaluation:	70
		Total Marks:	100

Course outcor	nes	Upon	success	ful co	mplet	tion of	f the c	ourse	, the s	studer	nt will	be abl	e to:		
		CO1	under	stand,	draw	and i	nterpi	et inf	luenco	e line	diagra	ams.			
		CO2	apply	energ	y met	hods	for an	alysis	of in	deteri	ninate	e beam	s and	frames.	
		CO3	analyz metho	ze sta ods.	ticall	y ind	eterm	inate	struc	tures	using	g forc	e and	displa	cement
		CO4	evalua metho	ate mu ods.	ıltisto	ry fra	mes f	or ver	tical a	and ho	orizon	tal loa	ds by a	approxi	mate
Contribution of Course Outcomes		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
towards achievement	CO1	3				2							2	2	
of Program Outcomes	CO2	3	1			2							2	2	
(1 – Low, 2 - Medium, 3	CO3	3	1			2							2	2	
– High)	CO4	3	1			2							2	2	
Course Conte	nt	UNIT	` — I									I		<u> </u>	
		INFLU : EQU Influer maxin	JENCE ILIBRI nce line num ano	UM I UM I for b d abso	ES FC PRINC eam r blute n	OR ST CIPLE eactio naxim	ATIC ES AN on; Sh um b	CALLY ND IT: earing ending	Y DE' S API g force g mor	TERN PLICA es; Be nent f	/INA ATIOI ending for rol	TE ST N mome ling lo	RUCT ent; Ca ads.	TURES	on of
		INFLU : MUI Muller	JENCE LER B r Bresla	LINI RESI u Prir	ES FC LAU I nciple	OR ST PRINC ; Conc	ATIC CIPLE cept a	EALLY ES AN nd Its	Y DE' ID IT Appl	TERN S API icatio	/INA' PLIC/ n.	FE ST ATION	RUCT	TURES	
		UNIT ANAI	– II LYSIS (OF IN	DETI	ERMI	NATI	E STR	RUCT	URE	S USI	NG EI	NERG	Ү МЕТ	HODS

	: BEAMS Strain Energy Method for analysis of continuous beams up to two spans.
	ANALYSIS OF INDETERMINATE STRUCTURES USING ENERGY METHODS :FRAMES Analysis of rigid frames up to first degree of redundancy.
	UNIT – III
	ANALYSIS OF INDETERMINATE STRUCTURES: FORCE METHOD Propped cantilever by consistent deformation method; Fixed beams for different loadings.
	ANALYSIS OF INDETERMINATE STRUCTURES:DISPLACEMENT METHODS
	Slope deflection method for continuous beam (two span) and portal frames without side sway. Moment distribution method for continuous (two span) and portal frames without side sway.
	UNIT – IV APPROXIMATEMETHODSOFANALYSISFORMULTISTORYFRAMES: KANI'SMETHOD
	Introduction and principles of the kani's method; Application of the method to continuous beams; Application of method to the analysis of portal frames without side sway.
	APPROXIMATEMETHODSOFANALYSISFORMULTISTORYFRAMES: : ANALYSIS OF LATERAL LOADS Portal method and cantilever method.
Text books	[T1] Analysis of structures by Volume I –17 th Edition by Vazirani&Ratwani &
	Volume –II 16 th Edition by Vazirani&Ratwani, Khanna Publications; Delhi,2015.
	[T2] Structural Analysis by S.S. Bhavikatti, Volume-I and II, 4 th Edition, Vikas Publishing house PVT Ltd,2014.
Reference books	[R1] Structural analysis by Hibbeler, 6 th Edition, Pearson India Education Services PvtLtd.2015
	 [R2] Structural Analysis by R.Vaidyanathan Volume-I and II, 3rdEdition, Laxmi Publications (P) Ltd,2012. [R3] Theory of structures by S. Ramamrutham, 9thEdition, DhanapatRai Publications,2014.
	[R4] Basic Structural Engineering by C.S Reddy, Tata McGraw Hill, ThirdEdition. [R5] Theory of structuresVol–IbyG.S. Panditand S.P. Gupta and R.Gupta by Tata McGraw Hill Ltd., New Delhi.
E-resources and other digital material	Structural Analysis–I - http:// nptel.ac.in/courses/105101085 Structural Analysis - I - http://nptel.ac.in/courses/105105166 Structural Analysis - II - http://nptel.ac.in/courses/105101086

	23CE4304	GEOTECHNICAL ENGINEERING							
Course Category:	Program Core	Credits:	4						
Course Type:	Theory & Practice	Lecture - Tutorial - Practice:	3-0-2						
Prerequisites:		Continuous Evaluation:	30						
		Semester end Evaluation:	70						
		Total Marks:	100						

Course outcomes		Upon successful completion of the course, the student will be able to:													
		CO1	Unde	rstand	the or	rigin o	of soil	and b	asic i	nter-r	elatio	nships	of soil	compo	onents
		CO2	Determine the index properties of soil and classify the soil based on the index properties												
	CO3	Unde	Understand the Soil-Water Interactions												
		CO4	Unde soils	rstand	and d	eterm	ine co	ompre	ssibili	ity and	d shea	r stren	igth ch	aracteri	stics of
Contribution of Course		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
Outcomes towards achievement of Program Outcomes (1 – Low, 2 –	CO1	3	3												
	CO2	3	3		2						1			3	3
	CO3	3	3		2	3					1			3	3
Medium, 3 – High)	CO4	3	3		2	3					1			3	3
Course Conten	UNIT INTR Scope soils; Phase relatic Inter– INDE Index Densi liquid soils. Exper 1. D	<u>– I</u> ODUC of Ge Transpe diagra onships: relatior X PRO Proper ty,Plast ity indi Unified iments: etermin	TION, ootechr ortatio ams; ; Spec ships PERT ties – icity o ces; F l soil c	BAS nical I n of s Volur ific g IES A Introd of soi low in lassifi	SIC Di Engine soils; I netric ravity ND S luction ils, C ndex of cation	EFINI eering Major rela of so OIL (n, Par onsist & tou n syste n syste	TION ; Ori soil c tionsh bils; T CLAS ticle S ency ghnes em; In	IS AN gin o leposi iips; 'hree Size D Limi s inde adian s	ND RH f Soi its of J Weig phase Distrib ts and ex; Se standa	ELAT ls; Fo India. ht ree diag DN: ution d use ensitiv ard so	IONS: ormations ram in Curve s, Pla ity; Tl il class	on of a ship; n terms and its stic, cu hixotro sificatio	soils; T Volume s of voi s uses, I onsister opy; Act on syste	ypes of e-weight id ratio; Relative ncy and ivity of m	

- 2. Determination of specific gravity by Density bottle & Pycnometer
- 3. Grain Size analysis Mechanical analysis wet and dry soil
- 4. Determination of liquid limit and plastic limit of soil
- 5. Determination of in-situ dry density of soil by Core cutter method and by sand replacement method

UNIT – II

SOIL MOISTURE AND PERMEABILITY:

Flow of water in soils; Darcy's law; Validity of Darcy's law by Reynolds number; Determination of coefficient of permeability by constant head and variable head methods & Indirect methods; Seepage velocity; Factors affecting permeability; Permeability of stratified soil deposits.

EFFECTIVE STRESS PRINCIPLE:

Effective stress principle; Effective stress in a soil mass under different loading conditions – effect of depth of water table, surcharge loading, capillary water

Experiments:

6. Determination of permeability by Constant head and Variable head methods

UNIT – III

SEEPAGE THROUGH SOILS

Quick sand conditions; Characteristics of flow net; Uses of flow nets; Seepage through earth dams with horizontal filter; Uplift pressure; Flow net for anisotropic soils.

COMPACTION OF SOILS:

Introduction; Standard proctor test and modified proctor test; Compaction of clayey soil and sand; Factors affecting compaction; Effect of compaction on properties of soils; Field compaction of soils and field compaction control.

Experiments:

7. Standard proctor compaction test- Determination of OMC, MOD

UNIT – IV

CONSOLIDATION OF SOILS:

Introduction; Initial and secondary consolidation; Spring analogy for primary consolidation; Terazaghi's theory of consolidation; Solution of basic differential equation; Consolidation test; Determination of void ratio at various load increments-height of solids and change in voids ratio methods; Consolidation test results; Determination of coefficient of consolidation-square root of time and logarithmic time fitting methods

SHEAR STRENGTH OF SOILS:

Introduction; Mohr – coulomb theory; Different types laboratory of shear strength tests; Different drainage conditions and their field applicability; Mohr - coulomb failure criterion; Shear characteristic of cohesive and cohesion less soils

Experiments:

- 8. Determination of shear parameters (C and ϕ) of soil by direct shear test
- 9. Unconfined compression test- Determination of C and $\boldsymbol{\phi}$
- 10. Determination of Shear strength of soil by Vane shear test

Text books	 [T1] Soil Mechanics and Foundation Engineering by K.R. Arora; Standard Publishers & Distributors, NaiSarak, New Delhi. [T2] Basic and Applied Soil Mechanics by GopalRanjan and A.S.R. Rao; New Age International Ltd., New Delhi.
Reference books	 [R1] Geotechnical Engineering by C. Venkata Ramaiah; published by New Age International Ltd., New Delhi. [R2] Geotechnical Engineering by V. N. S. Murthy; Marcel Dekker Inc., New York. [R3] Soil Mechanics and Foundation Engineering by B. C. Punmia; Laxmi Publications, Delhi. [R4] Relevant Indian Standard Code Books – IS2720 series; SP 36-part 1.
E-resources and other digital material	Introduction to Soil Mechanics - http://nptel.ac.in/courses/105103097/ Soil Mechanics - <u>http://nptel.ac.in/courses/105101084/</u> Geotechnical Engineering Laboratory - <u>https://nptel.ac.in/courses/105101160/</u>

23CE 4305

HYDRAULICS & HYDRAULIC MACHINES

Course Category:	Programme Core	Credits:	4
Course Type:	Theory & Practice	Lecture - Tutorial - Practice:	3 - 0 - 2
Prerequisites:	20CE 3304 – Fluid Mechanics	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:															
	CO1	eval	uate th	e most	econo	mical	dimens	sions o	f diffe	rent ch	annel	section	s.			
	CO2	eval	uate th	e flow	throug	gh pipe	s and o	open cl	nannel.							
	CO3	eval	evaluate an equation for a phenomenon using dimensional analysis.													
	CO4	anal	analyze the performance of various Hydraulic machines .													
Contribution of Course Outcomes		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	
towards achievement of Program Outcomes	CO1	3	2	3										3		
	CO2	3	3	3											3	
(1–Low, 2 -	CO3	3	2	3											3	
Medium, 3 – High)	CO4	3	3	3										2	3	
Course	UNIT	' I:	1	4	-1	4	-1	-1	-1		-1	I	-1		1	
Content	OPEN CHANNEL FLOW: UNIFORM FLOW: Introduction, Classification of flows and channels; Chezy's, Manning's, Bazin's, Kutter's Equations; Hydraulically efficient channel sections - Rectangular, Trapezoidal and Circular channels. NON-UNIFORM FLOW: Concept of specific energy; Specific energy curves; Critical flow; Critical flow in a rectangular channel; Critical slope; Different slope conditions; Channel transitions.										s and hannel					

Laboratory tests:

- 1. Determine Chezy's and Manning's coefficient for free surface flow in a rough/smooth surfaced rectangular channel.
- 2. Characterise the state of fluid flow by Reynolds's Number
- 3. Determination of flow-rate in an open channel using V Notch.

UNIT II:

GRADUALLY VARIED FLOW: Dynamic equation; Types of Surface Profiles; Computation of surface profiles by single step method; Back water Curves and Draw down curves.

RAPIDLY VARIED FLOW: Hydraulic jump; Elements and characteristics of hydraulic jump; Types of hydraulic jumps; Applications of hydraulic jump; Energy loss in a hydraulic jump.

Laboratory tests:

- 4. Validate Bernoulli's energy principle experimentally along a conduit.
- 5. Determine the coefficient of discharge for a Venturimeter/ Orificemeter
- 6. Workout the flow rate of a liquid using Orifice/Mouthpiece for steady flow in water tanks.

UNIT III:

DIMENSIONAL ANALYSIS AND SIMILITUDE: Dimensional homogeneity; Rayleigh's method; Buckingham – Pi theorem; Geometric, Kinematic and dynamic similarities; Scale effect.

IMPACT OF JETS: Force exerted by fluid jet on stationary and moving flat plates and curved plates; Force exerted by fluid jet on series of flat vanes; Angular momentum principle; Torque exerted on a wheel with radial curved vanes.

Laboratory tests:

- 7. Measurement of force due to impact of jet on Flat/Curved vanes used in Hydropower projects.
- 8. Determination of minor loss of head in pipes a) Due to bends b) Sudden contractionsc) Sudden expansion.
- 9. Estimation of friction factor and major head loss for a given pipe system

UNIT – IV

HYDRAULIC TURBINES: Classification; Impulse; Reaction; Radial, Axial, mixed and tangential flow turbines; Pelton, Francis and Kaplan turbines; Velocity triangles; Head and efficiency; Draft tube theory; Concept of specific speed; Cavitation.

CENTRIFUGAL PUMPS: Types of pumps, Manometric head; Losses and efficiencies; Working Principle and Work done; Priming; Velocity triangles; Multistage pumps; Specific speed; Cavitation. Laboratory tests: 10. Find the overall efficiency of single stage centrifugal pump.

11. Find the Performance studies on Reciprocating pump.

12. Conduct Performance test for Francis turbine at constant head and determine efficiency. Demonstration Experiments:

Conduct Performance test for Kaplan / Pelton at constant head and determine efficiency

Text books [T1] P.N. Modi& S.N. Seth, "Hydraulics & Fluid Mechanics", 18th ed., Standard Book House, New Delhi, 2015.

[T2] A.K. Jain, "Fluid Mechanics", 11th ed., Khanna Publishers, New Delhi, 2014.

Reference [R1] Jagadhishlal, "Hydraulic Machines",9th ed., Metropoliton Company, New Delhi, 2012.

books	 [R2] R. K. Bansal, "Fluid Mechanics and Hydraulic Machines", 9th ed., Laxmi Publications; New Delhi, 2015. [R3] Rajput R.K., "Fluid Mechanics and Hydraulic Machines", 3rd ed., S.Chand and Company Ltd., New Delhi, 2014. [R4] K. Subramanya, "Flow in Open Channels" – 3rd ed., Tata McGraw Hill Publishing Company, New Delhi, 2013.
E-resources and other digital material	www.nptel.ac.in / courses/ 105103096/ www.nptel.ac.in / courses/ 105106114/

STRENGTH OF MATERIALS LAB

23CE4353

Course Category:	Programme core lab	Credits:	1
Course Type:	Laboratory	Lecture - Tutorial - Practice:	0-0-2
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to:													
		CO1	O1 understand the properties of wood, steel and other building materials as per IS code provisions.												
	CO2	analyse the behaviour in stress-strain, deflection, flexure/bending and torsion, of building components													
Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)		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
	CO1	3	3		3	1				2	2		1		2
	CO2	3	3		3	1				2	2		1		2
Course Content	 Study f Determ Find th Find th bendir Find th beam a Find th Impac Find th 8. Determ Determ Tests Strain Conti Torsie rigidit 	the stress nine the le Brinn le Youn ng test o ne Youn and prop le impace t testing he modu nine the nine the on timb n gauge nuous b on Test y, energ	s-strain ultima el's han g's moo g's moo pped ca pped ca ct resist g machi lus of n modul ductili oer. applica eam – on Bea	n chara te shea dulus c ly supp dulus c untileve ance o ne. igidity us of r ty of st tion an deflect ms: Te	acteris r stren numb of the ported of the er. of the igidity teel w and eva- tion te orque	tics o ngth c er and given bean given given onduc y of th ire. cluatic est and a	f mild of mild l Rock mater n. mater ting to the mat	steel/ steel/ vell' val (V val by val by orsion erial o stress.	/tor st l rod i 's hard Vood/ v cond c cond t test o of the	eel by n sing lness Steel/ lucting ucting on soli spring	Univ gle and numb Alum g bend g Chai d circ g.	rersal to d doub er of tl inum) ding te rpy tes cular sh cular sh	esting le she ne giv bycor st onc t and l naft.	machir ar. enmater iducting antileve IZODte	ie. rial. g st on us of

	14. Deflection Test on Beams: Load deformation characteristics, Young's Modulus, Maxwell's Reciprocal law verification.
Text books	[T1] Strength of Materials by S Ramamrutham& R Narayan; DhanpatRai Publishing Co.(P) Ltd, New Delhi.
Reference books	[R1] Material science and metallurgy for engineers by V D Kodgire and S V Kodgire, Everest publishing house, Pune.
E-resources and other digital material	https://home.iitm.ac.in/kramesh/Strength%20of%20Materials%20Laboratory%20Manual.p df

23TP4106

ENGLISH FOR PROFESSIONALS

Course Category:	Programme Core	Credits:	1
Course Type:	Practice	Lecture - Tutorial - Practice:	0-0-2
Prerequisites:	Basic understanding of the language	Continuous Evaluation:	100
	skills viz Listening, Speaking, Reading and Writing.	Semester end Evaluation:	0
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to :													
		CO1	Und	erstan	d how	to lis	ten, re	flect, a	nd spe	ak whi	le com	munic	ating v	with oth	ers.
		CO2	2 Recall the fundamentals of language in terms of grammar and vocabulary in communication.												
		CO3	App clari	Apply English language skills in various speaking contexts to present ideas with clarity and accuracy.											
		CO4	Analyze the different parts in Versant Test and answer them.												
Contribution of Course Outcomes towards achievement of Program Outcomes		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
	CO1	2									3				
	CO2	2									3				
(1 – Low, 2 - Medium.	CO3	2								2	3				
3– High)	CO4	2									3				
Course Conter	nt	COURSE CONTENT													
	 1. CONVERSATION STARTERS Introduction – Seeking Permissions – Asking for Directions – Making Requests – Offering Help – Expressing Thanks – Conveying Apologies – Starting a Conversation with a Stranger – Practice. 2. FUNCTIONAL CONVERSATIONS Introducing Self – Introducing Others – Starting a Group Introduction – Icebreaker Introduction – Introducing a Formal Setting – Practice Exercises.														

	1
	3. GRAMMAR Verbs – Tenses – Sentence Structures – Spotting the Errors.
	4. JUST A MINUTE Introduction – Significance – Fluency – Coherence – Avoiding Errors – Communication Skills – Confidence – Practice.
	5. VOCABULARY Idioms – Phrases – Significance – Meanings – Usage – Practice.
	6. ELOCUTION Definition – Importance – Key Components – Voice Modulation – Articulation – Posture and Gestures – Practice.
	7. EXTEMPORE Introduction – Significance – Developing Quick Thinking – Communication Skills – Confidence – Practice.
	8. DEBATE Introduction – Understanding the Structure – Purpose of a Debate – Developing Basic Debating skills – Do's and Don'ts – Practice.
	9. VERSANT TEST Overview of the Versant Test – Purpose and Importance – Format of the Test – Types of Questions – Practice.
	10. STORY TELLING
	Know Your Audience – Choose a Story – Set the Scene – Introduce the Characters – Build Suspense – Describe the Conflict – Show the Resolution – Share the moral/message – Use Vivid Language – Practice Delivery – Invite Reflection/Discussion – Follow Up.
Text books	[T1] English for Professionals Lab Manual
Reference books	 [R1] Wren & Martin. English Grammar and Composition. S.Chand & Company, 2023. [R2] Dale Carnegie. The Quick and Easy way to Effective Speaking. Rupa Publications, 2016. [R3] Richard A. Spears. McGraw-Hill's Dictionary of American Idioms and Phrasal Verbs. McGraw Hill, 2005. [R4] Kamalesh Sadanand. A Spoken English. VOL 1&2, Orient BlackSwan, Second Edition, 2014.
E-resources and other digital material	 [1] https://www.pearson.com/languages/hr-professionals/versant.htmlSoftx [2] https://www.ted.com/talks [3] https://shortstoryproject.com/

Course Category:	Skill Enhancement Course	Credits:	1
Course Type:	Laboratory	Lecture - Tutorial - Practice:	0-0-2
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcor	nes	Upon successful completion of the course, the student will be able to:														
		CO1	21 analyze 3D Structural elements using Autodesk Revit and develop drawings with the necessary details for construction													
		CO2	apply spreadsheet techniques to solve different engineering problems.													
Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)		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	
	CO1	2	1			2						3		2	1	
	CO2	2	2			2						3		2	1	
Course Conte	nt	PART-A: AUTODESK RIVET STRUCTURES														
		Design a 1. Creat 2. Work 3. Creat 4. Demo mode 5. Mode 6. Dem struc B: Excel 1. U	and Dra e additi ing wit ing and onstrate el using elling S onstrat ture, wa for En Jsing e	wing t ional g h Stru l mana e the S g Autoo teel tru ion on alkway gineer xcel a	he deta rids an ctural (ging C kills an desk Ri iss fran sheet y throu s s a en	ails of d leve Colum all out nd kno ivet St me and s Crea gh and gineer	the fo ls, fan ns, B view wled ructur l desig ation d sun	ollowi mily c eams, ge rec res gn con and path a	ng 3D ontent walls licatin juired manag analys at help	Struct f, floors gviews to con ons fing m is	ural el s, foun s, Ann vert A aterial	dation notatio autocad ls, Cos world	s . s ns dd 2D st anal f probl	drawinş lysis of lems rel	g to 3D whole ated to	
civil engineering.2. Gain knowledge in excel and visual basics for3. Create spreadsheets to solve different structur									or appl ural de	applications. al design problems.						

	 Utilize excel engineering for optimization and uncertainty analysis. Introduce user forms and user controls for overall project control
Text books	 [T1] Auto desk Rivet structures manual. [T2] Exploring Autodesk Revit 2020 for structures,10thedition,byProf. Sham Tickoo, Purdue University Northwest, USA [T3] MS Excel user manual.
Reference books	[R1] Autodesk Revit 2021 Structure Fundamentals by By ASCENT publications
	Published August 10, 2020, ISBN: 978-1-63057-358-4 ISBN 10: 1630573582
E-resources and other digital material	https://www.coursera.org/learn/autodesk-revit-for-structural-design-exam-prep

23MC4107A	\]	Building Materials and Construction								
Course Category:	Mandatory Course	Credits:	-							
Course Type:	Theory	Lecture - Tutorial - Practice:	2-0-0							
Prerequisites:		Continuous Evaluation: Semester end Evaluation:	40+40+3+17							
		Total Marks:	100							

Course	On successful completion of the course, the student will be able to:														
Outcomes	CO1	Und	Inderstand physical properties, manufacturing processes and benefits of building												
		mate	erials	that ar	e used	l in str	uctural	and n	on-stri	uctural	compo	nents.			
	CO2	Und	erstai	nd app	licatio	n of p	rotectiv	ve mat	erials f	for stru	ctural 1	nember	'S.		
	CO3	Dist	ingui	sh dif	ferent	types	of co	nstruct	ional	proced	lures fo	or diffe	rent cor	nponent	ts of a
		buil	ding.			• 1				•				•	
	CO4	App	ly the	e know	ledge	of diff	erent s	uppor	t syste	ms for	constru	ction a	nd repai	rs.	
Contributio		PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO
n of Course		1	2	3	4	5	6	7	8	9	0	1	2	1	2
Outcomes	CO1	L		Μ		L		М	L						Н
Towards	CO2	L		L				М							М
achievement	CO3	L		М		М	М								Н
of Program	CO4	L		М		Μ	Н					`			Н
Outcomes															
(L – Low,															
M-															
Medium,H-															
High)															
Course	UNIT	· - I													
Content	STON	ONES:													
	Qualit	ties of	fago	ood bu	ilding	stone	; Ston	e quar	rying;	Tools	for bla	sting; I	Material	s for bl	asting;
	Proce	ss of ł	olastii	1g: Co	mmon	build	ing sto	nes of	India.			•			-
	BRIC	KS∙		0,			0								
	Comp	nsitio	n of	good	brick	earth	Manu	factur	e of h	ricks	Oualiti	es of a	ood bri	cks Te	ests for
	bricks			good tion of	f brick	curun,	Ivianu	iactur	010	nexs,	Quanti	C3 01 E	,000 011	CK5, 10	515 101
	OTEE	, Clas	511100			.5,									
	SIEE	L:	c		C ()		C .	1 3 6	1		C / 1				
	Gener	al; M	anuta	cture (of steel	l; Uses	s of ste	el; Ma	rket IC	orms of	f steel;				
	UNIT	– II													
	TIMB	ER:													
	Defini	ition;	Struc	ture of	a tree	; Qua	lities o	f good	timbe	er; Dec	ay of ti	mber; F	Preserva	tion of t	timber;
	Seaso	ning o	of tim	ber; A	dvanta	iges of	f timbe	r cons	tructio	n; Indi	an timb	oer trees	5.		
		0		,		0				,					
	PAIN	ts v	ARN	ISHE	SANG	DIST	ГЕМР	ERS							
	Gener	-D, V	aintin	o Vo	rnichi		ictomn	ering.	Wall	nanor	· White	wach	ing. Co	lour w	aching
	Emul	ai, ra	aintill	ig, va	1115111	1g, D	istemp	cinig,	vv all	paper	, •• 1110	- wasii	ing, Co	ioui wa	asining,
	Emuls	sion P	aints.												

	UNIT – III BRICK MASONRY: Technical terms; Types of bonds in brickwork- Stretcher, header, English, Flemish. STONE MASONRY: Technical terms; Classification of stone masonry. WALLS AND LINTELS: Classification of walls, Classification of Lintels- timber, stone, brick, steel, reinforced concrete lintels.
	UNIT – IV
	DAMPNESS AND DAMP PROOFING:
	Causes of dampness; Methods of preventing dampness; Damp proofing materials
	Technical terms: Types of flooring materials.
	ROOFS:
	Technical terms; Types of roofs; Trusses- king post, queen post, combination of king post & queen post trusses, mansard roof truss; Steel sloping roofs; Roof covering materials; Types of flat roofs;
	SCAFFOLDING, SHORING, UNDER PINNING AND FORM WORK:
	Types of scaffolding; Types of shoring; Methods of underpinning; Types of form work;
Text books	[T1] Engineering Materials by S. C. Rangwala; Charotar Publishing House.[T2] Building construction by B. C. Punmia -Laxmi Publications, New Delhi.
Reference	[R1] Building construction and construction materials by G.S.Birdie and T.D.Ahuja,
books	Dhanpathrai publishing company, New Delhi.
E-resources	
and other	
digital	
material	

Course Category:	Engineering Science lab	Credits:	1.5
Course Type:	Laboratory	Lecture - Tutorial - Practice:	0-0-3
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to:													
	CO1	CO1 analyze complex civil engineering problems innovatively with the use of different construction materials and structural elements.													
	CO2	apply various power tools for construction													
Contribution of Course Outcomes towards achievement of Program Outcomes		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
	CO1	2	2	2	2	2				2		2	2		2
(1 – Low, 2 - Medium, 3 – High)	CO2	3	2	3	3	1				2		2	2		2
Course Content	 1 DESIG a. Introduction a. Introduction b. Emparent a. Emparent b. Emparent b. Emparent c. Emparent c. Prototyping * For the innovative * Once the considering * If the Design of the 	 1 DESIGN THINKING a. Introduction to Design Thinking : An insight into Design, origin of Design thinking, Design thinking and its process models, application of Design thinking. b. Empathize In Design Thinking: Role of Empathy in design thinking, methods and tools of empathy, understanding empathy tools. Explore define phase state users' needs and problems using empathy method. *Carry out the detailed questionnaire to arrive at the problem of the selected theme. The empathy report shall be prepared based on the response of the stake holders. c. Prototyping and Testing: Methods and tools of ideations, prototyping and methods of prototyping, user testing methods, Advantages and disadvantages of user Testing/ Validation. * For the problem identified, the team needs to give solution through thinking out of the box innovatively to complete the ideation stage of DTL. *Once the idea of the solution is ready, detailed design has to be formulated in the Design stage considering the practical feasibility. *If the Design of the problem is approved, the team should implement the design and come out 													

	*Conduct thorough testing of all the modules in the prototype developed and carry out integrated testing
	*Demonstrate the functioning of the prototype along with presentations of the same.
	d. Product Innovation: Innovation towards product design Case studies.
	* Prepare a Digital poster indicating all the stages of DTL separately. A Detailed project report also should be submitted covering the difficulties and challenges faced in each stage of DTL. Methods of testing and validation should be clearly defined both in the Digital poster as well as the report.
	e. Ideation, Prototyping And Testing of an Innovative Model Based on the Topics Learnt –
	(Class may be divided in to groups. some marks may be allotted for the submission of
	innovation. Better innovations may lead to exhibition in NITs, IITs / patents / may be useful to Atal innovation ranking).
	2. Calculate the length, area, volume, area of a built-up space and a small parcel of land - use digital distance measuring devices and To set horizontal, vertical and angle lines using different types of laser instruments.
	3. (a) To find out the different materials present in the wall using wall scanner. (b) To view the objects using an inspection camera which are not accessible &visible. (c) To set different angles to a ramp or staircase using Inclinometer.
	4. (a) To cut shapes and curves in wood with its narrow blade using Jigsaw. (b) To cut through
	wood and other soft materials using Saber saw. (c) Polish the concrete using concrete grinder.
	5. Painting – Paint a given surface in this order - putty, primer and painting.
	6. Flooring – Suggest a suitable flooring and install in the given space.
	7. Plumbing – Design pipeline layout for the given plan and utilize proper fittings.
	8. Formwork – Suggest proper formwork for footings, stair case,
	9. Apply basic techniques for masonry and concreting works – different types of brick bonds, plumb, alignment, brick quantity estimation
	10. Estimation of material contents for cement mortar and plastering.
Text books	[T1] Building construction by B. C. Punmia -Laxmi Publications, New Delhi
	[T2] Design thinking for strategic Innovation, IdrisMootee, 2013, John Wiley & amp; Sons [T3] Design thinking – The guidebook – Facilitated by the Royal Civil Service Commission,
	Bhutan
Reference books	[R1] Design Methods: A Structured Approach for Driving Innovation in Your Organization, Vijay Kumar, First Edition, 2012, Wiley [R2] Human-Centered Design Toolkit: An Open-Source Toolkit to Inspire New Solutions in the
	Developing World, IDEO, Second Edition, 2011, IDEO.
E-resources and other digital material	

MINORS & HONORS

23CEM 4701

INTRODUCTION TO CIVIL ENGINEERING- CONCEPTS AND MATERIALS

Course Category:	Minor	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0- 0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	unde com	erstan poner	d eval nt.	luation	of civ	vil eng	gineeri	ing n	ateria	ls and	use of	stone	e as a j	primary
	CO2	eval	uate t	he qua	lity of	bricks	and ti	mber.							
	CO3	appl	apply test on cement and understand varieties of concrete.												
	CO4	anal	analyze the quality of steel and paints.												
Contribution of Course Outcomes towards achievement		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
	CO1	3						2							3
Outcomes	CO2	3						2							3
(1 – Low, 2 -	CO3	3						2							3
Medium, 3 – High)	CO4	3						2							3
Course Content	UNIT -	UNIT – I													
	INTRO Genera Engine STONI Classif Tools f	DDUC I Intr ering ES: ication	TION oducti in the n of r sting;	ion to overa ocks; Comi	Civil ll infra Qualit mon bu	Engin structu ies of iilding	eering; iral de a good stones	; Histo velopr 1 builo ofInd	ory of ment of ding s lia.	f Civil of the o tone;	l Engin country Uses c	neering y. of Stone	; Rele es; Sto	vance o ne quai	of Civil rrying;

	UNIT – II
	BRICKS: Composition of good brick earth; Qualities of good bricks; Tests for bricks; Classification of bricks; Size and weight of bricks.TIMBER: Definition; Structure of a tree; Qualities of good timber; Preservation of timber; Seasoning of timber; Advantages of timber construction; Use of timber.
	UNIT – III
	CEMENT Basic Ingredients; Grades of cement; Properties of cement; Field tests on cement. CONCRETE Definition; properties; Special Concretes-Light weight concrete, High density concrete, Fibre reinforced concrete, Polymer concrete.
	UNIT – IV STEEL General; Manufacture of steel; Uses of steel; Market forms of steel; Properties of mild steel; Properties of hard steel;
	General; Painting; Varnishing; Distempering; Wall paper; White washing; Colour washing.
Text books	[T1] Engineering Materials by S. C. Rangwala; CharotarPublishing House.[T2] Building construction by B. C. Punmia -Laxmi Publications, New Delhi.
Reference books	[R1]Building construction and construction materials by G.S.Birdie and T.D.Ahuja, Dhanpathrai publishing company, New Delhi.
E-resource and other digital material	http://nptel.ac.in/courses/105102088/

METHODOLOGY FOR CIVIL ENGINEERING CONSTRUCTION

Course Category:	Minor	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to:													
		CO1	eval	evaluate the feasibility of the construction project											
		CO2	appl	apply planning and construction contracts											
		CO3	anal	analyse construction finance and organization structure											
		CO4	eval	evaluate the materials and adopt the quality control procedures											
Contribution of Course Outcomes		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
towards achievement	CO1	1	1	1							1	2			1
of Program Outcomes	CO2	1	1	1							1	2			1
(1 – Low, 2 - Medium, 3 –	CO3	1	1	1						1	1	2			1
High)	CO4	1		1							1	2			1
Course Content		UNIT - INTRO Role o various PROJE Introdu analysi	UNIT – I INTRODUCTION Role of government and construction agencies, classification of construction works, various stages in construction of a project, the construction team. PROJECT FEASIBILITY REPORTS Introduction, technical analysis, financial analysis, economic analysis, ecological analysis schematic diagram for feasibility study												

	UNIT – II PLANNING FOR CONSTRUCTION PROJECTS General, steps involved in planning, objectives, principles, advantages of planning, limitations, stages and types of planning, stages of planning by different agencies. CONSTRUCTION CONTRACTS & TENDERS General, contract documents, types of contract, tender notice, types of tenders, tender documents, Earnest money deposit and security deposit.
	UNIT – III CONSTRUCTION FINANCING AND CONTROL Introduction, costs associated with constructed facilities, estimates, effect of scale on construction cost, means of financing, application of financial assistance, cost control. ORGANISING FOR CONSTRUCTION Importance, general principles, types of organization structures, forms of business organizations.
	UNIT – IV MATERIALS MANAGEMENT Importance, Objectives, Costs, functions of material management, uses, stores management, material procurement, maintaining stocks, material handling. QUALITY CONTROL IN CONSTRUCTION Elements of quality, Organisation for quality control, Quality assurance techniques, Documentation, Quality control circles, variation.
Text books	[T1] Dr.S.Seetharaman, "Construction Engineering and Management", 5 th Edition, Umesh Publications, New Delhi,
Reference books	[R1] Kumar Neeraj Jha, "Construction Project Management", 2nd Edition, Pearson Education India, New Delhi, 2015
E-resources and other digital material	

23CEM6701

Course Category:	Minor	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

		Upon successful completion of the course, the student will be able to:													
		CO1	understand selection of resources with low environmental impact;												
		CO2	apply design of products with low environmental impact;												
		CO3	analy	analyse product-Service System Design for eco-efficiency;											
		CO4	evalı	evaluate design for social equity and cohesion.											
Contribution of Course Outcomes towards		PO 1	PO 2	P O3	P O 4	P O 5	P O 6	P O7	P O8	Р О9	P O1 0	PO 11	P O1 2	PSO 1	PSO2
achievement of Program	C01	1		1			2	3					1		2
Outcomes $(1 - Low, 2 -$	CO2	1		1			2	3					1		2
Medium, 3 – High)	CO3	1		1			2	3					1		2
	CO4	1		1			2	3					1		2
Course Content		UNIT – I INTRODUCTION Addressing Sustainability by design; An Introduction to Sustainable Product-Service Systems Applied to Distributed Renewable Energy; United Nations Sustainability Energy for All (SE4A) Agenda. DISTRIBUTED ENERGY SYSTEMS Distributed Renewable Energy Systemsand Integrating S.PSS with DE													

	UNIT – II SUSTAINABLE PRODUCT-SERVICE SYSTEM (S.PSS) Introduction to S.PSS; Types; Sustainability Benefits; Barriers and Limits
	SUSTAINABLE PRODUCT-SERVICE SYSTEM APPLIED TO DISTRIBUTED RENEWABLE ENERGIES
	A Win-Win Opportunity; Scenario for S.PSS applied to Distributed Renewable Energy(DRE); S.PSS Applied to DRE: Sustainability Potential Benefits; S.PSS Applied to DRE: Sustainability Potential Benefits
	UNIT – III DESIGN FOR SUSTAINABILITY: AN INTRODUCTION Evolution of Design for Sustainability ; Product Life Cycle Design or Eco-Design ;Design for Eco-Efficient Product-Service Systems ;Design for Social Equity and Cohesion ;Design for Socio-Technical Transitions ;State of the Art of Design for Sustainability Human-Centred and Universal Design
	SYSTEM DESIGN FOR SUSTAINABLE ENERGY FOR ALL: A NEW ROLE FOR DESIGNERS System Design for Sustainable Energy for All (SD4SEA); SDSEA Design Criteria, Guidelines and Examples
	UNIT – IV METHOD AND TOOLS FOR SYSTEM DESIGN FOR SUSTAINABLE ENERGY FOR ALL(SD4SEA)
	Method for System Design for Sustainable Energy; for All; Sustainability Design Orienting Scenario; (SDOS) on S.PSS&DRE Sustainable Energy for All Idea Tables and Cards; E.DRE—Estimator for Distributed Renewable Energy; PSS + DRE Innovation Map
	S.PSS + DRE Design Framework & Cards ; The Energy System Map Innovation Diagram for S.PSS&DRE Concept Description Form for S.PSS and DRE Stakeholder Motivation and Sustainability Table
	PRACTICAL EXAMPLES OF APPLICATION OF SDSEA APPROACH/TOOLS AND OTHER METHODS TO ACHIEVE SUSTAINABILITY
	Solar Energy Company, Botswana; SMEs for Energy, Uganda ; Summary and Considerations; green design; emotionally durable design; cradle to cradle design, biomimicry design; design for base of a pyramid design; design for social innovation
Text books	[T1] FabrizioCeschin, İdilGaziulusoy, Design for Sustainability A Multi- level Framework from Products to Socio- technical Systems, Taylor and Francis, 2020.
	 [T2] Carlo Vezzoli; FabrizioCeschin; Lilac Osanjo; Mugendi K. M'Rithaa; Richie Moalosi; VennyNakazibwe; Jan Carel Diehl, Designing Sustainable Energy for All Sustainable Product-Service System Design Applied to Distributed Renewable Energy; Green Energy and Technology, Springer, 2018.

Reference books	[R1] Ceschin, F., and Gaziulusoy, I. (2016) Design for Sustainability: An Evolutionary Review, in Lloyd, P. and Bohemia, E. (eds.), Future Focused Thinking DRS International Conference 2016, 27 - 30 June, Brighton, United Kingdom.											
	[R2] Elisa Bacchetti, Towards sustainable energy for All Designing Sustainable Product-Service System applied to Distributed Renewable Energy, Politecnico di Milano, Milano, Italy 2017											
E-resources and other digital material	Quality as Driver for Sustainable Construction—Holistic Quality Model and Assessment.pdf											

23CEM6702

Course Category:	Minor	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to:													
		CO1	CO1 analyze the issues concerned with ecology, environment and sustainability.												
		CO2	CO2 evaluate the quantity and quality of water based on the available natural sources.												
		CO3	evaluate the water purification units and components of the distribution systems.												
		CO4	anal	yse th	e effe	ect of	vario	us attri	ibutes	of envi	ronme	ntal po	llutio	n	
Contribution of Course Outcomes		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
towards achievement	CO1	1						2					2		
of Program Outcomes	CO2	2	3		3		1						1		2
(1 – Low, 2 - Medium, 3 –	CO3	2	1	3			1								3
High))	CO4	1	1	2	1										2
Course Content		UNIT - INTRC Definit ecology social s SUSTA Sustain Case St	- I DDUCT ion, sc y, eco s ecurity AINAB ability tudies.	TION T ope & system 7. ILITY – defi	TO EC impo - bala	COLO ortanc unced	GY A e, nec ecosy	ND E ed for stem,	NVIRO public human stainat	ONME c award activit	NT eness- ties - fe oals, in	envirc ood, sh mpacts	onmen lelter,	t - defi econon imate c	nition, iic and hange,

	UNIT – II WATER SUPPLY - QUANTITYOF WATER Sources of water, objectives of water supply systems, Per capita consumption; Types of demands; Fluctuations in demand.
	QUALITY OF WATER
	Impurities in water; routine water analysis - physical, chemical and bacteriological tests; Standards for drinking water; Water borne diseases.
	UNIT – III WATER TREATMENT
	Fundamentals of purification of water; plain sedimentation; coagulation and types of coagulants; sedimentation and coagulation tanks; theory of filtration; slow sand and rapid sand filters; operation; disinfection.
	DISTRIBUTIONSYSTEMS Methods of supply; Layouts, Plumbing-pipes and fittings; Traps; One pipe and Two pipe systems.
	UNIT – IV ENVIRONMENTAL POLLUTION Environmental Pollution and their effects. Water pollution, Land pollution, Air pollution, Public Health aspects.
	SOLID WASTE MANAGEMENT
	Solid waste characteristics-basics of on-site handling and collection-separation and processing – Incineration- Composting-Solid waste disposal methods – fundamentals of land filling.
Text books	 [T1] Benny Joseph, "Environmental Studies", Tata Mc Graw Hill, 2005 [T2] IgnaciMuthu S, "Ecology and Environment", Eastern Book Corporation, 2007 [T3] Birdie G.S. and Birdie J. S., "Water Supply and Sanitary Engineering", 9th ed., Dhanpat Rai Publishing Company, New Delhi, 2015.
Reference books	 [R1] Garg S. K., "Environmental Engineering Vol. I& II- Water supply engineering", Khanna Publishers, New Delhi, 2017. [R2] Gurucharan Singh, "Water Supply and Sanitary Engineering", Standard Publishers Distributors, Delhi, 2009. [R3] Anjaneyulu Y. "Introduction to Environmental sciences", B S Publications PVT
	Ltd, Hyderabad 2004.
E-resources and other	https://nptel.ac.in/courses/127106004
digital material	(Ecology and environment by Dr. Abhijit P. Deshpande, IIT Madras).

Course Category:	Minor	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	3 - 0 - 0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

	Upon s	Upon successful completion of the course, the student will be able to:													
	CO1	unde	understand different pavement structures												
Course	CO2	unde	rstand	mater	ials an	d metł	nods us	ed for	constr	ruction					
Outcomes	CO3	unde	rstand	the co	mpon	ents of	the Ra	ilway	Track	•					
	CO4	analy	yse geo	ometri	c featu	res of	railway	y track							
Contribution of Course		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
Outcomes towards	CO1	3						1						3	
Program	CO2	3						1					1	3	
	CO3	3												3	
(1 – Low, 2 - Medium, 3 – High)	CO4	3												3	
Course Content	UNIT- INTRO Differ Classif PAVEI Differe importa UNIT- MATE Materi cement CONS ⁷ Constru equipm	CO4 3 3 UNIT-I INTRODUCTION TO ROADWAYS Different Modes of Transportation, Road development in India during twentieth century, Classification of different types of roads, Highway cross section elements, PAVEMENTS Different types of pavements – Cross section, functions of pavement layers, Need for design, importance of drainage UNIT-II MATERIALS FOR PAVEMENTS Materials used in highway construction- soil, fine and coarse aggregate, bituminous binders, cement, water. CONSTRUCTION OF PAVEMENTS Construction of flexible pavement, Construction of rigid pavement, Equipment for excavation, equipment for compaction.							entury, design, inders, vation,						

	UNIT-III INTRODUCTION TO RAILWAYS Historic development of railways in India, Classification of Indian Railways, Different gauges in Indian Railways
	COMPONENTS OF RAILWAY TRACK Permanent way cross section and functions, Types of rails, Types of Sleepers, Types of ballast, cross section of ballast, coning of wheels, sleeper density, length of rails.
	UNIT-IV
	GEOMETRIC FEATURES AND OPERATION Super elevation or cant, cant deficiency, cant excess, negative super elevation concept, types of transition curves, gradient types.
	POINTS AND CROSSINGS Switches, crossings, working principle of turnout, classification of signals, interlocking.
Text books	 [T1] Sk Khanna, CEG Justo, A Veeraragavan, Highway Engineering, Nem Chand & Bros, 10th Edition, 2018 [T2] Satish Chandra, MM Agarwal, Railway Engineering, Oxford University Press, 2nd Edition 2013
Reference Book	[R1] Saxena, S.C. and Arora. S, Railway Engineering, Dhanpat Rai, NDLS, 2009
E-resources and other digital material	https://nptel.ac.in/courses/105/105/105105107/ https://nptel.ac.in/courses/105/101/105101087/ https://archive.nptel.ac.in/courses/105/107/105107123/

23CEM7702B	NPTEL-Mandatory (Course Based on Availability)
23CEH4801A	STABILITY OF STRUCTURES
------------	-------------------------

Course Category:	Honors	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:	23CE5404/A – Advanced Structural Analysis.	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to:													
	CO1	analyz energ	analyze the buckling of columns, beam-columns and find critical loads using energy and non-energy methods												
		CO2	analyz	analyze the lateral buckling of beams by energy and non-energy methods											
		CO3	analyz for va	analyze the buckling of rectangular plates and find critical compressive loads for various boundary conditions											
		CO4	analyz	ze the	buck	ling o	f axia	lly loa	aded o	cylind	lrical	shells			
Contribution of Course Outcomes		PO 1	PO 2	P O3	Р О 4	Р О 5	Р О б	P O7	P O8	Р О9	P O1 0	PO 11	PO 12	PSO 1	PSO 2
towards achievement	CO1	3	2		1	1								3	
of Program Outcomes	CO2	3	2		1	1								3	
$(I_{-1} M_{-2})$	CO3	3	2		1	1								3	
(L - 1, M - 2, H - 3)	CO4	3	2		1	1								3	
Course Content	UNIT BUCH Introd with d colum distrib BEAM Theor loads.	F – I KLING uction; lifferent uns; Ene outed lo M COLI y of Be	OF C Meth t end c ergy n ading UMN	OLU ods o condit nethod S	MNS f findi tions a ls; Pri – Sta	ing cr and lo smati	itical bading ic and analy	loads ; Inel non-j	; Criti astic prism	cal lo buckl atic c	oads for ing of a olumna	r straig axially s under th diffe	ht colun loaded discrete	nns e and bes of	

	UNIT – II
	BEAMS UNDER PURE BENDING Cantilever and simply supported beams of rectangular and I sections.
	BEAMS UNDER TRANSVERSE LOADING Energy methods; Solution of simple problems.
	UNIT – III
	PLATES SIMPLY SUPPORTED ON ALL EDGES Plates simply supported on all edges and subjected to constant compression in one or two directions.
	PLATES SIMPLY SUPPORTED ALONG TWO OPPOSITE SIDES Plates simply supported along two opposite sides perpendicular to the direction of compression and having various edge conditions along the other two sides.
	UNIT – IV
	BUCKLING OF AXIALLY COMPRESSED CYLINDRICAL SHELLS Introduction to buckling of axially compressed cylindrical shells, failure of axially compressed cylindrical shells.
	CRITICAL LOAD OF AN AXIALLY LOADED CYLINDER Linear theory of cylindrical shells-donnell equations, critical load of an axially loaded cylinder.
Text books	[T1] Theory of elastic stability by Timoshenko & Gere, McGraw Hill, 1961.[T2] Background to buckling by Allen and Bulson, McGrawHill, 1980.
Reference books	 [R1] Elastic stability of structural elements by N.G.R.Iyengar, Macmillan India Ltd., 2007. [R2] Principles of Structural stability theory by AlexandarChajes, 1974.
E-resources and other digital material	https://nptel.ac.in/courses/105105166 https://youtu.be/ZSQ_5lRj5gI https://nptel.ac.in/courses/105108141

Course Category:	Honors	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to:													
	CO1	CO1 apply the green buildings and sustainable design aspects													
		CO2	analy	analyze the water conservation and energy efficiency											
		CO3	evalu	evaluate the sustainable materials and wellbeing of residents											
		CO4	apply	/ princ	ciples of	of gree	n ratir	ig syste	ems in	const	ructior	1			
Contribution of Course Outcomes towards		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	P 01 2	PSO 1	PSO 2
achievement of Program	CO1	1		1				2	1						1
Outcomes $(Low - 1)$	CO2	1		1				2	1						1
Medium - 2, High $- 3$)	CO3	1		1			2	2	1						2
	CO4	1		1				2	1						2
Course Content		UNIT INTR Greer buildi SUST Local island educa	⁷ – I ODUC n build ngs ⁷ AINA buildi l effect tion &	CTION ing, BLE I ng rec , roof aware	I Globa DESIG Juirem & not eness	l warr iN ents, s n-roof,	ning, r soil erc	require osion c ve arc	ement control hitectu	of Gre , natur re, bas	een Bu ral top sic hou	iilding ograph 1se ho	, Ben ny, ve ld am	efits of getation enities,	green n, heat green

	UNIT – II
	WATER CONSERVATION Water efficient plumbing fixtures, rain water harvesting, landscape design, management of irrigation system, recycle and reuse of waste water, water quality
	ENERGY EFFICIENCY HCFC free equipment, minimum energy performance, enhance energy performance, alternate water heating systems, on-site renewable energy – common lighting, energy
	efficiency in common area equipment, integrated energy monitoring system
	UNIT – III
	MATERIALS & RESOURCES
	Separation of house-hold waste, green procurement policy, local materials, eco friendly wood based materials, alternate construction material, handling of construction & demolition material.
	RESIDENT HEALTH & WELLBEING
	Minimum day lighting, Ventilation design, no smoking policy, enhanced day lighting, enhanced ventilation design, cross ventilation
	UNIT-IV
	CONSTRUCTION AND OPERATIONS
	Construction, Occupancy & Operations
	GREEN RATING SYSTEMS
	IGBC, LEED, GRIHA, BEE, benefits of rating systems, procedure to get IGBC certification
Text books	[T1] IGBC Green homes rating system Version 3.0 – A bridged reference guide, September 2019 [T2] Jarry Vudelson "Green building through Integrated design" Me Green Hill
	2009
	[T3]Gautham R K, "Green Homes", BSP Books Private Limited, New Delhi, 2009.
Reference books	[R1] "Sustainable building technical manual- Green building design, constructions and operation", Produced by Public Technology Inc., US Green Building Council
E-resources and other digital material	

23CEH4801C	DESIGN OF FORMWORK

Course Category:	Honors	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon	successful completion of the course, the student will be able to:													
	CO1	apply	pply a right material for manufacturing false work and form work suiting specific												
	CO2	analy	ze the	pressu	re of co	oncrete	on for	m woi	·k						
	CO3	evalu	ate the	adequ	acy of	deckin	ıg, forr	n work	and fa	lse wo	rk.				
	CO4	evalu invol	ate th ved in	e sequ the des	ence of sign of	of con form v	structio vork ar	on of nd fals	civil e e work.	nginee	ring s	tructur	es and	safety	steps
Contributio n of Course		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
Outcomes towards	CO1		1			2	1	1		1	1				2
achieveme nt of	CO2	2	2	1		2								2	
Program Outcomes	CO3	3	3	3			1			1				3	1
(Low – 1, Medium - 2, High – 3)	CO4	1	2			1	2	1		1	1			2	
Course Content UNIT – I INTRODUCTION Formwork and false work, Temporary work systems, Construction planning constraints. MATERIALS OF FORMWORK Materials and construction of the common formwork and false work systems, Spe proprietary forms.							ning an 5, Specia	d site al and							
		UNIT FOR Form	Γ – II M WO work -	RK - Desig	gn: Cor	ncrete p	oressur	e on fo	orms, D	esign (of timb	er and	steel fo	orms	
		ANA Load	LYSIS	S OF F d mom	ORMV ent of 1	VORK formwo	ork.								

	UNIT – III DESIGN OF DECKS Types of beam, decking and column formwork, Design of decking FALSE WORKS False work design, Effects of wind load, Foundation and soil on false work design.
	UNIT – IV SPECIAL FORMS The use and applications of special forms. CONSTRUCTION SEQUENCE AND SAFETY IN USE OF FORMWORK Sequence of construction, Safety use of formwork and false work.
Text books	 [T1] Robert L. Peurifoy and Garold D. Oberiender, "Formwork for Concrete Structures", McGraw-Hill, 1996. [T2] TudorDinescu and Constantin Radulescu, "Slip Form Techniques", Abacus Press, Turn Bridge Wells, Kent, 2004.
Reference books	[R1] Austin, C.K., "Formwork for concrete", Cleaver - Hume Press Ltd., London, 1996[R2] Michael P. Hurst, "Construction Press", London and New York., 2003
E-resources and other digital material	Open web

23CEH5801A	L
------------	---

Course Category:	Honors	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:	23ES3103A - Engineering Geology	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:														
		CO1	evaluate rock masses based on classification systems												
		CO2	apply engin	apply the field and laboratory testing on rocks to assess engineering properties analyze rocks based on the failure criteria under various stress fields											assess
		CO3	analy												
		CO4	evalua slope	ate the stabili	e beari ty me	ing ca thods	pacity	/ of fo	ounda	tion o	n roc	ks and	d unde	erstand	various
Contribution of		PO	PO	Р	Р	Р	Р	Р	Р	Р	Р	PO	Р	PSO	PSO
Course Outcomes towards		1	2	03	0 4	O 5	0 6	07	08	O9	O1 0	11	01 2	1	2
achievement of Program	CO1	3	2	2			3								1
(Low - 1,	CO2	3	2	2			3								1
Medium - 2, High – 3)	CO3	3	2	2			3								1
	CO4	3	2	2			3								1
Course Content	ourse Content UNIT – I INTRODUCTION TO ROCK MECHANICS AND CLASSIFICATION OF ROCKS Objectives of rock mechanics, Fields of application of rock mechanics. Geologi Classification of igneous, sedimentary and metamorphic rocks based on texture stratification ROCK MASS CLASSIFICATIONS Rock Quality Designation (RQD), Rock Structure Rating (RSR), Rock Ma Rating (RMR).								DF logical cture and						

	UNIT - II LABORATORY TESTS - PHYSICO — MECHANICAL PROPERTIES OF ROCKS Compressive strength, Tensile strength, Direct shear test, Triaxial shear test, Slake durability test, Schmidt rebound hardness test
	FIELD TESTS - PHYSICO — MECHANICAL PROPERTIES OF ROCKS Uniaxial jacking test- Pressure meter tests Hydraulic fracturing- Flat jack test Stress. Electric resistivity method- Seismic refraction method
	UNIT – III FAILURE CRITERIA FOR ROCK AND ROCK MASSES Mohr-Coulomb Yield Criterion, Hoek-Brown Criterion,
	STRENGTH AND DEFORMABILITY OF JOINTED ROCK MASS Shear strength of Rock joints, Deformability of Rock joints, Concept of joint compliance
	UNIT - IV FOUNDATION ON ROCKS Estimation of bearing capacity, Settlement in rocks, Pile foundation in rocks. STABILITY OF ROCK SLOPES AND METHODS TO IMPROVE ROCK MASS RESPONSES Modes of failure. Grouting in Rocks, Rock bolting, Rock Anchors.
Text books	 [T1] Goodman-Introduction to Rock mechanics, Willey International(1980). [T2] Ramamurthy, T Engineering in Rocks for slopes, foundations and tunnels, Prenice Hall of India.(2007) [T3] Rock mechanics in engineering practice: Stag and Zienkiewiz, John wiley& sons
Reference books	 [R1] Jaeger, J. C. and Cook, N. G. W. — Fundamentals of Rock Mechanics, Chapman and Hall, London.(1979). [R2] Hoek, E. and Brown, E. T. Underground Excavation in Rock, Institution of Mining and Metallurgy, 1982. [R3] Brady, B. H. G. and Brown, E. T Rock Mechanics for Underground Mining, Chapman & Hall, 1993. [R4] Rock mechanics for engineers: Varma, B.P,Khanna Publishers
E-resources and other digital material	·

23CEH5801B

Course Category:	Honors	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:	23CE6301 Design of Steel Structures	Continuous Evaluation:	30
	Structures	Semester end Evaluation:	70
		Total Marks:	
			100

Course outcomes		Upon s	Upon successful completion of the course, the student will be able to:												
	CO1	analyse safe section for Tension members with lug angle and Built up Compression Members													
		CO2	analy	analyse safe section for Plate girders											
		CO3	analy	analyse for safe section for gantry girders											
		CO4	analy	analyse safe section for eccentric connections											
Contribution of Course Outcomes		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	PSO2
towards achievement of	CO1	2		2		3	1						1	3	
Program Outcomes	CO2	2		2		3	1						1	3	
(Low – 1, Medium - 2,	CO3	2		2		3	1						1	3	
High – 3)	CO4	2		2		3	1						1	3	
Course Content	UNIT TENSI Design COMP Design columr	- I ON M of ten RESSI of axi as with	EMB sion n ON N ally lo bolte	ERS (nembo /IEMI baded d and	IS800 ers wi BERS built weldo)-2007 th Lug (IS80 up con ed cor	7) 90-200 mpres nnectio	es wi)7) sion 1 ons.	th bol nemb	ted ar	nd weld	led co	nnectio d Batte	ons. ned	

	UNIT - II INTRODUCTION TO GANTRY GIRDER Introduction, Various loads, Load effects, explanation of how to calculate loads, Calculation of Maximum SF and Maximum BM using influence lines, Deflections DESIGN OF GANTRY GIRDER Design of Gantry Girder, Problems on design of gantry girder.
	UNIT - III INTRODUCTION TO PLATE GIRDERS Introduction to plate girder, Elements eccentric depth, Design of web and flanges, Design of plate girders without stiffeners, Problems DESIGN OF PLATE GIRDERS Design of plate girders with stiffeners. Design of plate girders with intermediate
	stiffeners, Problems on plate girders with intermediate stiffeners
	UNIT – IV SEATED CONNECTIONS Introduction to Connections, Unstiffened seated connections-bolted and welded, Stiffened seated connection-bolted and welded BRACKET CONNECTIONS Bracket Connections, type1-bolted and welded, Bracket connection type2-bolted and welded
Text books	 [T1] Duggal, S.K., Limit State Design of Steel Structures, McGraw-Hill, NDLS, 2019. [T2] Bhavikatti, S.S., Design of Steel Structures-By Limit State Method as per IS:800-2007, I. K. IBH Pvt. Ltd., NDLS, 2019.
Reference books	 [R1] Subramanian, N., Design of Steel Structures-Limit State Method Oxford University press, HYB, 2018. [R2] Ram, K.S.S., Design of Steel Structures, Pearson Education India, NDLS, 2015. [R3] Chandra, R. and Gehlot, V., Limit State Design of Steel Structures, Scientific Publishers, NDLS, 2010.
E-resources and other digital material	https://nptel.ac.in/courses/105105162 https://nptel.ac.in/courses/105106113

23CEH5801C	GEOSPATIAL DATA PROCESSING

Course Category:	Honors	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0-0
Prerequisites	NIL	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	understand the concepts of Geographical information systems and apply them in various engineering applications.									ous				
	CO2	evalu mana	valuate appropriate remote sensing data products for mapping, monitoring and nanagement applications.												
	CO3	apply	vario	ous ima	age pro	ocessin	g tech	niques	and the	eir app	licatio	ns.			
	CO4	apply	pply RS and GIS techniques for solving Engineering applications.												
Contribution of Course Outcomes		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
towards achievement	CO1	3	2	3		3									3
of Program Outcomes	CO2	3	2	3		3									3
	CO3	3	2	3		3								2	
(Low – 1, Medium - 2, High – 3)	CO4	3	2	3		3								2	
Course Content	UNIT GEOC Comp coord Geore	UNIT-I GEOGRAPHICAL INFORMATION SYSTEM Components of GIS, Types of Data, coordinate systems, Geographic coordinate system, Projected coordinate system, Maps and scales, Types of Maps and scales, Projections, Types of Projections, Georeferencing, Data structures, GIS analysis functions.													

DATA EDITING AND STORAGE

Raster and vector data models, Digitization, Data editing, Errors and corrections, data presentation and generation of thematic maps, spatial database management systems, Data representation, Data storage, Entity relationship models.

PRACTISE

- 1. Introduction to Arc GIS and Georeferencing, projections and re-projections
- 2. Creating a shape file, clip and attribute data manipulation.

UNIT-II

INTRODUCTION TO REMOTE SENSING

Introduction, Data and Information, Remote sensing data collection, Remote sensing advantages & Limitations, Remote Sensing process. Electromagnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, and vegetation), Resolution, image registration and elements of visual interpretation techniques.

DATA ACQUISITION AND PLATFORMS

Indian Satellites and Sensors characteristics, Remote Sensing Platforms, Sensors and Properties of Digital Data, Data Formats: Introduction, platforms-IRS, Landsat, Sentinel, SPOT, CARTOSAT, etc. sensors, sensor resolutions (spatial, spectral, radiometric and temporal), Optical, Thermal and Microwave, signal to noise ratio, LiDAR data acquisition and processing.

PRACTISE

3.DataDigitization (Draw, edit, delete and update)

UNIT-III IMAGE CLASSIFICATION TECHNIQUES

Supervised Classification, Unsupervised classification, ANN and SVM classification techniques

SPECTRAL INDICES

Vegetation indices, water related indices, Digital elevation model, Digital terrain model, Triangulated irregular networks.

PRACTISE

4. Data Analysis – Overlay, Buffer

5. Generation of DEM and DTM using raster data.

UNIT-IV

APPLICATIONS IN SCIENCE DOMAIN

Applications of Remote sensing in various Engineering and Science domains such as Agriculture, Forest, Soil, Geology

APPLICATIONS IN ENGINEERING DOMAIN

LU/LC, Water Resources, Urban, Disaster Management, etc.

	PRACTISE 6.Assignment on Application of Geospatial techniques in Civil Engineering.
Text books	 [T1] Photogrammetry, GIS & Remote Sensing, <u>SSManugula</u>, VeerannaBommakanti, Educreation Publishing, 2018 [T2] Text Book of Remote Sensing and Geographical Information Systems, M. Anji Reddy, BS Publications/BSP Books, 4th edition, 2012
Reference books	[R1] Remote Sensing and Image Interpretation, Lillesand, T.M, R.W. Kiefer and J.W. Chipman, Wiley India Pvt. Ltd., New Delhi,7th Edition 2015[R2] Remote Sensing and GIS, BasudeBhatta, Oxford UniversityPress,2nd Edition, 2011
E-resources and other digital material	https://nptel.ac.in/courses/105/103/105103193/ https://nptel.ac.in/courses/105/101/105101206/ https://nptel.ac.in/courses/105/107/105107206/

23CEH6801A	TRAFFIC ANALYSIS AND DESIGN

Course Category:	Honors	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:	23CE6302 Transportation	Continuous Evaluation:	30
	Engineering	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon	Upon successful completion of the course, the student will be able to:														
	CO1	unde	rstand	traffic	engin	eering	g studie	es, anal	lyse the	e data a	and pre	esent the	e result	S.		
	CO2	evalu move	ate tra ement.	affic a	and ro	ad fac	cilities	, and	interse	ction of	control	measu	res for	smooth	n traffic	
	CO3	analy	analyse appropriate traffic control and management measures.													
	CO4	apply	apply the principles of queuing theory to analyse delay at signalized and unsignalized intersections.													
Contribution of Course		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	
Outcomes towards	CO1	3	2	1	3	1	1			1						
of Program Outcomes	CO2	3	3							1				3		
	CO3	3			2	2	3			1					3	
(Low – 1, Medium - 2, High – 3)	CO4	3	3							1					3	
Course Content	UNI TRAI Samp	NIT – I RAFFIC ENGINEERING STUDIES AND ANALYSIS ampling in Traffic Studies, Adequacy of Sample Size; Objectives, Methods of Study, Equipment.														
	Data Case (f) Ac UNIT	Data Collection, Analysis and Interpretation Case Studies of (a) Speed (b) Speed and Delay (c) Volume (d) Origin and Destination (e) Parking (f) Accident & other Studies UNIT – II														

	DESIGN OF TRAFFIC ENGINEERING FACILITIES Control of Traffic Movements through Time Sharing and Space Sharing Concepts.
	Design of Islands Design of Channelising Islands, T, Y, Skewed, Staggered, Roundabout, Mini-roundabout and other forms of AT-Grade Crossings including provision for safe crossing of Pedestrians and Cyclists; Grade Separated Intersections, their Warrants and Design Features; Bus Stop Location and Bus Bay Design
	UNIT – III TRAFFIC REGULATION AND MANAGEMENT Traffic Signs, Markings and Signals; Principles of Signal Design, Webster's method of Signal Design, Redesign of Existing Signals including Case Studies; Signal System and Coordination.
	TRAFFIC MANAGEMENT MEASURES
	Speed, vehicle, parking, enforcement regulations, mixed traffic regulation, various management techniques.
	UNIT – IV TRAFFIC STREAM MODELS Fundamental Equation of Traffic Flow, Speed-Flow-Concentration Relationships, Normalised Relationship, Fluid Flow Analogy Approach, Shock Wave Theory, Platoon Diffusion and Boltzman Like Behaviour of Traffic Flow, Car-Following Theory, Linear and Non-Linear Car-Following Models, Acceleration Noise.
	QUEUING ANALYSIS
	Fundamentals of Queuing Theory, Demand Service Characteristics, Deterministic Queuing Models, Stochastic Queuing Models, Multiple Service Channels, Models of Delay at Intersections and Pedestrian Crossings.
Text books	[T1] Kadiyali, L.R., Traffic Engineering and Transport Planning, Khanna publishers, 2011. [T2] The Institute of Transportation Engineers, Traffic Engineering Handbook, 7th edn, 2016.
Reference books	 [R1] IRC-SP41: Guidelines for the Design of At-Grade Intersections in Rural & Urban Areas [R2] Pignataro, L., Traffic Engineering – Theory & Practice, John Wiley, 1973. [R3] Salter, R J., Highway Traffic Analysis and Design, ELBS, 1996
E-Reference	Nil

TRANSPORTATION ECONOMICS

Course Category:	Honors	Credits:	3
Course Type:	Program Elective	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:	23CE6302 Transportation	Continuous Evaluation:	30
	Engineering	Semester end Evaluation:	70
		Total Marks:	100

Course outcon	mes	Upon successful completion of the course, the student will be able to:													
	CO1	apply the economic principles and estimating the various cost components in transportation													
		CO2	apply appro	apply the possible project alternatives for the economic analysis and applying the appropriate economic analysis method											
		CO3	analy	analyze Demand and Supply modelling											
		CO4	understand Knowledge on Regulation and Policy making of Economic Evaluation												
Contribution of Course Outcomes		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
towards achievement of Program Outcomes	CO1	3	3	1		1				1		1		3	3
(L – Low,	CO2	3	3	1	1	3				1		1			
Medium, H – High)	CO3	3	1	1	3										
THEN/	CO4	3							3	1		1			3
Course Content U T P m C C R ar c C			Γ – I NSPOI ciples o enance SEQU ced vel onvenio quence	RT CO f econo cost, c ENCE hicle op ence, co s – trav	STS A omic a ost es S OF peration ost of vel tim	AND I nalysis timatin TRAN on cost accide ne.	BENEI s, Fixe ng met NSPOI s, valu nt redu	FITS d and v hods, a RT PR action,	variable ccount OJEC avel tir reduct	e cost, ting for TS, R (ne savi	cost of r inflati OAD U ings, va mainte	impro ion, ex J SER alue of nance of	vemen ternal o CONS increa cost, no	it, costs. EQUEI sed com on-user	NCES nfort

	UNIT – II
	ECONOMIC ANALYSIS METHODS
	Generation and screening of project Alternatives
	DIFFERENT METHODS OF ECONOMIC ANALYSIS annual cost and benefit ratio methods, discounted cash flow methods, shadow pricing techniques, determination of IRR and NPV, examples of economic analysis, application economic theory in traffic assignment problem.
	UNIT – III TRANSPORT DEMAND The Basic Framework- measuring the demand in a spatial and temporal setting. Traditional Four-Stage Demand Model; modern approaches to modelling demand and practical issues in demand estimation.
	TRANSPORT SUPPLY
	The nature of output in transport, output and costs, economies of size, density and scope, empirical estimation of transport cost functions- the approaches and illustrations.
	UNIT – IV REGULATION AND POLICY Theory of Regulation, Deregulation and Privatisation in Transport. Approaches to privatisation of transport infrastructure and services and a competition policy for transport. Evolution of transport policy in India with focus on case studies regarding different modes. EVOLUTION OF POLICY Evolution of transport policy in India with focus on case studies regarding different modes.
Text books	 [T1] McCarthy, P. S., Transportation Economics, Massachusetts: Blackwell Publishers. 2001 [T2] Winfrey R, Highway Economic Analysis, International Textbook Company, 1969.
Reference books	 [R1] Kenneth J. Button, Transport Economics, Elgar, 2010 [R2] David A. Hensher, Ann M. Brewer, Transport: An Economics and Management Perspective, Oxford University Press, 2001. [R3] Emile Quinet, Roger Vickerman, Principles of Transport Economics, Edward Elgar Pub, 2005 [R4] Road User Cost Study, Central Road Research Institute [R5] Dickey J.W, Project Appraisal for Developing Countries, John Wiley, 1984
E-resources and other digital material	https://www.civil.iitb.ac.in/~dhingra

23CEH6801C

ADVANCED FOUNDATION ENGINEERING

Course Category:	Honors	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:	23CE7302 Foundation Engineering	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcor	nes	Upon successful completion of the course, the student will be able to:														
		CO1	1 apply various bearing capacity determination techniques and													
		CO2	anal	nalysis for determination of bearing capacity and settlement of shallow foundation												
		CO3	eval	valuate safe capacity of pile foundation for all types of loads												
		CO4	anal	analyze section for stability of well foundation / caisson.												
Contribution of Course		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	
Outcomes towards	CO1	3	1	1									2		2	
of Program Outcomes	CO2	3	1	1									2		2	
(Low – 1,	CO3	3	1	1									2		2	
Medium - 2, High – 3)	CO4	3	1	1									2		2	
Course Conter	nt	UNIT BEAF Vesic Loads ESTII Bearin UNIT CONO Imme SETT Settle	⁷ – I RING meth s, Foo MATI ng Pre ⁷ – II CEPT diate LEM ment	CAPA od, IS tings o ION O essure t OF SE Settlen ENT E of four	CITY Code n Lay F BEA using ETTLI nent, (STIM	Y OF S metho ered S ARINO SPT& EMEN Conso IATIC ns on	SHAL od; Ef Soils. G CA z CPT NT CI lidation DN - E Sands	LOW fect of PACIT , LASSIC on Sett EMPIR S-Schm	FOUN Water Y BA C THE lement ICAL	DATIC Table; SED O ORIES t; Secor METH	ONS Footing N FIEL ndary Co ODS	gs with D TES	TS Sion S	ntric or In	t.	

	UNIT – III PILES IN COMPRESSION Static capacity of piles, Point Bearing Resistance with SPT and CPT ;Ultimate Capacity of Pile Groups in Compression, Settlement; Pile Load Test; Negative Skin Friction.
	SPECIAL PILES AND SETTLEMENTS OF PILE Laterally Loaded Piles -Ultimate Lateral Resistance; Batter Piles; Under Reamed Piles; Mini and Micro Piles, Pullout & Lateral Load; Efficiency; Settlements of Pile Groups;
	UNIT – IV WELL FOUNDATIONS Open wells; Design of pier foundations and well foundations; Lateral stability of well foundations; R.C.C. designs of wells
	PNEUMATIC CAISSONS Introduction to Pneumatic Caissons, construction of piers;
Text books	 [T1] Das, B. M. Principles of Foundation Engineering 5th Edition Nelson Engineering, 2004. [T2] Coduto, D,P. Foundation Design Principles and Practices, 2nd edition, Pearson, Indianedition, 2012. Phi Learning, 2008.
	 [T3] Bowles, J. E. Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc, 1996. [T4]Poulos, H. G. & Davis, E. H. Pile Foundation Analysis and Design, John Wiley & Sons Inc, 2008.
Reference books	 [R1] Reese, L. C. & Van Impe, W. F. Single Piles and Pile Groups under Lateral Loading - Taylor & Francis Group (Jan 2000) [R2] Rowe, R. K. Geotechnical & Geo-environmental Engineering Hand Book -Springer ,2001. [R3] Tomlinson, M. J. Foundation Design and Construction, PHI , 2003.
E-resources and other digital material	nptel.ac.in/courses/105107120 nptel.ac.in/courses/105101083

Course Category:	Honors	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:	23CE4304 Geotechnical Engineering	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outco	mes	Upon successful completion of the course, the student will be able to:													
		CO1 analyze the properties of geosynthetics													
		CO2 understand functions and applications of geosynthetics													
		CO3	evalua	ate a ty	pical s	ectior	n for t	he cor	nstructi	on of r	einforce	ed earth	walls		
		CO4	evalua	ate rein	forced	earth	slop	es and	founda	ations					
Contributio	С	PO	РО	PO	PO	Р	Р	РО	PO	PO	PO	PO	PO	PSO	PS
n of Course Outcomes	01	1	2	3	4	0 5	0 6	7	8	9	10	11	12	1	02
towards achievemen t of	C O2	3	3	3		3								3	3
Program Outcomes	C O3	3	3	3		3								3	3
(Low– 1, Medium - 2, High – 3)	C O4	3	3	3		3								3	3
Course Conte	ent	UNIT – I GEOSYNTHETICS Introduction to Geosynthetics-Types of geosynthetics- Functions of Geosynthetics Applications of Geosynthetics- Strength of reinforced soils						etics-							
		MANUFACTURING OF GEOSYNTHETICS Manufacture of geotextiles- Manufacture of geogrids- Manufacture of geonets- Manufactur of geomembranes- Manufacture of geocomposites						acture							

	UNIT – II PROPERTIES OF GEOSYNTHETICS Physical properties-Mechanical Properties-Hydraulic Properties-Endurance Properties- Degradation properties TESTING OF GEOSYNTHETICS Need for testing of Geosynthetics-Testing of geogrids-Testing of geonets-Testing of geomembranes-Testing of GCLs
	UNIT – III EXTERNAL STABILITY ANALYSIS OF REINFORCED SOIL WALLS Different Types of Soil Retaining Structures-Construction Aspects of Geosynthetic Reinforced Soil Retaining Walls-External Stability Analysis of Reinforced Soil Retaining Walls
	INTERNAL STABILITY ANALYSIS OF REINFORCED SOIL WALLS Internal Stability Analysis of Reinforced Soil Walls- Testing requirements for Reinforced Soil Retaining Walls- Design of Gabions.
	UNIT – IV STABILITY ANALYSIS OF REINFORCED SOIL EMBANKMENTS Stability analysis of reinforced soil Embankments resting on soft foundation soils-Stability analysis of reinforced soil slopes- Reinforced soil for supporting shallow foundations- Natural geosynthetics and their applications.
	GEOSYNTHETICS FOR LANDFILLS Geosynthetics for construction of municipal waste landfills-Geosynthetics for construction of hazardous waste landfills
Text books	 [T1] Koerner, R.M. "Designing with Geosynthetics", Prentice Hall, Eaglewood cliffs, NJ, 2005. [T2] Sanjay Kumar Shukla, Jian-Hua Yin, Taylor, "Fundamentals of Geosynthetics Engineering" & Francis, Milton Park, Abingdon, UK, 2010. [T3] Saran, S. "Reinforced Soil and Its Engineering Applications", I.K. International Pvt Ltd, New Delhi, 2005.
Reference books	 [R1] Venkatappa Rao, G. and Suryanarayana Raju, GVS. "Engineering with Geosynthetics", Tata McGraw Hill Publishing Company Limited – New Delhi, 2008. [R2] Koerner, R.M. and Welsh, J. P. "Construction and Geotechnical Engineering using Synthetic Fabrics" by. John Willey and Sons, New York, 1993.
E-resources and other digital material	https://nptel.ac.in/courses/105/101/105101143/[J. N. Mandal, Geosynthetics Engineering]

23CEH7801B

INTELLIGENT TRANSPORTATION SYSTEMS

Course Category: Course Type: Prerequisites:	Honors Theory 23CE6302 Transportation Engineering							Credits: Lecture - Tutorial - Practice: Continuous Evaluation: Semester end Evaluation: Total Marks:					3 3 - 0- 0 30 70 100		
	Upon CO1	Upon successful completion of the course, the student will be able to:													
Course Outcomes	CO2	appl	y ITS	for d	iffere	nt fun	ctiona	l area	.S				1		
	CO3	appl	y ITS	for d	iffere	nt use	r need	ls and	servi	ces					
	CO4	unde	erstan	d the	signif	icance	e of IT	'S in o	levelo	ped a	nd de	velopir	ng cou	ntries	
Contribution of Course Outcomes		PO 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
towards achievement of Program Outcomes	CO1	2		2		2									2
(Low 1 Medium	CO2	2				2									2
(10w - 1, Weddin - 2, High - 3)	CO3	2	2			2									2
	CO4	2	2			2							2		2
Course Content	UNIT INTR Defin collec Identi TELE Impo Mana Syster	UNIT-I INTRODUCTION TO ITS Definition of ITS, ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection. TELECOMMUNICATIONS IN ITS Importance of telecommunications in the ITS system, Information Management, Traffic Management Centres (TMC). Vehicle – Road side communication – Vehicle Positioning System													
	UNIT-II ITS FUNCTIONAL AREAS Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), ITS FUNCTIONAL AREAS IN TRANSPORTATION SYSTEM Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).														

	UNIT-III ITS USER NEEDS Travel and Traffic management, Public Transportation Management, Electronic Payment, ITS User Services Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management.
	UNIT-IV AUTOMATED HIGHWAY SYSTEMS Automated highway system - Vehicles in Platoons – Integration of Automated Highway Systems.
	ITS PROGRAMS IN THE WORLD Overview of ITS implementations in developed countries, ITS in developing countries.
Text books	 [T1] Ghosh. S, T. Lee, T.S Lee. "Intelligent Transportation Systems: New Principles and Architectures", 1sted, CRC Press, Boca Raton, 2000. [T2] Sussman. J, "Perspective on Intelligent Transport System ITS", 1sted, Artech House Publishers, Boston 2005.
Reference Book	 [R1] M.A. Chowdhury, & A. Sadek, "Fundamentals of Intelligent Transportation Systems Planning", 1st ed, Artech House Publishers, Boston, 2003. [R2] J. Miles, K. Chen, C.J.C Miles, "ITS Hand Book 2000: Recommendations for World Road Association (PIARC)" 1sted, Artech House Publishers, Boston, 1999
E-resources and other digital material	https://www.civil.iitb.ac.in/~vmtom/nptel/591_ITS_1/web/web.html https://coeut.iitm.ac.in/ITS_synthesis.pdf [https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-212j-an-introduction- to-intelligent-transportation-systems-spring-2005/lecture-notes/

23CEH7801C	ENVIRONMENTAL IMPACT ASSESSMENT

Course Category:	Honours	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0- 0
Prerequisites:	23MC3107B – Environmental studies	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon s	ucces	ccessful completion of the course, the student will be able to:												
	CO1 understand the Concept of EIA, EIA methodologies.														
	CO2	anal	yze th	e effec	et on di	ifferen	t sourc	es on c	levelop	omenta	l activ	ities.			
	CO3	anal	yze th	e effec	ct of de	evelopi	ment of	n flora	and fa	una.					
	CO4	unde	inderstand the different acts and case studies.												
Contribution of Course		РО 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
Outcomes towards achievement of Program	CO1	3					2						1		2
	CO2	3	2							3					2
Outcomes	CO3	3	2										1		2
(Low – 1, Medium - 2, High – 3)	CO4						2								2
Course Content	UNIT I INTRC Basic classifi evaluat enviror EIA M Criteria method cost/be	UNIT I INTRODUCTION TO ENVIRONMENTAL IMPACT ASSESSMENT Basic concept-Salient Features of EIA, EIA Procedure – Analytical functions of EIA – classification and prediction of impacts -Elements of EIA - Factors affecting EIA – Impact evaluation and analysis - Preparation of environmental base map - Classification of environmental parameters. EIA METHODOLOGIES Criteria for the selection of EIA Methodology – EIA methods - Adhoc methods, matrix methods, network method - Environmental medium quality index method, overlay methods and cost/benefit analysis.													

	 UNIT II ENVIRONMENTAL IMPACT ASSESSMENT ON SOIL AND GROUND WATER Introduction, Prediction and assessment - Soil quality -Methodology for the assessment of soil and groundwater - Delineation of study area - Identification of activities. ENVIRONMENTAL IMPACT ASSESSMENT OF SURFACE WATER AND AIR Impact prediction - Assessment of impact significance - Identification and incorporation of mitigation measures - EIA in surface water, air and biological environment: Methodology for the assessment of impacts on surface water environment. Air pollution sources, Air pollution effect - Generalized approach for assessment of air pollution Impact.
	UNIT III ASSESSMENT OF IMPACT ON VEGETATION AND WILDLIFE
	Assessment of impact of developmental activities on vegetation and wildlife - Environmental impact of deforestation – Causes and effects of deforestation.
	ENVIRONMENTAL AUDIT Environmental audit and environmental legislation - Objectives of environmental audit - Types of environmental audit - Audit protocol - Stages of environmental audit - Onsite activities - Evaluation of audit data and preparation of audit report.
	UNIT – IV ENVIRONMENTAL ACTS Post audit activities - The Environmental protection act - The water act - The air act - Wild life act. CASE STUDIES Case studies and preparation of environmental impact assessment statement for various industries.
Text books	 [T1] Anjaneyulu, VallManickam, "Environmental Impact Assessment Methodologies", 2nd Edition ,B.S. Publications, 2007. [T2] Glynn. J, and Gary W. Heinke, "Environmental Science and Engineering", PHI, NDLS, 1996.
Reference books	 [R1] Barthwal, R. R., "Environmental Impact Assessment", New Age International Publications [R2] Dhameja,S.K., Environmental Engineering and Management, Kataria, NDLS, 2010. [R3] Bhatia,H.S., A Text Book of Environmental Pollution and Control, Galgotia NDLS, 2003.
E-resources and other digital material	https://nptel.ac.in/courses/120/108/120108004/

23CEH6802B1	NPTEL Mandatory(Course Based on Availability)
-------------	---