B.E. Civil Engineering

CURRICULUM AND SYLLABUS

Regulation – 2020

(2021 & 2022 Admitted Batch Students)

ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

Accredited by NBA and NAAC with "A+"and Recognized by UGC (2f&12B)

KOMARAPALAYAM – 637303

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B.E. CIVIL ENGINEERING
REGULATION – 2020
CHOICE BASED CREDIT SYSTEM
I TO VIII SEMESTERS CURRICULUM AND SYLLABI

SEMESTER I									
Sub Code	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course (s)									
20MA102	Mathematics - I for Building Sciences	BS	3	2	0	4	40	60	100
20CE101	Basics of Civil Engineering	ES	3	0	0	3	40	60	100
Theory with Practical Course (s)									
20ENEXX	Language Elective - I*	HSS	2	0	2	3	50	50	100
20CH102	Chemistry for Building Sciences	BS	3	0	2	4	50	50	100
20ME101	Engineering Graphics	ES	1	0	4	3	50	50	100
Practical Course (s)									
20CE102	Civil Engineering Practices Laboratory	ES	0	0	2	1	60	40	100
Mandatory Course (s)									
20MC101	Induction Programme	MC	2 Weeks			0	100	0	100
		Total	**12**	**2**	**10**	**18**	**390**	**310**	**700**
***Language Electives – I**									
20ENE01	Communicative English	HSS	2	0	2	3	50	50	100
20ENE02	Advanced Communicative English	HSS	2	0	2	3	50	50	100

SEMESTER II									
Sub Code	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course (s)									

CHAIRMAN - BOARD OF STUDIES

Approved in Academic Council meeting

Passed in Board of studies meeting

20MA202	Mathematics - II for Building Sciences	BS	3	2	0	4	40	60	100
20ME201	Engineering Mechanics	ES	3	2	0	4	40	60	100
Theory with Practical Course (s)									
20ENEXX	Language Elective - II*	HSS	2	0	2	3	50	50	100
20PH202	Physics for Building Sciences	BS	3	0	2	4	50	50	100
20CS201	Problem Solving using Python	ES	3	0	2	4	50	50	100
Practical Course (s)									
20CE201	Computer Aided Building Drawing Laboratory	PC	0	0	4	2	60	40	100
Mandatory Course (s)									
20MC201	Environmental Sciences	MC	2	0	0	0	100	0	100
		Total	**16**	**4**	**10**	**21**	**390**	**310**	**700**
***Language Electives - II**									
20ENE02	Advanced Communicative English	HSS	2	0	2	3	50	50	100
20ENE03	Hindi	HSS	2	0	2	3	50	50	100
20ENE04	French	HSS	2	0	2	3	50	50	100
20ENE05	German	HSS	2	0	2	3	50	50	100

SEMESTER III									
Sub Code	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course (s)									
20MA301	Transforms and Boundary Value Problems	BS	3	2	0	4	40	60	100
20CE301	Mechanics of Solids I	ES	3	2	0	4	40	60	100
20CE302	Fluid Mechanics	ES	3	0	0	3	40	60	100
20CE303	Engineering Geology	PC	3	0	0	3	40	60	100
Theory with Practical Course (s)									
20CE304	Surveying I	PC	3	0	2	4	50	50	100
20CE305	Construction Materials	PC	3	0	2	4	50	50	100
Mandatory Course (s)									

20MC301	Interpersonnal Skills	MC	0	0	2	0	100	0	100
		Total	**18**	**4**	**6**	**22**	**360**	**340**	**700**

SEMESTER IV									
Sub Code	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course (s)									
20MA401	Numerical Analysis and Statistics	BS	3	2	0	4	40	60	100
20CE401	Concrete Technology	PC	3	0	0	3	40	60	100
20CE402	Geotechnical Engineering I	PC	3	0	0	3	40	60	100
20CE403	Mechanics of Solids II	PC	3	2	0	4	40	60	100
Theory with Practical Course (s)									
20CE404	Surveying II	PC	3	0	2	4	50	50	100
20CE405	Applied Hydraulic Engineering	ES	3	0	2	4	50	50	100
Practical Course (s)									
20CE406	Strength of Materials Laboratory	PC	0	0	2	1	60	40	100
Mandatory Course (s)									
20MC401	Soft Skills	MC	2	0	0	0	100	0	100
		Total	**20**	**4**	**6**	**23**	**420**	**380**	**800**

SEMESTER V									
Sub Code	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course (s)									
20CE501	Design of Reinforced Cement Concrete Elements	PC	3	2	0	4	40	60	100
20CE502	Structural Analysis I	PC	3	0	0	3	40	60	100
20CEEXX	Professional Elective-I	PE	3	0	0	3	40	60	100

20YYOXX	Open Elective-I	OE	3	0	0	3	40	60	100
Theory with Practical Course (s)									
20CE503	Environmental Engineering I	PC	3	0	2	4	50	50	100
20CE504	Geotechnical Engineering II	PC	3	0	2	4	50	50	100
Practical Course (s)									
20CE505	Survey Camp	PC	1 Week			1	100	0	100
		Total	**18**	**2**	**4**	**22**	**360**	**340**	**700**

SEMESTER VI									
Sub Code	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course (s)									
20CE601	Design of Steel Structural Elements	PC	3	2	0	4	40	60	100
20CE602	Structural Analysis II	PC	3	0	0	3	40	60	100
20CE603	Environmental Engineering II	PC	3	0	0	3	40	60	100
20CEEXX	Professional Elective-II	PE	3	0	0	3	40	60	100
20YYOXX	Open Elective-II	OE	3	0	0	3	40	60	100
Theory with Practical Course (s)									
20CE604	Highway Engineering	PC	3	0	2	4	50	50	100
Employment Enhancement Course (s)									
20CE605	Mini Project	EEC	0	0	2	1	50	50	100
20CE606	Internship	EEC	2 weeks			1	100	0	100
		Total	**18**	**2**	**4**	**22**	**400**	**400**	**800**

SEMESTER VII									
Sub Code	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course (s)									
20CE701	Structural Dynamics and Earthquake Engineering	PC	3	0	0	3	40	60	100
20CE702	Estimation Costing and ValuationEngineering	PC	3	0	0	3	40	60	100
20CE703	Water Resource and Irrigation Engineering	PC	3	0	0	3	40	60	100
20CEEXX	Professional Elective-III	PE	3	0	0	3	40	60	100
20CEEXX	Professional Elective-IV	PE	3	0	0	3	40	60	100
20YYOXX	Open Elective-III	OE	3	0	0	3	40	60	100
Practical Course (s)									
20CE704	Computer Aided Design and Drawing Laboratory (Concrete and Steel)	PC	0	0	4	2	60	40	100
Employment Enhancement Course (s)									
20CE705	Design Project	EEC	0	0	2	1	50	50	100
		Total	**18**	**0**	**6**	**21**	**350**	**450**	**800**

SEMESTER VIII									
Sub Code	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course (s)									
20CEEXX	Professional Elective-V	PE	3	0	0	3	40	60	100
20CEEXX	Professional Elective-VI	PE	3	0	0	3	40	60	100
Employment Enhancement Course (s)									
20CE801	Major Project	EEC	0	0	20	10	50	50	100
		Total	**6**	**0**	**20**	**16**	**130**	**170**	**300**

PROFESSIONAL ELECTIVES (PE)									
STREAM-I : ENVIRONMENTAL AND WATER RESOURCE ENGINEERING									
Sub Code	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
20CEE01	Hydrology	PE	3	0	0	3	40	60	100
20CEE02	Ground Water Engineering	PE	3	0	0	3	40	60	100
20CEE03	Air Pollution and Control Engineering	PE	3	0	0	3	40	60	100
20CEE04	Water Resources Systems Analysis	PE	3	0	0	3	40	60	100
20CEE05	Integrated Water Resources Management	PE	3	0	0	3	40	60	100
20CEE06	Hospital Waste Management	PE	3	0	0	3	40	60	100
20CEE07	Municipal Solid Waste Management	PE	3	0	0	3	40	60	100
20CEE08	Participatory Water Resources Management	PE	3	0	0	3	40	60	100
20CEE09	Air Pollution Management	PE	3	0	0	3	40	60	100
20CEE10	Industrial Waste Management	PE	3	0	0	3	40	60	100
20CEE11	Environmental and Social Impact Assessment	PE	3	0	0	3	40	60	100
20CEE12	Geo- Environmental Engineering	PE	3	0	0	3	40	60	100

STREAM-II : STRUCTURAL ENGINEERING									
Sub Code	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
20CEE21	Building Services	PE	3	0	0	3	40	60	100
20CEE22	Disaster Management	PE	3	0	0	3	40	60	100
20CEE23	Industrial Structures	PE	3	0	0	3	40	60	100
20CEE24	Maintenance, Repair and Rehabilitation of Structures	PE	3	0	0	3	40	60	100
20CEE25	Design of Prestressed Concrete Structures	PE	3	0	0	3	40	60	100
20CEE26	Experimental Analysis of Stress	PE	3	0	0	3	40	60	100
20CEE27	Bridge Structures	PE	3	0	0	3	40	60	100

20CEE28	Storage Structures	PE	3	0	0	3	40	60	100
20CEE29	Ground Improvement Techniques	PE	3	0	0	3	40	60	100
20CEE30	Cost Effective Construction and Green Building	PE	3	0	0	3	40	60	100
20CEE31	Tall Buildings	PE	3	0	0	3	40	60	100
20CEE32	Prefabricated Structures	PE	3	0	0	3	40	60	100
20CEE33	Rock Mechanics	PE	3	0	0	3	40	60	100
20CEE34	Reinforced Soil Structure	PE	3	0	0	3	40	60	100
20CEE35	Geotechnical Exploration and Instrumentation	PE	3	0	0	3	40	60	100
20CEE36	Design of Masonry, Timber & Steel Elements	PE	3	0	0	3	40	60	100

STREAM-III : CONSTRUCTION ENGINEERING AND MANAGEMENT									
Sub Code	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
20CEE41	Construction Planning and Scheduling	PE	3	0	0	3	40	60	100
20CEE42	Modern Construction Materials	PE	3	0	0	3	40	60	100
20CEE43	Housing Planning and Management	PE	3	0	0	3	40	60	100
20CEE44	Construction Project Management	PE	3	0	0	3	40	60	100
20CEE45	Economic and Finance Management in Construction	PE	3	0	0	3	40	60	100
20CEE46	System Integration in Construction	PE	3	0	0	3	40	60	100
20CEE47	Contract Laws and Regulation	PE	3	0	0	3	40	60	100
20CEE48	Resource Management and Control in Construction	PE	3	0	0	3	40	60	100
20CEE49	Quality Control and Assurance in Construction	PE	3	0	0	3	40	60	100
20CEE50	Design of Energy Efficient Building	PE	3	0	0	3	40	60	100
20CEE51	Project Formulation and Appraisal	PE	3	0	0	3	40	60	100

20CEE52	Project Safety Management	PE	3	0	0	3	40	60	100
20CEE53	Railway, Airport, Docks and Harbor Engineering	PE	3	0	0	3	40	60	100

OPEN ELECTIVE COURSES (For Other Branches)									
Sub Code	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
20CEO01	Energy Conservation and Management	OE	3	0	0	3	40	60	100
20CEO02	Environment and Agriculture	OE	3	0	0	3	40	60	100
20CEO03	Renewable Energy Sources	OE	3	0	0	3	40	60	100
20CEO04	Vibration and Noise Control	OE	3	0	0	3	40	60	100
20CEO05	Climate Change and its Impacts	OE	3	0	0	3	40	60	100
20CEO06	Green Building Design	OE	3	0	0	3	40	60	100
20CEO07	Selection of Materials	OE	3	0	0	3	40	60	100
20CEO08	Testing of Materials	OE	3	0	0	3	40	60	100

ONE CREDIT COURSES									
Sub Code	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
20CEA01	Drafting and Documentation of Construction Projects	PC	1	0	0	1	100	0	100
20CEA02	3D Modeling Techniques of BIM	PC	1	0	0	1	100	0	100
20CEA03	3DModelling of Buildings	PC	1	0	0	1	100	0	100
20CEA04	Total Station Survey	PC	1	0	0	1	100	0	100
20CEA05	Tekla	PC	1	0	0	1	100	0	100
20CEA06	Vasthu	PC	1	0	0	1	100	0	100
20CEA07	Pre-Engineered Building	PC	1	0	0	1	100	0	100

VALUE ADDED COURSES									
Sub Code	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
20CEB01	Auto cad	OE	2	0	2	3	100	0	100
20CEB02	Revit Architecture	OE	2	0	2	3	100	0	100
20CEB03	E tabs	OE	2	0	2	3	100	0	100
20CEB04	3 DX Max	OE	2	0	2	3	100	0	100
20CEB05	Stadd Pro.	OE	2	0	2	3	100	0	100
20CEB06	Primavera	OE	2	0	2	3	100	0	100
20CEB07	Drone Survey	OE	2	0	2	3	100	0	100

Sl. No.	**Category**	**Credits per Semester**								**Total Credits**	**By AICTE**
		I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**		
1	HSS	3	3							6	10-14
2	BS	8	8	4	4					24	22-28
3	ES	7	8	7	4					26	24
4	PC		2	11	15	16	14	11		69	48
5	PE					3	3	6	6	18	18
6	OE					3	3	3		9	9
7	EEC						2	1	10	13	12-16
8	MC	0								0	
Total		**18**	**21**	**22**	**23**	**22**	**22**	**21**	**16**	**165**	**143-157**

HSS - Humanities and Social Sciences
BS - Basic Sciences
ES - Engineering Sciences
PC - Professional Core
PE - Professional Electives
OE - Open Electives
EEC - Employability Enhancement Courses
MC - Mandatory Courses (Non-Credit Courses)
CA - Continuous Assessment
FE - Final Examination

20MA102	Mathematics – I for Building Sciences	L	T	P	C
		3	2	0	4
Nature of Course	Basic sciences				
Pre requisites	Fundamentals of Basic Mathematics				

Course Objectives

The course is intended to

1. Acquire the concepts of matrix algebra techniques.
2. Acquaint the mathematical tools needed in evaluating limits, derivatives and differentiation of one variable.
3. Learn the concept of calculus for solving the problems mathematically and obtaining solutions.
4. Learn the knowledge of definite, indefinite integrals and parts of Integration.
5. Learn the theory and applications of Riemann Integration of a bounded real valued functions defined on a closed and bounded interval.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Apply the idea of reducing the complex problems into simple form using matrix technique	Apply
CO2	Use both the limit definition and rules of differentiation to differentiate functions.	Understand
CO3	Identify the circle of curvature, evolutes and envelope of the curves.	Apply
CO4	Explain different method of integration using in Engineering problems	Apply
CO5	Show the relationship between the derivative and the definite integral as expressed in both parts of fundamental theorem of Calculus.	Understand

Course contents:

Unit- I Matrices 12

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties(statement only) – Cayley- Hamilton theorem and its applications – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation

Unit- II Limits and Continuity 12

Representation of functions- Limit of a function – Continuity – Derivatives – Differentiation rules – Maxima and Minima of functions of one variable.

Unit- III Differential Calculus 12

Curvature – radius of curvature (Cartesian and polar co-ordinates) – Centre of curvature – Circle of curvature – Involutes and evolutes – envelope

Unit- IV Integral Calculus 12

Definite and Indefinite integrals – Substitution rule – Techniques of integration – Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction – Double integral – Triple integral

Unit- V Riemann Integration 12

Definition and properties - fundamental theorem of integral calculus - improper integrals - Beta and Gamma functions

Total: 60 Periods

Text books

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers,44th Edition,2016.
2. Veerajan.T, "Engineering mathematics for semester I and II", Tata McGraw Hill, 3rd Edition,2014.

Reference books

1. Anton H. Bivens, and Davis, "Calculus", Wiley, 10th Edition, 2016.
2. Weir M.D. and Joel Hass, "Thomas calculus", Pearson,12th Edition, 2016.

Additional References:

1. nptel.ac.in/course/111/105/111105121
2. nptel.ac.in/course/122/104/122104017

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2										1	
CO2	3	3	2										2	
CO3	2	3	2										1	
CO4	3	3	1										2	
CO5	3	3	2										1	
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Tutorial Class/Assignment	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	**(60)**
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CE101	Basics of Civil Engineering	L	T	P	C
		3	0	0	3
Nature of Course	Engineering sciences				
Pre requisites	NIL				

Course Objectives

The course is intended to

1. Understand basic concepts of about Civil Engineering
2. Know about the various types of buildings.
3. Gain knowledge about the properties and uses of various materials for constructions
4. Recognize the necessity for composite materials like concrete, RCC
5. Understand the building components

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Gain knowledge on scope and importance of civil engineering.	Apply
CO2	Acquire knowledge on the composition, properties and classification of building materials.	Understand
CO3	Analyze the properties of timber, and other building materials used in construction	Apply
CO4	Explain the various building components and their functions.	Apply
CO5	Differentiate the types of masonry and also enumerate the functions of super- structure.	Understand

Course Contents:

Unit- I Scope of Civil Engineering 9

Scope of Civil Engineering- Functions of a Civil Engineer - Types of Building: Residential- Commercial- Industrial & Institutional buildings- Site selection- Units & Unit conversions- Room dimensions as per NBC.

Unit- II Primary Building Materials 9

Bricks: Manufacturing of bricks-Types- Characteristics of Bricks. Stone: Characteristics of Stones- Coarse aggregate- Characteristics of good building stone. Concrete: Definition-Cement-Types- Manufacturing of cement. Fine aggregate- M-sand- Manufacturing of M-Sand. Water- Water standards for construction purpose. Steel: Properties- Grade- Cold formed steel- Hot rolled steel- Sections.

Unit - III Other Building Materials 9

Timber: Types of Timber - Seasoning of Timber- Applications. PVC, UPVC, Aluminium, Glass & Stainless steel types- Applications in construction. Paints: Composition of oil paints- Purpose of paints- Applications. Enamels- Varnishes- Plaster of Paris- Purpose- Applications

Unit- IV Building Components (Sub-Structure) 9

Components of Building- Sub structures- Foundation and its Types- Construction sequence in Building- Design sequence in Building- Ground level- Basement- Plinth level- Sill level- Lintel level- Roof level- Parapet level

Unit- V Building Components (Super-Structure) 9

Super-structure - Walls: Types of Stone masonry and Brick masonry walls- Brick bonds- Slab- Beam- Column- Roof - Floor- Door- Windows- Lintel- Parapet

Total: 45 Periods

Text Books:

1. S. K. Duggal, "Building Materials", New Age International (P) Ltd.3rd Edition,,2003.
2. P. C. Varghese, "Building Materials", PHI Learning Private Limited, New Delhi,2nd Edition,2010.
3. S. P. Arora and S. P. Bindra, "Textbook of Building Construction", DhanpatRai Publications(P) Ltd. Revised Edition 2003.

Reference Books:

1. Punmia B. C., Jain A. J. and Jain A. J. "Building construction", Laxmi Publications,5th Edition2005.
2. Shetty .M.S., " Concrete Technology, Theory and Practice", Revised Edition, S. Chand & company Ltd., New Delhi,2006.
3. E. Keith Blankenbaker, "Construction and Building Technology", 1st Edition,2009.

Additional References:

1. National Building Code

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3				3							3		2
CO2	3				3							3		2
CO3	3				3							3		2
CO4	3				3							3		2
CO5	3				3							3		2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CH102	Chemistry for Building Sciences (Civil Engineering)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Science				
Prerequisites	Nil				

Course Objectives

The course is intended to

1. Impart knowledge and understanding about the constituents present in water and the need for purification of water.
2. Understand the fundamentals of batteries.
3. Provide knowledge about materials like metals, refractory and cement.
4. Learn about the nature, types and problems of the soil.
5. Understand the causes and control measures of corrosion.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Develop innovative and eco-friendly method for water purification to meet the growing industrial demand	Apply
CO2	Discuss the basic principles and mechanism of working of batteries and fuel cells	Understand
CO3	Discuss about various types of alloys and engineering materials	Understand
CO4	Identify the nature and problems of the soil	Understand
CO5	Demonstrate the importance of protection of metals from corrosion	Apply

Course Contents

Unit-I Water Analysis and Water Treatment 9

Water analysis: Sources of water, Hard water and soft water, Hardness of water, acidity, alkalinity, pH value, amount of free CO_2, fluoride content and chloride content. Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD). Water treatment: Definition, Zeolite process, Conditioning methods: internal conditioning (Phosphate, Calgon) and external conditioning (Demineralisation), Desalination, Reverse osmosis (RO).

Unit-II Energy Storage Devices 9

Batteries: Definition, characteristics and classification, Primary battery: Alkaline battery, Secondary battery: lead acid battery, nickel cadmium battery, lithium battery and lithium ion battery, Fuel cells: construction and working of phosphoric acid fuel cell

Unit-III Alloys and Engineering Materials 9

Alloys: classification and types, Ferrous alloys (Nichrome and stainless steel only), Non- ferrous alloys (brass and bronze), Heat treatment of steel, Refractories: characteristics, classification and manufacture, Cement: manufacture and setting

Unit-IV Soil Chemistry 9

Types of soil: saline soil, acidic soil and alkaline soil. Formation: acid, acid sulphate, salt affected and calcareous soil. Characteristics and Reclamation. Methods of reclamation: mechanical, chemical and biological methods. Chemistry of submerged soils

Unit-V Corrosion and its Control **9**

Corrosion: Classification, Types: Chemical corrosion and Electrochemical corrosion, mechanism. Corrosion control: Corrosion inhibitors, cathodic protection (sacrificial anodic protection, impressed current cathodic protection), Protective coating, Paint and Electroplating (Au).

Total: 45 Periods

Laboratory Component

S.No	Name of the Experiment	CO Mapping	RBT
1	Determination of hardness of water	CO1	Apply
2	Determination of chloride content in water sample	CO1	Apply
3	Conductometric titration of strong acid versus strong base	CO2	Understand
4	Determination of strength of HCl by pH meter	CO2	Understand
5	Estimation of copper in brass by EDTA method	CO3	Apply
6	Determination of CaO in cement	CO3	Apply
7	Measurement of pH of soil sample using litmus paper and pH strips	CO4	Apply
8	Determination of the nature of sample solution of soil (acidic, alkaline, neutral) using universal indicator	CO5	Apply

Total: 30 Periods

Text Books

1. O.G.Palanna, “Engineering Chemistry” Tata McGraw-Hill Pub.Co.Ltd, 1st Edition, New Delhi, 2017.
2. P.C.Jain and Monicka Jain, “Engineering Chemistry”, Dhanapat Rai Publishing Company Pvt. Ltd, 2nd Edition, 2017.

Reference Books

1. B. Sivasankar “Engineering Chemistry”, Tata McGraw-Hill Pub.Co.Ltd, 2nd Edition, 2009.
2. S.Tolanur, “Soil Chemistry”, CBS Publishers, 2nd Edition, 2015.
3. R. Sivakumar and N. Sivakumar, “Engineering Chemistry”, Tata McGraw-Hill Pub.Co.Ltd, 1st Edition, 2009.
4. Dr.Sivanesan and Nandagopal, “Engineering Chemistry-I”, V. K. Pub. Pvt. Ltd, 2nd Edition, 2011.

Additional Resources

1. https://nptel.ac.in/downloads/122101001
2. https://nptel.ac.in/courses/103103033/module9/lecture1.pdf
3. https://nptel.ac.in/courses/102103044/3
4. https://www.youtube.com/watch?v=jFQeDef6bug
5. https://www.sciencedirect.com/topics/chemistry/phosphoric-acid-fuel-cells

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2									1				
CO2	3	2									1				
CO3	3	2									1				
CO4	3	2									1				
CO5	3	1									1				
	3	High				2	Medium				1	Low			

Summative Assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50]**
	Theory				**Practical's**	
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**		**Rubric based CIA[10]** / **Model Examination [10 marks]**	
Remember	30	20	10	Attendance[5]	20	20
Understand	10	20	30		20	40
Apply	10	10	10		40	20
Analyze					20	20
Evaluate						
Create						

20ME101	Engineering Graphics (Common to Aeronautical ,Agriculture, Civil, Mechanical, Safety and Fire Engineering & Food Technology)	L	T	P	C
		1	0	4	3
Nature of Course	Engineering Sciences				
Pre requisites	Nil				

Course Objectives:

The course is intended to

1. Understand technical drawings in various fields of engineering
2. Imagine and visualize the geometric details of engineering objects.
3. Translate the geometric information of engineering objects into engineering drawings.
4. Develop the graphical skills for communication of concepts, ideas and design of engineering products through technical drawings.
5. Visualize and draw isometric and perspective views

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO 1	Develop the conic sections, special curves, and draw orthographic views from pictorial views.	Apply
CO 2	Apply the principles of orthographic projections of points in all quadrants, lines and planes in first quadrant.	Apply
CO 3	Construct the projections of simple solids like prisms, pyramids, cylinder and cone.	Apply
CO 4	Build the sectional views of solids like cube, prisms, pyramids, cylinders & cones and development of its lateral surfaces.	Apply
CO 5	Organize and draw isometric and perspective sections of simple solids.	Apply

Course Contents:

Concepts and Conventions (Not for Examination) **1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

Unit - I Plane Curves and Free Hand Sketching **(3+12)**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles -Representation of Three-Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

Unit – II Projection of Points, Lines and Plane Surfaces **(3+12)**

Orthographic projection- principles-Principal Planes-First angle projection-projection of points Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Unit- III Projection of Solids (3+12)

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

Unit- IV Projection of Sectioned Solids and Development of Surface (3+12)

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section, Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

Unit -V Isometric and Perspective Projections (3+12)

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

Total:(15+60) Periods

Text Books:

1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited,1st Edition 2011.
2. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2012.

Reference Books:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
2. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Parthasarathy N S and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.

Web References:

1. http://nptel.ac.in/courses/112103019/Engineering drawing
2. http://pioneer.netserv.chula.ac.th/~kjirapon/self-practice.html

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable only to Final Examinations of Engineering Graphics:

1. There will be five questions, each of either-or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2										1	2		
CO2	3	2										1	2		
CO3	3	2										1	2		
CO4	3	3										1	2		
CO5	3	2										1	2		
	3	High				2	Medium				1	Low			

Summative Assessment							
Bloom's Level	**Continuous Assessment**						**Final Examination (Theory) [50]**
	Theory				**Practical's**		
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	Attendance[5]	**Rubric based CIA[10]**	**Model Examination [10 marks]**	
Remember	30	20	10		20		20
Understand	10	20	30		20		40
Apply	10	10	10		40		20
Analyze					20		20
Evaluate							
Create							

20CE102	Civil Engineering Practices Laboratory	L	T	P	C
		0	0	2	1
Nature of Course	Engineering Sciences				
Pre requisites	Nil				

Course Objectives:

The course is intended to

1. To provide hands on training on plumbing works
2. To impart knowledge on carpentry using power tools
3. To practice Butt joints, Lap joints and T- Joints. by metal arc welding
4. To provide training in basic machining works
5. To fabricate different models using sheet metal

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Get trained in plumbing works.	Apply
CO2	Fabricate joints in carpentry components.	Apply
CO3	Experiment with arc welding equipment to make joints.	Apply
CO4	Carry out the basic machining operations for turning and drilling.	Apply
CO5	Make the models using sheet metal.	Apply

Course Contents:

S.No	List of Experiment	CO Mapping	RBT
1	**Buildings** Study of plumbing and carpentry components of residential and industry buildings, safety aspects.	**CO1**	**Apply**
2	**Plumbing Works** a. Pipeline joints, location and functions: valves, tapes, couplings, unions, reduces, elbows and house a. hold fittings. b. Pipe connection requirements for pumps and turbines. c. Preparation of plumbing line sketches for water supply and sewage works. d. Basic pipe connections, mixed pipe material connections, pipe connections with different	**CO1**	**Apply**

	joining components. Plumbing requirements of high rise buildings		
3	**Carpentry using power tools** a. Joints in roofs, doors, windows and furniture. b. Planning and making of various joints	**CO2**	**Apply**
4	**Welding** a. Preparation of welding symbols and edges b. Arc welding – Butt joints, Lap joints and T joints. c. Standard size of bars, rods, section and sheet metal	**CO3**	**Apply**
5	**Basic Machining** a. Facing and plain turning. b. Drilling practice. c. Different types of screw drivers, screws, bolt and nuts.	**CO4**	**Apply**
6	**Sheet metal work** a. Model making using bending and forming - trays, cone b. Study of thickness gauges, wire gauges.	**CO5**	**Apply**

Total: 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3		2	1	3									3
CO2	3		2	1	3									3
CO3	3		2	1	3									3
CO4	3		2	1	3									3
CO5	3		2	1	3									3
	3	High				2	Medium				1	Low		

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	**Rubric based Continuous Assessment [30 marks]**	**Preparatory Examination [25 Marks]**	**Attendance [5 Marks]**	**Final Examination [40 Marks]**
Remember	20	20		20
Understand	30	20		20
Apply	50	40		40
Analyze		20		20
Evaluate				
Create				

Passed in Board of studies meeting CHAIRMAN - BOARD OF STUDIES *Approved in Academic Council meeting*

20MC101	Induction Programme	L	T	P	C
		2	0	0	0
Nature of Course	Mandatory, Non Credit				
Pre requisites	Completion of Schooling at Higher Secondary Level				

Course Objectives

The course is intended

1. To nurture the character and behavior as a student.
2. To have broad understanding of society and relationships.
3. To impart interpersonal and soft skills.
4. To inspire the students in the field of engineering.
5. To provide exposure to industries.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO 1	Perform curricular and co-curricular activities excellently.	Knowledge
CO 2	Do the skill based training with excellence.	Understand
CO 3	Work as team for the given task	Apply
CO 4	Gain character and behavior	Knowledge
CO 5	Demonstrate the acquired skills effectively	Apply

Course Contents

PHYSICAL ACTIVITY

Yoga, Sports

CREATIVE ARTS (students can select any one of their choice)

Painting, sculpture, pottery, music, craft making and so on

UNIVERSAL HUMAN VALUES

Enhancing soft skills

LITERARY AND PROFICIENCY MODULES

Reading, Writing, Speaking- Debate, Role play etc.,
Communication and computer skills

LECTURES BY EMINENT PEOPLE

Guest lecture by subject experts

VISIT TO LOCAL CITIES

Meditation centers / Industry

FAMILARIZATION TO DEPARTMENT / BRANCH INNOVATION

Lectures by Departments Head and senior faculty members

Total: 45 Periods

Mapping of COs with POs and PSOs

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1						2	1	2				3	2		
CO2						2	1	2				3	2		
CO3						2	1	2				3	2		
CO4						2	1	2				3	2		
CO5						2	1	2				3	2		
	3	High				2	Medium					1	Low		

Bloom's Level	**Continuous Assessment (Non-Credit, Mandatory)**				
	Test -I [20]	**Test -II [20]**	**Test - III [20]**	**Assignment/ Activity [20]**	**Attendance [20]**
Remember	10	10	10		
Understand	20	20	20	10	
Apply	20	20	20	10	
Analyse					
Evaluate					
Create					

20ENE01	COMMUNICATIVE ENGLISH (Common to all B.E/ B.Tech Programmes)	L	T	P	C
		2	0	2	3
Nature of Course	Humanities and Social Science				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Improve lexical, grammatical and semantic competence.
2. Enhance communicative skills in real life situations.
3. Augment thinking in all forms of communication.
4. Equip with oral and written communication skills.
5. Gain employability skills.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Use effectively the lexical, grammatical and semantic knowledge	Remember
CO2	Communicate with clarity using intentional vocabulary in English	Apply
CO3	Articulate perfectly and express their opinions confidently using communicative strategies	Remember
CO4	Accomplish listening and reading skills for lifelong learning	Understand
CO5	Comprehend, interpret and present data	Understand

Course Contents:

Unit – I Basic structure and Usage 6

Parts of Speech -- Articles -Tenses - Subject-Verb Agreement – Different Grammatical forms of the same word - Listening to Speeches and Conversations from Globareana software – Listening to Announcements – Listening and Gap Filling.

Unit – II Vocabulary and Language Development 6

Intentional vocabulary used in and around Airport, Hospital, Hotel, Court – Abbreviations and acronyms - One Word Substitution - Compound words – Homophones and Homonyms – Types of sentences - Ordering Jumbled Sentences Letter writing – informal.

Unit – III Oral Communication Skills 6

Improving fluency – Articulation with pronunciation – Voice modulation in Speaking – One minute talk -Self Introduction and introducing ones friend – Telephonic conversations – Group Discussion – Modal Auxiliaries – Discourse markers

Unit – IV Comprehensive Listening and Reading 6

Effective listening Strategies – Listening to Interviews from Globareana software – Phrasal verbs – Reading Comprehension – "An Astrologer"s Day" by R.K.Narayan and "Building a New State" by Dr. A.P.J. Abdul Kalam

Unit – V Effective Writing 6

Interpretation and presentation of data – Developing Hints – General essays and paragraph writing – Report Writing – survey report and accident report - Instructions and Recommendations

Total: 30 Periods

Laboratory Components

S.No	List of Exercises	CO Mapping	RBT
1	Role-play – One minute talk	3	Understand
2	Role-play – Telephonic conversations	3	Understand
3	Listening to speeches and lectures and gap filling	4	Understand
4	Group Discussion.	4	Understand
5	Articulation with pronunciation practice	3	Apply
6	Listening to Announcements – Listening and Gap Filling	4	Understand
7	Listening to Interviews & Native speakers‟ Conversations	4	Understand
8	Reading practice with articles in magazine and news papers.	4	Understand
9	Model – Job Interviews	4	Understand
10	Introspective report – Personal analysis	5	Understand
11	Telephone etiquette	3	Remember
12	Reading – Shorter texts and News Articles	4	Understand
13	Role Play – Getting and Giving Permission	3	Remember
14	Self Introduction(Formal)	3	Understand
15	Recommendations/Suggestions	3	Apply

Total: 30 Periods

Text Books

1. Rizvi, Ashraf M., “Effective Technical Communication”, Tata McGraw Hill Publishing Company Limited, New Delhi, 5th Edition, 2007.
2. Board of Editers, “Using English – A Coursebook for Undergraduate Engineers and Technologists”, Orient BlackSwan Private Limited, Hyderabad, 2nd Edition, 2017.

Reference Books:

1. Meenakshi Raman and Sangeetha Sharma, “Technical Communication”, Oxford University Press, USA, 10th Edition, 2007.
2. John Cunnison Catford, “A Practical Introduction to Phonetics”, Clarendon Press, Jamaica, 2nd Edition, 2001.
3. Hewings. M, “Advanced English Grammar”, Cambridge University Press, Chennai, 3rd Edition, 2000.
4. S P Dhanavel “English and Soft Skills”, Orient BlackSwan Private Limited, Hyderabad, 1st Edition, 2010.

Web reference:

https://www.googleadservices.com/pagead/aclk?sa=L&ai=DChcSEwij4dCTucfsAhXE1pYKHch4ABMYABABGgJ0bA&ohost=www.google.com&cid=CAASEuRo76H-Vx9BpazOOBfXeJSKVQ&sig=AOD64_3O-HNEnUO4A5sc31MsUfaTBGG-dQ&q&adurl&ved=2ahUKEwjC3ceTucfsAhXBeisKHatlBewQ0Qx6BAgfEAE

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1							1			3	2	2			
CO2							1			3	2	2			
CO3							1			3	2	2			
CO4							1			3	2	2			
CO5							1			3	2	2			
	3	**High**				**2**	**Medium**				**1**	**Low**			

Summative Assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50]**
	Theory				**Practical's**	
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	Attendance[5]	**Rubric based CIA[10]** / **Model Examination [10 marks]**	
Remember	30	20	10		20	20
Understand	10	20	30		20	40
Apply	10	10	10		40	20
Analyze					20	20
Evaluate						
Create						

20ENE02	Advanced Communicative English (Common to all B.E/ B.Tech Programmes)	L	T	P	C
		2	0	2	3
Nature of Course	Humanities and Social Sciences				
Pre requisites	Basics of Communicative English				

Course Objectives

The course is intended to

1. Demonstrate satisfactory control over complex structures and mechanics in English.
2. Develop fluency and accuracy in oral communication.
3. Communicate effectively and actively in social interactions.
4. Read English at inspectional level.
5. Face interviews with confidence.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Apply knowledge of English grammar for effective communication	Remember
CO2	Make use of common English phrases and vocabulary strength.	Understand
CO3	Build self confidence and enhance professionalism	Apply
CO4	Implement listening, reading and writing skills in real - life situations	Apply
CO5	Speak fluently in English with proper pronunciation, intonation, tone and accent.	Understand

Course Contents:

Unit - I Grammar and usage **6**

Active voice and passive voice – Prefixes and suffixes – Compound words – Clauses - If Conditionals – Idioms & Phrases - Right forms of verbs – Modal Auxiliaries - Spotting errors

Unit - II Lexical competence **6**

Technical Vocabulary - Expressions – Frequency – Cause and effect - Words often Miss-spelled – Syntax and structure - Homophones and Homonyms- Verbal analogy - idioms and phrases

Unit - III Conversational etiquette **6**

Processes description – Tone and accent in speech – Role-play (Job-Interview) – Presentation skills – Mechanics of presentation - Telephone etiquette – Group Discussion strategy - Formal & Informal, subjective and objective introduction – Body Language – Mock Interview

Unit – IV Listening reading and writing **6**

Listen to Scientific / Technical talks and gap filling – Listening to TED/INK Talks – Reading – "Water: The Elixir of Life" by C.V.Raman. "Progress" by St. John Ervine - Instructions and Recommendations – Letter writing formal – Job application- Report writing – Introspective report – Creative writing – Essays and Paragraph

Unit – V Phonetics **6**

Production and classification of speech sound – International Phonetic Alphabet and transcriptions – Phonological rules – way and Place of articulation – Vowels, consonants and diphthongs. Specific characteristics feature of vowel sounds.

Laboratory Components

S.No	List of Exercises	CO Mapping	RBT
1	Role-play – Processes Description	2	Remember
2	Listening to TED/INK Talks and gap filling	4	Understand
3	Group Discussion	3	Understand
4	Articulation with pronunciation practice	3	Apply
5	Reading – Longer texts and Technical Articles (Skimming & Scanning).	4	Apply
6	Presentation skills – Mechanics of presentation	5	Understand
7	Individual presentation on given topics	5	Remember
8	Telephone etiquette	5	Understand
9	Instructions and Recommendations	5	Remember
10	Writing – General Essays.	4	Apply
11	Report writing technique- write up	4	Remember
12	Introspective report – Personal analysis	4	Understand
13	Model Job Interviews	3	Understand
14	Job Interviews(Role play)	3	Apply
15	Body Language	3	Understand

Total: 30 Periods

Text Books

1. Rizvi, Ashraf.M, “Effective Technical Communication”, Tata McGraw Hill Publishing Company Limited, New Delhi, 5th Edition, 2007.
2. Hewings. M, “Advanced English Grammar”, Cambridge University Press, Chennai, 3rd Edition, 2000.
3. Board of Editers, “Using English – A Coursebook for Undergraduate Engineers and Technologists”, Orient BlackSwan Private Limited, Hyderabad, 2nd Edition, 2017.

Reference Books:

1. Raman M & Sangeetha Sharma, “Technical Communication”, Oxford University Press, USA, 10th Edition, 2007.
2. John Cunnison Catford, “A Practical Introduction to Phonetics”,Clarendon Press, Jamaica, 2nd Edition, 2001.
3. Norman Whitby, Business Benchmark – “Pre-Intermediate to Intermediate, Students Book”, Cambridge University Press, 1st Edition, 2006.
4. Dhanavel S. P., “English and Soft Skills”, Orient BlackSwan Private Limited, Hyderabad, 1st Edition, 2010.

Web reference:

1. https://www.coursera.org/lecture/tesol-speaking/video-2-listening-strategies-for-learners-3AeBL?utm_source=mobile&utm_medium=page_share&utm_content=vlp&utm_campaign=top_button
2. blob:https://www.youtube.com/73f7256d-d302-4563-bed5-9e84c94a26ac

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**PO's**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1										3	1	2			
CO2										3	1	2			
CO3										3	1	2			
CO4										3	1	2			
CO5										3	1	2			
	3	High				2	Medium				1	Low			

Summative Assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50]**
	Theory				**Practical's**	
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	Attendance[5]	**Rubric based CIA[10]** / **Model Examination [10 marks]**	
Remember	30	20	10		20	20
Understand	10	20	30		20	40
Apply	10	10	10		40	20
Analyze					20	20
Evaluate						
Create						

20MA202	Mathematics – II for Building Sciences	L	T	P	C
		3	2	0	4
Nature of Course	Basic sciences				
Pre requisites	Fundamentals of basic mathematics				

Course Objectives

The course is intended to

1. Study the basics of vector calculus comprising of gradient, divergence ,curl, line, surface and volume integrals and the classical theorems.
2. Learn the mathematical analysis to understand the sequences.
3. Classify and explain the functions of singularities and its corresponding residue theorem.
4. Understand the concepts of mathematical skills to solve the first order differential equations.
5. Explain the method of finding Laplace transform of different functions.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Apply the concepts of differentiation and integration to vectors.	Apply
CO2	Observe how the terms of a sequence are represented graphically.	Understand
CO3	Identify the Singularities and its corresponding Residues for the given function.	Apply
CO4	Construct the first order differential equations from real time phenomena and solve it by suitable method.	Understand
CO5	Compare Laplace transform, Inverse Laplace transform and solve the linear differential equations by Laplace transform techniques.	Apply

Course contents

Unit I Vector Analysis **12**

Gradient, Divergence and Curl –Directional derivative – Irrotational and Solenoid vector fields – Vector integration – Green‟s, Gauss divergence and Stokes‟ theorem – Statement, Verification and Simple applications

Unit II Sequence and Series **12**

Sequences and series – Convergence and divergence of series – Absolute convergence – Conditional convergence – Test for convergence and divergence. Power series for functions – interval of convergence –Taylor and Maclaurin series – Taylor‟s theorem with reminder.

Unit III Complex Analysis **12**

Analytic function – Construction of analytic function – Conformal mapping: w=kz, 1/z - Cauchy‟s Integral theorem (statement only) – Cauchy‟s integral formula – Taylor‟s and Laurent‟s series – Classification of singularities – Cauchy‟s residue theorem – Contour integration.

Unit IV First Order Differential Equation **12**

Separable differential equations – Homogeneous differential equations – Exact differential equations – Integrating factor – Bernoulli‟s equation – Applications

Unit V Laplace Transforms **12**

Introduction to Laplace and inverse Laplace Transform – Laplace Transform of elementary functions – Basic Properties –Transforms of derivatives and integrals of functions - Transform of periodic functions. Inverse Laplace transform of elementary functions – Statement and applications of Convolution theorem –Initial and Final value theorems –Solution of linear ODE of second order with constant coefficients by Laplace Transforms

Total: 60 Periods

Text books

1. Grewal B.S., „„Higher Engineering Mathematics"", Khanna Publishers,44th Edition, 2016.
2. Veerajan T, „„Engineering Mathematics I and II"", Tata MC Graw-Hilli, 3rd Edition, 2014.
3. Ramana B.V, "Higher Engineering Mathematics", MC Graw-Hill companies, 5th reprint, 2008.

Reference books

1. Bali N.P and Manish Goyal, „„A text book Engineering Mathematics Semester II"", Laxmi Publications,8thEdition Reprint2015.
2. Erwin Kreyszig, „„Advanced Engineering Mathematics"", John Wiley and sons, 10thEdition, 2018.

Additional References:

1. nptel.ac.in/courses/111/111106142
2. nptel.ac.in/courses/122/104/122104017
3. nptel.ac.in/courses/111/105/111105134

Mapping of Course Outcomes(COs) with Programme Outcomes(POs) Programme Specific Outcomes (PSOs)														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3										1	
CO2	3	3	3										1	
CO3	3	3	2										2	
CO4	3	2	2										1	
CO5	2	3	2										2	
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Tutorial Class/Assignment	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination**
	IAE 1 (5)	**IAE 2 (10)**	**IAE 3 (10)**	**(60)**
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

Passed in Board of studies meeting CHAIRMAN - BOARD OF STUDIES *Approved in Academic Council meeting*

20ME201	Engineering Mechanics (Common to Aeronautical ,Agriculture, Civil, Mechanical, Safety and Fire Engineering)	L	T	P	C
		3	2	0	4
Nature of Course	Engineering Sciences				
Pre requisites	Fundamentals of Basic Mathematics and Physics				

Course Objectives

The course is intended to

1. Develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.
2. Make the students understand the vector and scalar representation of forces and Moments and the static equilibrium of particles and rigid bodies.
3. Understand the effect of friction on equilibrium, laws of motion, kinematics of motion and the interrelationship.
4. Make the students understand the properties of surfaces and solids, prediction of behavior of particles and rigid bodies under motion.
5. Make the students familiar with frictional laws and its application

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO 1	Illustrate the vectorial and scalar representation of forces and moments	Apply
CO 2	Find the rigid body in equilibrium.	Apply
CO 3	Determine the properties of surfaces and solids.	Apply
CO 4	Calculate dynamic forces exerted in rigid body	Apply
CO 5	Determine the friction and the effects by the laws of friction	Apply

Course Contents

Unit - I Statics of Particles 12

Introduction – Units and Dimensions – Laws of Mechanics – Lami‟s theorem, Parallelogram and triangular Law of forces – Vectorial representation of forces – Vector operations of forces - additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces –Principle of transmissibility .

Unit - II Equilibrium of Rigid Bodies 12

Free body diagram – Types of supports –Action and reaction forces – stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon‟s theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions.

Unit- III Properties of Surfaces and Solids 12

Centroids and centre of mass- Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula –

Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem –Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

Unit -IV Dynamics of Particles 12

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion - Newton‟s laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

Unit - V Friction and Elements of Rigid Body Dynamics 12

Friction force – Laws of sliding friction – Equilibrium analysis of simple systems with sliding friction – wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder and fly wheel

Total: 60 Periods

Text Books:

1. Rajasekaran, S. and Sankarasubramanian. G, “Fundamentals of Engineering 17 Mechanics”, Vikas Publishing House Pvt. Ltd., New Delhi, 2009
2. Kumar, K.L., “Engineering Mechanics”, Tata McGraw-Hill Publishing Company, New Delhi, 3rd revised Edition, 2008

References:

1. Beer, F.P and Johnston Jr. E.R., “Vector Mechanics for Engineers (In SI Units): Statics and Dynamics”, Tata McGraw-Hill Publishing Company, New Delhi, 8th Edition 2004
2. Hibbeller, R.C and Ashok Gupta, “Engineering Mechanics: Statics and Dynamics”, Pearson Education ,11th Edition, 2010

Web References:

1. http://nptel.ac.in/courses/122104015/
2. http://nptel.ac.in/courses/112103109/

Online Resources:

1. https://ocw.mit.edu/courses

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2		1									3		
CO2	3	2		1									3		
CO3	3	2		1									3		
CO4	3	2		1									3		
CO5	3	2		1									3		
	3	High				2	Medium				1	Low			

Formative assessment			
Bloom’s Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz or Tutorial Class	5	15
Understand	Assignment	5	
	Attendance	5	

Passed in Board of studies meeting *Approved in Academic Council meeting*

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Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

Passed in Board of studies meeting

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Approved in Academic Council meeting

20PH202	Physics for Building Sciences (Civil Engineering)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Science				
Pre requisites	Nil				

Course Objectives:

The course is intended to

1. Impart knowledge of optics, especially laser and their applications in fiber optics.
2. Provide knowledge of the thermal properties of materials and their applications.
3. Impart knowledge on properties of matter like elasticity and its applications
4. Learn the acoustic properties of materials and their applications in buildings.
5. Deliver knowledge on basic concept of seismic and flood hazard.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Compare the working of lasers and propagation of light through Optical fibers and its applications	Understand
CO2	Demonstrate the thermal conductivity of good and bad conductors	Understand
CO3	Explain the knowledge about elastic modulus	Understand
CO4	Interpret the knowledge about the acoustics of buildings.	Understand
CO5	Classify the natural calamities like seismic hazards, flood hazards in detail	Understand

Course Content:

Unit- I Laser And Fiber Optics 9

Lasers: population of energy levels, Einstein‟s A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Semiconductor lasers: homo junction and hetero junction – Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibers (material, refractive index, mode) – optical fiber communication system- fiber optic endoscope.

Unit- II Thermal Physics 9

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conductivity - Forbe‟s and Lee‟s disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications : heat exchangers in refrigerators, ovens and solar water heaters.

Unit- III Properties of Matter 9

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever – uniform and non-uniform bending - I-shaped girders - stress due to bending in beams.

Unit- IV Acoustics 9

Classification of sound - decibel - Weber-Fechner law – Reverberation - Sabine‟s formula-derivation using growth and decay method – Absorption Coefficient and its determination – factors affecting acoustics of buildings and their remedies - sound insulation and its measurements.

Unit- V Hazards 9

Seismology and Seismic waves - Earth quake ground motion - Basic concepts and estimation techniques - site effects - Probabilistic and deterministic Seismic hazard analysis - Cyclone and flood hazards - Fire hazards and fire protection, fire-proofing of materials, fire safety regulations and firefighting equipment - Prevention and safety measures.

Total : 45 Periods

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Laboratory Components

S.No	List of Experiments	CO Mapping	RBT
1	Determination of rigidity modulus – Torsion pendulum	CO3	Apply
2	Determination of Young„s modulus by non-uniform bending Method.	CO3	Apply
3	Determination of wavelength, and particle size using Laser	CO1	Apply
4	Determination of acceptance angle in an optical fiber	CO1	Apply
5	Determination of thermal conductivity of a bad conductor by Lee„s Disc method.	CO2	Apply
6	Determination of velocity of sound and compressibility of Liquid by Ultrasonic interferometer	CO4	Apply
7	Determination of Coefficient of viscosity of liquid	CO3	Apply

Total:30 Periods

Text Books:

1. Bhattacharya D.K. and Poonam T., “Engineering Physics”, Oxford University Press, 2nd Edition, 2015.
2. Avadhanulu M.N. and Kshirsagar P.G., “A Text book of Engineering Physics”, S.Chand and company., New Delhi, 10th Edition, 2014.
3. Ulrich Ranke., “Natural Disaster Risk management”, Springer International Publishing, 1st Edition, 2016.

References:

1. David Halliday. Robert Resnick. and Jearl Walker., “Principles of Physics”, Wiley, 10th Edition, 2014
2. Raymond A Serway. and John W Jewett., “Physics for Scientists and Engineers”, Cengage Learning, 9th Edition, 20191. David Halliday. Robert Resnick. and Jearl Walker., “Principles of Physics”, Wiley, 10th Edition,
2014
2. Raymond A Serway. and John W Jewett., “Physics for Scientists and Engineers”, Cengage Learning, 9th Edition, 2019.

Web References:

1. https://nptel.ac.in/courses/115/107/115107095/
2. https://spaceplace.nasa.gov/laser/en/
3. https://www.coursera.org/lecture/fe-exam/stresses-in-beams-strains-in-pure-and-nonuniform-ending-6aMRx
4. http://www.ce.memphis.edu/7119/PDFs/FEAM_Notes/Topic05a- Seismic Hazard Analysis Notes.pdf

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	1													
CO2	3	1													
CO3	3	2	2												
CO4	3	2	2												
CO5	3														
	3	High				2	Medium					1	Low		

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Summative Assessment							
Bloom's Level	**Continuous Assessment**						**Final Examination (Theory) [50]**
	Theory				**Practical's**		
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	Attendance[5]	**Rubric based CIA[10]**	**Model Examination [10 marks]**	
Remember	30	20	10		20		20
Understand	10	20	30		20		40
Apply	10	10	10		40		20
Analyze					20		20
Evaluate							
Create							

20CS201	Problem Solving Using Python (Common to all Branches)	L	T	P	C
		3	0	2	4
Nature of Course	Engineering Sciences				
Pre requisites	Mathematical and Logical Knowledge				

Course Objectives

The course is intended

1. To think logically and write algorithm and draw flow charts for problems.
2. To read and write simple Python programs.
3. To develop Python programs with conditionals and loops.
4. To define Python functions and call them.
5. To use Python data structures -- lists, tuples, dictionaries and files.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Develop algorithmic solutions to simple computational problems and read, write, execute by simple python programs.	Apply
CO2	Structure simple python programs for solving problems.	Understand
CO3	Administer the role of control statements and functions involving the idea of modularity.	Apply
CO4	Represent compound data using python strings and lists.	Apply
CO5	Read and write data from/to files in python Programs.	Understand

Course Contents:

Unit- I Basics of Computers & Problem Solving 9

Computer Basics - Components-Computer organization - Computer Software- Types of software - Software Development steps -Need for logical analysis and thinking- Algorithms – Flowchart - Number system.

Unit- II Introduction of Python Programming 9

Introduction-Python Interpreter-Interactive and script mode -Values and types, variables, operators, expressions, statements, precedence of operators, Multiple assignments, comments, Input and Output Statements.

Unit - III Control statements and Functions 9

Conditional (if), alternative (if-else), chained conditional (if-elif-else)-Iteration-while, for, break, continue, pass – Functions - Introduction, inbuilt functions, user defined functions, passing parameters, return values, recursion, Lambda functions.

Unit IV Strings and Lists 9

Strings-String slices, immutability, string methods and operations -Lists-creating lists, list operations, list methods, mutability, aliasing, cloning lists, list and strings, list and functions-list processing-list comprehension, searching and sorting.

Unit -V Tuples, Dictionaries and Files 9

Tuples- Tuple assignment, lists and tuples, Tuple as return value- Dictionaries-operations and methods, Files and Exception-Text files, reading and writing files, format Operator, Exception handling.

Total: 45 Periods

Laboratory Components

S.No	List of Experiments	CO Mapping	RBT
1	Write a algorithm & draw flowchart for simple computational problems	CO1	Understand
2	Write a program to perform different arithmetic operations on numbers in python.	CO2	Understand
3	Write a python program to implement the various control structures	CO3	Apply
4	Write a python program for computational problems using recursive function.	CO3	Apply
5	Demonstrate use of list for data validation.	CO4	Apply
6	Develop a python program to explore string functions	CO4	Analyze
7	Implement linear search and binary search.	CO4	Apply
8	Develop a python program to implement sorting methods	CO4	Analyze
9	Develop python programs to perform operations on dictionaries.	CO5	Analyze
10	Write a python program to read and write into a file	CO5	Apply

Total: 30 Periods

Text Books

1. Reema Thareja, "Problem Solving and Programming with Python", Oxford University Press, 2018
2. Dr. R. Nageswara Rao, "Core Python Programming", Dreamtech Press, 2017 Edition

Reference Books:

1. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012
2. Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python" , Mc-Graw Hill Education, 2018.
3. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition, 2013
4. Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1										3	1	
CO2	3	2	1										3	1	
CO3	3	2	2										3	1	
CO4	3	2	2										3	1	
CO5	3	2	2										3	1	
	3	High				2	Medium					1	Low		

Summative Assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50]**
	Theory				**Practical's**	
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	Attendance[5]	**Rubric based CIA[10]** / **Model Examination [10 marks]**	
Remember	30	20	10		20	20
Understand	10	20	30		20	40
Apply	10	10	10		40	20
Analyze					20	20
Evaluate						
Create						

Passed in Board of studies meeting

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20CE201	Computer Aided Building Drawing Laboratory	L	T	P	C
		0	0	4	2
Nature of Course	Professional Core				
Pre requisites	NA				

Course Objectives

The course is intended to

1. Understand the techniques of building drawing
2. Develop plan, elevation and technical uses of building
3. Follow the development and control rules
4. Satisfy orientation and functional requirements as per National Building Code
5. Visualize and draw 2D and 3D models of Engineering Components

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Gain the various basic commands used for drafting and known the type of coordinate system.	Apply
CO2	Utilize the software packages for drafting and modeling.	Apply
CO3	Prepare the plan of building components o satisfy the functional and orientation aspects.	Apply
C04	Draw the plan, elevation and sectional views of load bearing structures and framed structures.	Apply
CO5	Visualize and draw 2D and 3D models of Engineering Components	Apply

Course Content:

S.No	List of Experiment	CO Mapping	RBT
1	**Principles of planning, orientation and complete joinery details (Paneled and Glazed Doors and Windows)** a. Introduce to draw the plan, elevation and sectional views of buildings as per National Building Regulations b. Making the students to get practice in various AUTOCAD Commands for preparing building plan, elevation and sections. c. Specify the Principles of Planning, Orientation and Complete Joinery Details (Paneled and Glazed Doors and Windows).	**CO1**	**Apply**
2	**Buildings with Load Bearing Walls**	**CO2**	**Apply**

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	a. Draw the Plan, Elevation and Section of the Residential Building with Load Bearing walls and RCC Flat Roof. b. Draw the Plan, Elevation and Section of the Primary Health Centre. c. Draw the Plan, Elevation and Section of the School Building.		
3	**Buildings with Sloping Roof** a. Draw the Plan, Elevation and Section of the Fully Tiled Gabled House b. Draw the Plan, Elevation and Section of the Residential Building with Load Bearing walls and Pitched Roof.	**CO3**	**Apply**
4	**R.C.C. framed structures.** a. Draw the Plan, Elevation and Section of the A Reading Room with RCC Flat Roof. b. Draw the Plan, Elevation and Section of the Library Building with RCC Flat Roof. c. Draw the Plan, Elevation and Section of the RCC Framed Building with RCC Roof. d. Draw the Plan, Elevation and Section of the A Single Bed Room Residential Building with RCC Roof	**CO4**	**Apply**
5	**Industrial buildings – North light roof structure** a. Draw the Plan, Elevation and Section of the workshop building	**CO5**	**Apply**

Total: 45 Periods

Textbooks:

1. Sikka V.B., A Course in Civil Engineering Drawing, , S.K.Kataria and Sons,4th Edition,2015.
2. George Omura, "Mastering in Autocad 2005 and Autocad LT 2005"- BPB Publications,2nd edition,2009

References:

1. Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston, BIM Handbook:A Guide to building information modeling for Owners, Managers, Designers, Engineers, and Contractors, John Wiley and Sons.Inc.,2011.
2. Marimuthu V.M., Murugesan R. and Padmini S., Civil Engineering Drawing-I, Pratheeba Publishers,2008.

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3. Shah.M.G., Kale. C.M. and Patki.S.Y., Building Drawing with an Integrated Approach to Built Environment, Tata McGraw Hill Publishers Limited,2007.
4. Verma.B.P., Civil Engineering Drawing and House Planning, Khanna Publishers,2010.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	**3**		**3**		**3**								**3**	
CO2	**3**		**3**		**3**								**3**	
CO3	**3**		**3**		**3**								**3**	
CO4	**3**		**3**		**3**								**3**	
CO5	**3**		**3**		**3**								**3**	
	3	High				2	Medium					1	Low	

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Rubric based Continuous Assessment [30 marks]**	**Preparatory Examination [25 Marks]**	**Attendance [5 Marks]**	**Final Examination [40 Marks]**
Remember	20	20		20
Understand	30	20		20
Apply	50	40		40
Analyze		20		20
Evaluate				
Create				

Passed in Board of studies meeting

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Approved in Academic Council meeting

20MC201	**Environmental Science** (Common to Agriculture, Food Technology, Aero, Civil, Mechanical and Fire and Safety Engineering)	**L**	**T**	**P**	**C**
		2	**0**	**0**	**0**
Nature of Course	Mandatory				
Prerequisites	Nil				

Course Objectives

The course is intended to

1. Understand the concept of eco system and environment.
2. Become conversant with ecological balance and values of bio diversity.
3. Know the role of human in prevention of pollution and making a clean environment.
4. Get knowledge about conservation of non conventional energy resources.
5. Study about the nature and management of e-waste and solid waste.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Describe the ecosystem and environment	Understand
CO2	Understand the ecological balance and preservation of bio diversity	Understand
CO3	Demonstrate various types of pollution in order tocontrol pollution	Apply
CO4	Classify the energy sources for the conservation of non conventional energy sources	Understand
CO5	Identify the nature and management of e-waste and solid waste	Apply

Course Contents

Unit-I Ecosystem **6**

Eco system-Food chains, Food webs and Ecological pyramids. Ecosystem-(a) Forest eco system,(b) Aquatic eco system(pond ecosystem and marine ecosystem).

Unit-II Biodiversity **6**

Introduction to Bio diversity, Values of Bio diversity**,** Threads to Bio diversity**,** Endangered and Endemic species of India, Hotspots of biodiversity. Conservation of Bio diversity: In-Situ and Ex-Situ conservation of bio diversity.

Unit-III Environmental Pollution **6**

Definition Causes, Effects and Control of (a) Air pollution (b) Water pollution (c) Soil pollution. Electrostatic Precipitator for controlling air pollution.

Unit-IV Non Conventional Energy Resources **6**

Introduction, Types: Solar Energy, Wind Energy and Geo Thermal Energy.

Unit-V Environmental Management **6**

Sustainable Development, Role of Information technology in Environment and Human.HIV and AIDS: causes and control measures. Green chemistry: Definition and Principles

Activity Component

S.No	Name of the Experiment	CO Mapping	RBT
1	Field study of simple eco system: pond, river and hill slopes	CO1	Understand
2	Case study regarding environmental management	CO5	Apply

Total: 30 periods

Textbooks

1. AnubhaKaushik and C.P. Kaushik, "Environmental Science and Engineering, New Age International Publishers, New Delhi, 2nd Edition, 2015.
2. V. Kumar, "An Introduction to Green Chemistry" Vishal publishing Co. Reprint Edition,2010.

Reference Books

1. Masters, Gilbert M, "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi, 2nd Edition, 2012.
2. Santosh Kumar Garg andRajeshwariGarg"Ecological and Environmental Studies",Khanna Publishers, NaiSarak, Delhi, 2nd Edition, 2014.

Additional Resources

1. https://nptel.ac.in/courses/122103039/38
2. https://bch.cbd.int/cms/ui/collaboration/download/download.aspx?id=909
3. https://nptel.ac.in/courses/105102089/air%20pollution%20(Civil)/Module-3/3a.htm
4. www.vssut.ac.in/lecture_notes/lecture1428910296.pdf
5. nptel.ac.in/courses/120108004/module7/lecture8.pdf

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1							3					3			
CO2							3					3			
CO3							3					3			
CO4							3					3			
CO5							3					3			
	3	High					2	Medium				1	Low		

Bloom's Level	**Continuous Assessment**				
	IAE1 [20]	**IAE 2 [20]**	**IAE 3 [20]**	**Attendance [10]**	**Activity [30]**
Remember	30	20	20		
Understand	10	20	20		
Apply	10	10	10		
Analyze					
Evaluate					
Create					

Passed in Board of studies meeting

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Approved in Academic Council meeting

20ENE02	Advanced Communicative English (Common to all B.E/ B.Tech Programmes)	L	T	P	C
		2	0	2	3
Nature of Course	Humanities and Social Sciences				
Pre requisites	Basics of Communicative English				

Course Objectives

The course is intended to

6. Demonstrate satisfactory control over complex structures and mechanics in English.
7. Develop fluency and accuracy in oral communication.
8. Communicate effectively and actively in social interactions.
9. Read English at inspectional level.
10. Face interviews with confidence.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Apply knowledge of English grammar for effective communication	Remember
CO2	Make use of common English phrases and vocabulary strength.	Understand
CO3	Build self confidence and enhance professionalism	Apply
CO4	Implement listening, reading and writing skills in real - life situations	Apply
CO5	Speak fluently in English with proper pronunciation, intonation, tone and accent.	Understand

Course Contents:

Unit - I Grammar and usage **6**

Active voice and passive voice – Prefixes and suffixes – Compound words – Clauses - If Conditionals – Idioms & Phrases - Right forms of verbs – Modal Auxiliaries - Spotting errors

Unit - II Lexical competence **6**

Technical Vocabulary - Expressions – Frequency – Cause and effect - Words often Miss-spelled – Syntax and structure - Homophones and Homonyms- Verbal analogy - idioms and phrases

Unit - III Conversational etiquette **6**

Processes description – Tone and accent in speech – Role-play (Job-Interview) – Presentation skills – Mechanics of presentation - Telephone etiquette – Group Discussion strategy - Formal & Informal, subjective and objective introduction – Body Language – Mock Interview

Unit – IV Listening reading and writing **6**

Listen to Scientific / Technical talks and gap filling – Listening to TED/INK Talks – Reading – "Water: The Elixir of Life" by C.V.Raman. "Progress" by St. John Ervine - Instructions and Recommendations – Letter writing formal – Job application- Report writing – Introspective report – Creative writing – Essays and Paragraph

Unit – V Phonetics **6**

Production and classification of speech sound – International Phonetic Alphabet and transcriptions – Phonological rules – way and Place of articulation – Vowels, consonants and diphthongs. Specific characteristics feature of vowel sounds.

Laboratory Components

S.No	List of Exercises	CO Mapping	RBT
1	Role-play – Processes Description	2	Remember
2	Listening to TED/INK Talks and gap filling	4	Understand
3	Group Discussion	3	Understand
4	Articulation with pronunciation practice	3	Apply
5	Reading – Longer texts and Technical Articles (Skimming & Scanning).	4	Apply
6	Presentation skills – Mechanics of presentation	5	Understand
7	Individual presentation on given topics	5	Remember
8	Telephone etiquette	5	Understand
9	Instructions and Recommendations	5	Remember
10	Writing – General Essays.	4	Apply
11	Report writing technique- write up	4	Remember
12	Introspective report – Personal analysis	4	Understand
13	Model Job Interviews	3	Understand
14	Job Interviews(Role play)	3	Apply
15	Body Language	3	Understand

Total: 30 Periods

Text Books

4. Rizvi, Ashraf.M, “Effective Technical Communication”, Tata McGraw Hill Publishing Company Limited, New Delhi, 5th Edition, 2007.
5. Hewings. M, “Advanced English Grammar”, Cambridge University Press, Chennai, 3rd Edition, 2000.
6. Board of Editers, “Using English – A Coursebook for Undergraduate Engineers and Technologists”, Orient BlackSwan Private Limited, Hyderabad, 2nd Edition, 2017.

Reference Books:

5. Raman M & Sangeetha Sharma, “Technical Communication”, Oxford University Press, USA, 10th Edition, 2007.
6. John Cunnison Catford, “A Practical Introduction to Phonetics”,Clarendon Press, Jamaica, 2nd Edition, 2001.
7. Norman Whitby, Business Benchmark – “Pre-Intermediate to Intermediate, Students Book”, Cambridge University Press, 1st Edition, 2006.
8. Dhanavel S. P., “English and Soft Skills”, Orient BlackSwan Private Limited, Hyderabad, 1st Edition, 2010.

Web reference:

3. https://www.coursera.org/lecture/tesol-speaking/video-2-listening-strategies-for-learners-3AeBL?utm_source=mobile&utm_medium=page_share&utm_content=vlp&utm_campaign=top_button
4. blob:https://www.youtube.com/73f7256d-d302-4563-bed5-9e84c94a26ac

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**PO's**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1										3	1	2			
CO2										3	1	2			
CO3										3	1	2			
CO4										3	1	2			
CO5										3	1	2			
	3	High				2	Medium				1	Low			

Summative Assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50]**
	Theory				**Practical's**	
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	Attendance[5]	**Rubric based CIA[10]** / **Model Examination [10 marks]**	
Remember	30	20	10		20	20
Understand	10	20	30		20	40
Apply	10	10	10		40	20
Analyze					20	20
Evaluate						
Create						

20MA301	Transforms and Boundary Value Problems (Common to Aero, Mech, Civil, FDT, S&F and Agri.)	L	T	P	C
		3	2	0	4
Nature of Course	Basic Sciences				
Pre requisites	Mathematics-I & II for Mechanical, Building and Bio Sciences				

Course Objectives

The course is intended to

1. Familiarize linear and non-linear partial differential equations with different methods.
2. Acquire the knowledge of Fourier series.
3. Acquaint with the Fourier series techniques in solving one dimensional wave and heat equations.
4. Learn the concept of Fourier transforms and it's inverse.
5. Introduce the concept of Z-transforms and difference equations.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Classify the linear and non-linear partial differential equations.	Understand
CO2	Determine the Fourier series expansion.	Apply
CO3	Interpret the solution of boundary value problems.	Understand
CO4	Apply transform techniques to solve engineering problems.	Apply
CO5	Illustrate the Z-transforms and difference equations.	Understand

Course Contents:

UNIT I Partial Differential Equations **12**

Solution of standard types of first order non-linear partial differential equations: (i) f(p,q)=0, (ii) Clairaut's type - Lagrange's linear equation - Homogeneous linear partial differential equations of second and higher order with constant coefficients (R.H.S =Constant, e^{ax+by}, $cos(ax + by)$, $sin(ax + by)$).

UNIT II Fourier Analysis **12**

Condition for Fourier expansion -Fourier series for periodic functions- Determination of Fourier coefficients - Expansion of periodic functions with Period (0, 2L) and period (0, 2π) -Root mean square value on Fourier coefficients - Parseval's identity.

UNIT III Boundary Value Problems **12**

Classification of Partial differential equations – Method of separation of variables – Solutions of one dimensional wave equation – Solutions of one dimensional heat equation.

UNIT IV Fourier Transforms **12**

Statement of Fourier integral theorem – Fourier transforms pair: Fourier transforms and Inverse Fourier transforms – Fourier sine transforms -Fourier cosine transforms – Transforms of simple functions – Parseval's identity.

UNIT V Z - Transforms and Difference Equations **12**

Z-transforms - Properties – Inverse Z-transform: partial fraction and Convolution theorem - Formation

of difference equations –Solution of difference equations using Z – transform.

Total: 60 Periods

Text Books:

1. Veerarajan. T., "Transforms and Partial Differential Equations", 3rd edition, Tata McGraw HillEducation Pvt. Ltd., 2016.
2. Grewal B.S, "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, 2017.

Reference Books:

1. Bali N.P and Manish Goyal, "A Text book of Engineering Mathematics", 9th Edition, LakshmiPublications Pvt Ltd, 2016.
2. Ramana.B.V,"Higher Engineering Mathematics", Tata Mc-Graw Hill Publishing CompanyLimited,4th Edition 2016.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India Publications,10th Edition2015.

Additional References:

1. https://pvpsitrealm.blogspot.com/2016/09/higher-engineering-mathematics-by-bs.html
2. https://reference.wolfram.com/language/tutorial/DSolvePartialDifferentialEquations.html

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

Cos	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2									1	2		
CO2	3	2	2									1	2		
CO3	3	2	1									1	2		
CO4	3	2	2									1	1		
CO5	3	3	2									1	2		
	3	High				2	Medium					1	Low		

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Quiz	5	15
Understand	Tutorial Class / Assignment	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CE301	Mechanics of Solids I	L	T	P	C
		3	2	0	4
Nature of Course	Engineering Science				
Pre requisites	Engineering Mechanics				

Course Objectives

The course is intended to

1. Learn the fundamental concepts of Stress, Strain and deformation of solids.
2. Know the mechanism of load transfer in beams.
3. Study the beam for determining slope and deflection of beams.
4. Understand the effect of torsion on shafts and springs.
5. Gain knowledge on the analysis of trusses.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the concepts of stress and strain, principal stresses and principal planes.	Understand
CO2	Determine Shear force and bending moment in beams and understand the concept of theory of simple bending.	Apply
CO3	Calculate the slope and deflection of beams by various methods.	Apply
CO4	Apply theory of torsion in analysis of circular shafts and helical springs.	Apply
CO5	Analyze plane trusses	Analyze

Course Contents:

UNIT- I Stress, Strain and Deformation of Solids **12**

Simple Stresses and strains – Elastic constants - Relationship between elastic constants – Stress Strain Diagram – Ultimate Stress – Yield Stress – Deformation of axially loaded member - Composite Bars - Thermal Stresses – State of Stress in two dimensions – Stresses on inclined planes – Principal Stresses and Principal Planes – Maximum shear stress - Mohr's circle method

UNIT- II Transfer of Loads and Stresses in Beams **12**

Types of loads, supports, beams – concept of shearing force and bending moment - Relationship between intensity of load, Shear Force and Bending moment - Shear Force and Bending Moment Diagrams for Cantilever, simply supported and overhanging beams with concentrated load, uniformly distributed load, uniformly varying load and concentrated moment. Theory of Simple Bending – Stress Distribution due to bending moment and shearing force - Flitched Beams.

UNIT- III Deflection of Beams **12**

Elastic curve – Governing differential equation - Double integration method - Macaulay's method - Area moment method - conjugate beam method for computation of slope and deflection of determinant beams.

UNIT- IV Torsion **12**

Theory of Torsion – Stresses and Deformations in Solid and Hollow Circular Shafts – combined bending moment and torsion of shafts - Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs- Leaf Springs. – springs in series and parallel.

UNIT- V Analysis of Trusses **12**

Determinate and indeterminate trusses - Analysis of pin jointed plane determinate trusses by method of joints, method of sections and tension coefficient.

Total: 60 Periods

Text Books:

1. Rajput.R.K. “Strength of Materials”, S.Chand and Co, New Delhi, 2015.
2. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, SMTS –I Strength of materials, Laxmi publications. New Delhi, 2015.

Reference Books:

1. Singh. D.K., “Strength of Materials”, Ane Books Pvt. Ltd., New Delhi, 2016.
2. Bansal. R.K. “Strength of Materials”, Laxmi Publications Pvt. Ltd., New Delhi, 2010.
3. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 2009.

Additional References:

1. https://nptel.ac.in/courses/105/106/105106116/
2. https://nptel.ac.in/courses/112/102/112102284/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3		2											2
CO2	3		2											2
CO3	3		2											2
CO4	3		2											2
CO5	3		2											2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom’s Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom’s Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CE302	Fluid Mechanics	L	T	P	C
		3	0	0	3
Nature of Course	Engineering Science				
Pre requisites	Fundamentals of basic science				

Course Objectives

The course is intended to

1. Gain fundamental knowledge of fluids , its properties and behavior under various conditions
2. Impart knowledge on Fluid Kinematics and Dynamics
3. Acquire knowledge about dimensional analysis and model studies
4. Understand the concepts of flow through pipes
5. Become knowledgeable on boundary layer flows

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Identify the fluids in static, kinematic and dynamic equilibrium.	Understand
CO2	Demonstrate and solve the problems related to equation of motion	Understand
CO3	Implement dimensional and model analysis	Apply
CO4	Demonstrate the types of flow and losses of flow in pipes	Apply
CO5	Solve the boundary layer problems.	Apply

Course Contents:

UNIT- I Fluid Properties and Fluid Statics **9**

Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers-forces on planes – centre of pressure – buoyancy and floatation.

UNIT- II Fluid Kinematics and Dynamics **9**

Fluid Kinematics – Classification and types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- stream line-streak line-path line- stream function - velocity potential function - flow net. Fluid dynamics - equations of motion -Euler's equation along a streamline - Bernoulli's equation – applications - venturi meter, orifice meter and Pitot tube- linear momentum equation and its application to pipe bend.

UNIT - III Dimensional Analysis and Model Studies **9**

Fundamental dimensions - dimensional homogeneity - Rayleigh's method and Buckingham Pi-theorem - dimensionless parameters - similitudes and model studies - distorted models.

UNIT- IV Flow Through Pipes **9**

Reynold's experiment - laminar flow through circular pipe (Hagen poiseulle's) - hydraulic and energy gradient – flow through pipes - Darcy - Weisbach's equation - pipe roughness -friction factor- Moody's diagram- major and minor losses of flow in pipes - pipes in series and in parallel.

UNIT- V Boundary Layer **9**

Boundary layer – definition- boundary layer on a flat plate – laminar and turbulent boundary layer- displacement, energy and momentum thickness – Momentum integral equation-Boundary layer separation and control – drag on flat plate.

Total: 45 Periods

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Text Books:

1. Jain.A.K.., "Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.
2. Rajput.R.K. “Fluid Mechanics and Hydraulics Machines", S.Chand and Co, New Delhi, 2016.

Reference Books:

1. Streeter, V.L., and Wylie, E.B., “Fluid Mechanics”, McGraw Hill, 2000.
2. Modi P.N and Seth "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2009.
3. Bansal.R.K., “Fluid Mechanics and Hydraulic Machines”, Laxmi Publications Pvt. Ltd., New Delhi, 2013.

Additional References:

1. https://nptel.ac.in/courses/112/104/112104118/
2. https://nptel.ac.in/courses/105/103/105103192/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
Cos	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1		2			3							2		2
CO2		2			3							2		2
CO3		2			3							3		2
CO4		3			3							2		2
CO5		3			3							2		2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom’s Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom’s Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE-III (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CE303	Engineering Geology	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core				
Pre requisites	Engineering Science				

Course Objectives

The course is intended to

1. Learn the relevance of Engineering Geology in Civil Engineering and interpret earthquakes in relation to internal structure of the earth.
2. Learn concepts and properties of various types of minerals present in the rocks.
3. Identify common rock forming minerals and common rocks based on their physical properties
4. Impart knowledge on various natural hazards and its mitigation methods
5. Identify the attitude of geological structures and instruments used.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the basic concepts of geology in civil engineering field.	Understand
CO2	Identify the formation, properties, types of rocks and its types	Understand
CO3	Recognize the physical and chemical properties of various types of minerals present in the types of rocks	Understand
CO4	Explain the causes of faults, joints, folds and its mitigation methods in detail	Understand
CO5	Identify the application of Geological investigation on construction of various structures such as dams, tunnels & bridges	Understand

Course Contents:

UNIT- I Physical Geology **9**

Geology in civil engineering – branches of geology – structure of earth and its composition weathering of rocks – scale of weathering – soils – landforms and processes associated with river, wind, groundwater and sea – relevance to civil engineering. Plate tectonics – Earth quakes – Seismic zones in India.

UNIT- II Mineralogy **9**

Physical properties of minerals – Quartz group, Feldspar group, Pyroxene – hypersthene and augite, Amphibole – hornblende, Mica – muscovite and biotite, Calcite, Gypsum and Clay minerals.

UNIT- III Petrology **9**

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

UNIT- IV Structural Geology and Geophysical Methods **9**

Geological maps – attitude of beds, study of structures – folds, faults and joints – relevance to civil engineering. Geophysical methods – Seismic and electrical methods for subsurface investigations.

UNIT- V Application of Geological Investigations **9**

Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels, and Road cuttings – Hydrogeological investigations and mining – Coastal protection structures. Investigation of Landslides, causes and mitigation.

Total: 45 Periods

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Text Books:

1. Varghese, P.C., "Engineering Geology for Civil Engineering" Prentice Hall of India Learning PrivateLimited,NewDelhi,2012.
2. Venkat Reddy. D. "Engineering Geology", Vikas Publishing House Pvt. Lt, 2010.

Reference Books:

1. Blyth F.G.H. and de Freitas M.H., "Geology for Engineers", Edward Arnold, London, 2010.
2. Bell .F.G., "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011.
3. Gokhale KVGK, "Principles of Engineering Geology", B.S. Publications, Hyderabad 2011.

Additional References:

1. https://nptel.ac.in/courses/105/105/105105106/
2. https://nptel.ac.in/courses/105/104/105104191/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	2		3	3					2		2	2	
CO2	2	2		3	3					2		2	2	
CO3	2	2		3	3					2		2	2	
CO4	2	2		3	3					2		2	2	
CO5	2	2		3	3					2		2	2	
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CE304	Surveying I	L	T	P	C
		3	0	2	4
Nature of Course	Professional core				
Pre requisites	Basics of Mathematics				

Course Objectives

The course is intended to

1. Gain knowledge on the relative position of any objects or points of the earth
2. Impart knowledge on measurement of the distance and angle between different objects
3. Acquire knowledge on preparing a plan to represent an area on a horizontal plan
4. Familiarize on various applications of leveling in the construction field.
5. Gain knowledge on Theodolite Surveying and its field applications.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Implement the use of various surveying instruments and mapping	Apply
CO2	Sketch the traverse by compass and plane table surveying.	Apply
CO3	Execute the two types of Leveling	Apply
CO4	Interpret the leveling concepts in various construction field works	Apply
CO5	Identify the applications of theodolite surveying in construction site work.	Understand

Course Contents:

UNIT- I Fundamentals and Chain Surveying **9**

Definition- Classifications - Basic principles-Equipment and accessories for ranging and chaining – Methods of ranging - well conditioned triangles – Errors in linear measurement and their corrections - Obstacles - Traversing – Plotting – applications- enlarging the reducing the figures – Areas enclosed by straight line irregular figures- digital planimetre.

UNIT- II Compass and Plane Table Surveying **9**

Compass – Basic principles - Types - Bearing - Systems and conversions- Sources of errors - Local attraction - Magnetic declination-Dip-Traversing - Plotting - Adjustment of closing error – applications - Plane table and its accessories - Merits and demerits - Radiation - Intersection - Resection – Traversing- sources of errors – applications.

UNIT - III Levelling **9**

Level line - Horizontal line - Datum - Bench marks -Levels and staves - temporary and permanent adjustments – Methods of levelling - Fly levelling - Check levelling - Procedure in levelling - Booking -Reduction - Curvature and refraction - Reciprocal levelling – Sources of Errors in levelling- Precise levelling - Types of instruments - Adjustments - Field procedure

UNIT- IV Levelling Applications **9**

Longitudinal and Cross-section-Plotting - Contouring - Methods - Characteristics and uses of contours – Plotting – Methods of interpolating contours – Computations of cross sectional areas and volumes - Earthwork calculations - Capacity of reservoirs - Mass haul diagrams.

UNIT- V Theodolite Surveying **9**

Theodolite - Types - Description - Horizontal and vertical angles - Temporary and permanent adjustments – Heights and distances- Tangential and Stadia Tacheometry – Subtense method - Stadia constants - Anallactic lens.

.

Total: 45 Periods

Text Books:

1. Punmia.B.C., Ashok K.Jain and Arun K Jain , Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, 2016.
2. Bannister and S. Raymond, "Surveying", 7th Edition, Longman 2017.

Reference Books:

1. James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7th Edition, McGraw Hill, 2001.
2. Arora K.R."Surveying Vol I & II", Standard Book house, 10th Edition 2008 standard book house Publication.

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Laboratory Component

S.No	Name of the Experiment	CO Mapping	RBT
1	Study of chains and its accessories	CO1	Understand
2	Aligning, Ranging and Chaining	CO1	Apply
3	Chain Traversing	CO1	Apply
4	Compass Traversing	CO2	Apply
5	Plane table surveying: Radiation	CO2	Apply
6	Plane table surveying: Intersection	CO2	Apply
7	Plane table surveying: Traversing	CO2	Apply
8	Study of levels and leveling staff	CO3	Understand
9	Fly leveling using Dumpy level	CO3	Apply
10	Fly leveling using tilting level	CO3	Apply
11	Check leveling	CO3	Apply
12	LS and CS	CO4	Apply
13	Contouring	CO4	Apply
14	Study of Theodolite	CO5	Understand

Total: 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2			3				2			3		2
CO2	3	2			3				2			3		2
CO3	3	2			3				3			3		2
CO4	3	2			3				2			3		2
CO5	3	2			3				2			3		2
	3	High				2	Medium					1	Low	

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Summative Assessment							
Bloom's Level	**Continuous Assessment**						**Final Examination (Theory) [50]**
	Theory				**Practical's**		
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	Attendance[5]	**Rubric based CIA[10]**	**Model Examination [10 marks]**	
Remember	30	20	10		20		20
Understand	10	20	30		20		40
Apply	10	10	10		40		20
Analyze					20		20
Evaluate							
Create							

20CE305	Construction Materials	L	T	P	C
		3	0	2	4
Nature of Course	Professional core				
Pre requisites	Basics of Civil Engineering				

Course Objectives

The course is intended to

1. Understand basic concepts of Masonry materials.
2. Impart knowledge on mortar and aggregates.
3. Gain knowledge on the properties of ingredients of concrete.
4. Familiarize on timber and surface finishing materials.
5. Highlight the modern materials and application in construction.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Implement the masonry materials for construction based on the properties of stones, bricks and concrete blocks.	Apply
CO2	Interpret a suitable binder either lime or cement for mortar and utilize aggregates complying with test standards.	Apply
CO3	Recognize the quality of concrete based on the properties of fresh and hardened concrete.	Understand
CO4	Utilize various forms of timber, wood products and surface finishing materials in construction.	Apply
CO5	Identify modern construction materials for advanced construction.	Understand

Course Contents:

UNIT- I Stones – Bricks – Concrete Blocks **9**

Stone as building material - Criteria for selection - Tests on stones - Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive Strength - Water Absorption - Efflorescence - Bricks for special use - Refractory bricks - Fly ash brick- Hollow bricks - Interlocking bricks - Cement, Concrete blocks - Light weight concrete blocks-

UNIT- II Lime – Cement – Aggregates – Mortar **9**

Lime - Preparation of lime mortar - Cement - Ingredients - Manufacturing process - Types and Grades - Properties of cement and Cement mortar - Hydration - Compressive strength - Tensile strength - Fineness- Soundness and consistency - Setting time - Industrial byproducts - Fly ash - Aggregates - Natural stone aggregates - Crushing strength - Impact strength - Flakiness Index - Elongation Index - Abrasion Resistance - Grading - Sand Bulking.

UNIT - III Concrete **9**

Concrete - Ingredients - w/c ratio - Admixtures - Manufacturing Process - Batching plants - RMC - Properties of fresh concrete - Slump - Flow and compaction Factor - Properties of hardened concrete – Compressive, Tensile and shear strength – Modulus of rupture – Tests – Mix specification – Mix proportioning – BIS method – High Strength Concrete and HPC – Self compacting Concrete - Other types of Concrete - Durability of Concrete.

UNIT- IV Timber and Other Materials **9**

Timber - Market forms - Industrial timber- Plywood - Veneer - Thermacole - Panels of laminates - Steel - Aluminum and Other Metallic Materials - Composition - Aluminium composite panel - Uses Market forms – Mechanical treatment – Paints – Varnishes – Distempers – Bitumens

UNIT- V Modern Materials **9**

Glass – Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fibre textiles

Total: 45 Periods

Laboratory Component

S.No	Name of the Experiment	CO Mapping	RBT
I	**Test on Bricks and Blocks** 1. Determination of compressive strength of bricks and blocks 2. Determination water absorption of bricks and blocks 3. Determination of Efflorescence of bricks	CO1	Apply
II	**Test on Fine Aggregate** 1. Sieve analysis of fine aggregate 2. Determination of specific gravity and bulk density 3. Determination of Bulking of sand	CO2	Apply
III	**Test on Coarse Aggregate** 1. Determination of impact value 2. Determination of elongation index 3. Determination of flakiness index 4. Determination of aggregate crushing value	CO2	Apply
IV	**Test on Concrete** 1. Determination of workability by conducting slump test 2. Determination of workability by conducting compaction factor test 3. Determination of workability by conducting flow test 4. Determination of workability by conducting Vee-Bee consistency test 5. Determination of compressive strength of cube and cylinder 6. Determination flexural strength	CO3	Apply
V	**Study on timber and other materials** 1. Study on properties by using models of various types of wood, plywood, veneer, thermacole 2. Study on properties by using models of various types of steel, aluminum, copper, brass	CO4	Understand
VI	**Study on Modern materials** 1. Study on properties by using models of ceramic tiles, clay tiles	CO5	Understand

Total: 30 Periods

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Text Books:

1. Shetty.M.S., "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd.,2018
2. Duggal.S.K., "Building Materials", 4th Edition, New Age International , 2019.

Reference Books:

1. Jagadish.K.S, "Alternative Building Materials Technology", New Age International, 2017.
2. Gambhir. M.L., & Neha Jamwal., "Building Materials, products, properties and systems", Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2017.
3. IS383-1970: Indian Standard specification for coarse and fine aggregate from natural Sources for concrete, 2011.

Additional References:

1. IS456 – 2000: Indian Standard specification for plain and reinforced concrete, 2011
2. IS4926-2003 : Indian Standard specification for ready-mixed concrete, 2012
3. IS1542-1992: Indian standard specification for sand for plaster, 2009
4. https://nptel.ac.in/courses/105/106/105106053/
5. https://nptel.ac.in/courses/105/102/105102088/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3		2	3	3				2			2
CO2	3	3	3		2	3	3				2			2
CO3	3	3	3		2	3	3				2			2
CO4	3	3	3		2	3	3				2			2
CO5	3	3	3		3	3	3				3	3		2
	3	High				2	Medium					1	Low	

Summative Assessment							
Bloom's Level	**Continuous Assessment**						**Final Examination (Theory) [50]**
	Theory				**Practical's**		
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	Attendance[5]	**Rubric based CIA[10]**	**Model Examination [10 marks]**	
Remember	30	20	10		20		20
Understand	10	20	30		20		40
Apply	10	10	10		40		20
Analyze					20		20
Evaluate							
Create							

Passed in Board of studies meeting CHAIRMAN - BOARD OF STUDIES *Approved in Academic Council meeting*

20MC301	Interpersonal Skills	L	T	P	C
		0	0	2	0
Nature of Course	Mandatory, Non Credit				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Use interpersonal communication skills to influence and build good relationships.
2. Identify and pursue personal learning goals.
3. Obtain feedback skills in service of evolving learning goals.
4. Learn about group dynamics, behaviors and feelings
5. Enhance the communication process in both formal and informal contexts

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Practice interpersonal communication skills to influence and build good relationships	Understand
CO2	Identify and pursue personal learning goals.	Understand
CO3	Give evident feedback	Understand
CO4	Reveal group dynamics and amiable behavior	Understand
CO5	Emphasis the communication process	Understand

Course Contents:

UNIT I Fundamentals of Interpersonal Communication **6**

Facts of communication and Interpersonal communication – culture and gender – Communication and Self disclosure – Presentation of Interpersonal perception - Learning goals – Feeling and feedback.

UNIT II Interpersonal communication in action **6**

Nature of language – language and culture – usage and abuse of language –Positive communication - Non verbal communication - Listening strategies – Barriers of listening.

UNIT III Emotional Intelligence **6**

Influence of emotional experience and expressions – Accepting the responsibilities and changes - Negotiation tactics - Dealing with criticism and appreciation - Collaborative Problem Solving - Resilience Building.

UNIT IV Transactions **6**

Different types of transactions - Building Positive Relationship - Managing Conflict – Connecting across Difference – Factors hampering Interpersonal interactions – Assertiveness in communication.

UNIT V Essential Interpersonal Competencies **6**

Behaviour – Understanding limiting behaviour - Interpersonal and small group behavior – Critical and lateral thinking- Win – Win attitude – Positive thinking – Stress management – Assertive feedback - Personal Evaluation of Interpersonal Relationship Skills

Total 30 Periods

Passed in Board of studies meeting CHAIRMAN - BOARD OF STUDIES *Approved in Academic Council meeting*

Activity Component

S.No	Name of the Exercises	CO Mapping	RBT
1	Self-Introduction	1	Remember
2	Presentation of Individual perception	2	Understand
3	Role play - Non-verbal communication - Body language	4	Apply
4	Role play - Interpersonal interactions & Assertive feedback	3	Remember
5	Group Discussion	4	Apply
6	Role play - Situational conversation (On spot)	5	Understand

Text Books

1. Bozeman, Jeanine C and Argile Smith, “Interpersonal Relationship Skills for Ministers” Gretna, LA: Pelican Publishing Company, 1st Edition, 2004.
2. Floyd, Kory, “Interpersonal Communication”, 2d. Boston: McGraw-Hill, 2nd Edition, 2011.

Reference Books:

1. Augsburger, David, “Caring Enough to Confront How to Understand and Express Your Deepest Feelings Towards Others”, updated ed. Ventura, CA: Regal Books, 2nd Edition 2009.
2. Vohs, Kathleen D., and Eli J., Finkel, eds, “Self and Relationships: Connecting Intrapersonal and Interpersonal Processes”, New York: Guilford Press, 1st Edition, 2006.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
Cos	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1										3	2	1	2	
CO2										3	2	1	2	
CO3										3	2	1	2	
CO4										3	2	1	2	
CO5										3	2	1	2	
	3	High				2	Medium					1	Low	

Bloom’s Level	Summative Assessment (Internal Mode)	
	Assessment I (50 Marks)	Assessment II (50 Marks)
Remember	20	20
Understand	10	10
Apply	20	20
Analyze		
Evaluate		
Create		

Passed in Board of studies meeting CHAIRMAN - BOARD OF STUDIES *Approved in Academic Council meeting*

20MA401	Numerical Analysis and Statistics (Common to Aero, Mech, Civil ,S&F and Agri)	L	T	P	C
		3	2	0	4
Nature of Course	Basic sciences				
Pre requisites	Mathematics –I & II for Mechanical, Building and Bio Sciences				

Course Objectives

The course is intended to

1. Introduce the basic concepts of solving algebraic and transcendental equations.
2. Acquire the concept of numerical techniques of differentiation and integration.
3. Study the numerical techniques in solving ordinary differential equations.
4. Acquaint with the knowledge of testing of hypothesis for small and large samples.
5. Familiarize with the basic concept on types of design of experiments used in the field of engineering.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Illustrate the algebraic and transcendental equations.	Understand
CO2	Apply the numerical techniques of interpolation and error approximations in various intervals in real life situations.	Apply
CO3	Classify the numerical techniques for solving first and second order ordinary differential equations.	Understand
CO4	Interpret the testing of hypothesis for small and large samples.	Apply
CO5	Explain the basic concepts of classifications of design of experiments in the field of engineering	Apply

Course Contents:

UNIT- I Solution of Equations and Eigen value problems **12**

Solution of linear system of equations – Gauss elimination method – Pivoting – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power method..

UNIT- II Numerical differentiation and integration **12**

Lagrange's interpolations-Newton's divided difference interpolations – Newton's forward difference and backward difference formulae – Numerical integration using Trapezoidal and Simpson's 1/3 rules-Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT- III Numerical solution of Ordinary differential Equations **12**

Single step methods : Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first order equations – Multi step methods : Milne's- Bash forth predictor corrector methods for solving first order equations

UNIT- IV Testing of hypothesis **12**

Sampling distributions – Estimation of parameters – Statistical hypothesis – Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square for mean, variance and proportion -Contingency table (test for independent) -Goodness of fit

UNIT- V Design of Experiments **12**

One way and two way classifications - Completely randomized design - Randomized block design Latin square design - 2^2 factorial design

Total: 60 Periods

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Text Books:

1. Grewal B.S, and Grewal J.S,"Numerical methods in engineering and science",10th Edition, Khanna Publishers, 2015.
2. Johnson ,R.A.,Miler ,I and Freund J.,"Miller and Freund's Probability and statistics For Engineers",Pearson Education,Asia,8 th Edition ,2015.

Reference Books:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson Education, Asia, 2007.
3. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3rd Edition,New Delhi, 2007.

Additional References:

1. https://pvpsitrealm.blogspot.com/2016/09/higher-engineering-mathematics-by-bs.html
2. https://reference.wolfram.com/language/tutorial/Numerical methods.html

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
Cos	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2									1	1	
CO2	3	2	2									1	2	
CO3	3	3	1									1	1	
CO4	3	2	2									1	2	
CO5	3	3	2									1	2	
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember	10	10	10	20
Understand	30	30	30	60
Apply	10	10	10	20
Analyse				
Evaluate				
Create				

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20CE401	Concrete Technology	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Knowledge on ingredients of concrete				

Course Objectives

The course is intended to

1. Understand basic properties on constituent materials of concrete.
2. Impart knowledge on chemical and mineral admixtures.
3. Gain knowledge on the mix proportioning of concrete
4. Understand the properties and tests on fresh and hardened concrete.
5. Be aware of the various special concrete and its applications

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Interpret the properties of ingredients of concrete.	Apply
CO2	Recognize the effect of admixtures on properties of concrete.	Understand
CO3	Implement the concept and procedure of mix design as per IS guidelines.	Apply
CO4	Demonstrate the concrete based on the properties and tests conducted on fresh and hardened concrete.	Apply
CO5	Select the various special concretes with respect to its performance and wide applications in modern construction.	Understand

Course Contents:

UNIT- I Constituent Materials **9**

Cement - Different types - Chemical composition and Properties-Grades – Hydration of cement - Tests on cement - IS Specifications - Aggregates – Classification - Mechanical properties and tests as per BIS - Grading requirements – Water - Quality of water for use in concrete.

UNIT- II Chemical and Mineral Admixtures **9**

Accelerators – Retarders - Plasticizers - Super plasticizers - Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline - Effects on concrete properties.

UNIT- III Proportioning of Concrete Mix **9**

Principles of Mix Proportioning - Properties of concrete related to Mix Design - Physical properties of materials required for Mix Design - Design Mix and Nominal Mix - BIS Method of Mix Design - Mix Design Examples.

UNIT- IV Fresh and Hardened Properties of Concrete **9**

Workability - Tests for workability of concrete - Segregation and Bleeding - Determination of strength Properties of Hardened concrete - Compressive strength – split tensile strength - Flexural strength - Stress-strain curve for concrete - Modulus of elasticity – durability of concrete – water absorption – permeability – corrosion test – acid resistance.

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UNIT- V Special Concretes **9**

Light weight concretes - foam concrete- self compacting concrete – vacuum concrete - High strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete – SIFCON - Shotcrete – Polymer concrete - High performance concrete - Geopolymer Concrete.

Total: 45 Periods

Text Books:

1. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2018
2. Gambhir, M.L; "Concrete Technology", 5th Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2017.

Reference Books:

1. Job Thomas, "Concrete Technology", Cengage Learning India Pvt. Ltd., Delhi, 2015
2. Kumar P Mehta., Paulo J M Monterio., "Concrete - Microstructure, Properties and Materials", McGraw Hill Education (India) Private Limited, New Delhi, 2016
3. IS383-1970: Indian Standard specification for coarse and fine aggregate from natural Sources for concrete, 2011

Additional References:

1. IS456 – 2000: Indian Standard specification for plain and reinforced concrete, 2011
2. IS4926-2003 : Indian Standard specification for ready-mixed concrete, 2012
3. IS1542-1992: Indian standard specification for sand for plaster, 2009
4. https://nptel.ac.in/courses/105/102/105102012/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
Cos	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2		3	2						3	3		2
CO2	3	2		3	2						3	3		2
CO3	3	2		3	2						3	3		2
CO4	3	2		3	2						3	3		2
CO5	3	2		3	2						3	3		2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE-III (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

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20CE402	Geotechnical Engineering I	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Engineering Geology				

Course Objectives

The course is intended to

1. Understand basic concepts of about soils and soil properties
2. Study about stress development in the soil
3. Know about the stress distribution settlement
4. Recognize the necessity for shear strength of soil
5. Evaluate the stability of slope

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Classify the soil and assess the engineering properties, based on index properties.	Apply
CO2	Analyze the stress concepts in soils.	Understand
CO3	Understand and identify the settlement in soils.	Apply
CO4	Determine the shear strength of soil.	Apply
CO5	Analyze the stability of slopes.	Understand

Course Contents:

UNIT- I Soil Classification and Compaction **9**

History – formation and types of soil – composition - Index properties – clay mineralogy structural arrangement of grains – description – Classification – BIS – US – phase relationship – Compaction – theory – laboratory and field technology – field Compaction method – factors influencing compaction.

UNIT- II Effective Stress and Permeability **9**

Soil - water – Static pressure in water - Effective stress concepts in soils – Capillary phenomena- – Permeability – Darcy's law – Determination of Permeability – Laboratory Determination (Constant head and falling head methods) and field measurement pumping out in unconfined and confined aquifer – Factors influencing permeability of soils – Seepage - Two dimensional flow – Laplace's equation – Introduction to flow nets – Simple problems Sheet pile and wier.

UNIT- III Stress Distribution and Settlement **9**

Stress distribution in homogeneous and isotropic medium – Boussines of theory – (Point load, Line load and udl) Use of Newmarks influence chart –Components of settlement – Immediate and consolidation settlement – Factors influencing settlement – Terzaghi's one dimensional consolidation theory – Computation of rate of settlement. – $\sqrt{t}$ and log t methods. e-log p relationship consolidation settlement N-C clays – O.C clays – Computation.

UNIT- IV Shear Strength **9**

Shear strength of cohesive and cohesion less soils – Mohr-Coulomb failure theory – shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests – Pore pressure parameters – Factors influences shear strength of soil.

UNIT- V Slope Stability **9**

Infinite slopes and finite slopes – Friction circle method – Use of stability number –Guidelines for location of critical slope surface in cohesive and c - soil – Slope protection measures.

Total: 45 Periods

Text Books:

1. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017(Reprint).
2. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition, 2017.

Reference Books:

1. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations: Basic Geotechnics". Prentice-Hall, 2014
2. Purushothama Raj. P., "Soil Mechanics and Foundations Engineering",2nd Edition, Pearson Education, 2013.
3. Venkatramaiah.C., "Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 2018

Additional References:

1. https://nptel.ac.in/courses/105/105/105105168/
2. https://nptel.ac.in/courses/105/101/105101084/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1	3			2					3		2
CO2	3	3	1	3			2					3		2
CO3	3	3	1	3			2					3		2
CO4	3	3	1	3			2					3		2
CO5	3	3	1	3			3					3		2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

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Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CE403	Mechanics of Solids II	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Knowledge on Mechanics of Solids				

Course Objectives

The course is intended to

1. Gain knowledge on energy principles
2. Impart knowledge on analysis of indeterminate beams
3. Understand the Euler's column theory and types of cylinders
4. Become knowledgeable on the state of stress in three dimensions
5. Familiarize on unsymmetrical bending of beams

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Determine the strain energy and compute the deflection of determinate beams, frames and trusses using energy principles.	Apply
CO2	Analyze propped cantilever, fixed beams and continuous beams using theorem of three moment equation for external loadings and support settlements.	Understand
CO3	Find the load carrying capacity of columns and stresses induced in columns and cylinders	Apply
CO4	Determine principal stresses and planes for an element in three dimensional state of stress and study various theories of failure	Apply
CO5	Determine the stresses due to Unsymmetrical bending of beams, locate the shear center, and find the stresses in curved beams	Understand

Course Contents:

UNIT- I Energy Principles **9**

Strain energy and strain energy density – strain energy due to axial load (gradual, sudden and impact loadings) , shear, flexure and torsion – Castigliano's theorems – Maxwell's reciprocal theorem - Principle of virtual work – unit load method - Application of energy theorems for computing deflections in determinate beams , plane frames and plane trusses – lack of fit and temperature effects - Williot Mohr's Diagram

UNIT- II Indeterminate Beams **9**

Concept of Analysis - Propped cantilever and fixed beams - fixed end moments and reactions – sinking and rotation of supports - Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.

UNIT - III Columns and Cylinders **9**

Euler's column theory – critical load for prismatic columns with different end conditions – Effective length – limitations - Rankine-Gordon formula - Eccentrically loaded columns – middle third rule - core of a section – Thin cylindrical and spherical shells – stresses and change in dimensions - Thick cylinders – Compound cylinders – shrinking on stresses

UNIT- IV State of Stress in Three Dimensions **9**

Stress tensor at a point – Stress invariants - Determination of principal stresses and principal planes - Volumetric strain. Theories of failure: Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Total Strain energy theory – Maximum distortion energy theory – Application problems

UNIT- V Advanced Topics **9**

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections - Shear Centre - Curved beams – Winkler Bach formula **–** stresses in hooks.

Total: 45 Periods

Text Books:

1. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain"SMTS –I Strength of Materials", 11th Edition,Lakshmi publications. New Delhi,2018.
2. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 2015.

Reference Books:

1. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain,"Theory of Structures" (SMTS) Vol - II, Laxmi Publishing Pvt Ltd, New Delhi 2017.
2. Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2017.
3. Basavarajiah and Mahadevapa, Strength of Materials, University press, Hyderabad, 2016

Additional References:

1. https://nptel.ac.in/courses/105/105/105105108/
2. https://nptel.ac.in/courses/112/107/112107146/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
Cos	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2			3							3		2
CO2	3	2			3							3		2
CO3	3	2			3							3		2
CO4	3	2			3							3		2
CO5	3	2			3							3		2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CE404	Surveying II	L	T	P	C
		3	0	2	4
Nature of Course	Professional Core				
Pre requisites	Knowledge on fundamentals of survey				

Course Objectives

The course is intended to

1. Gain knowledge on control surveying
2. Impart knowledge on survey adjustment
3. Understand the principles of total station survey
4. Give an exposure to basic concepts of GPS surveying
5. Familiarize on setting out curves and astronomical surveying

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Select the methods of control surveying	Understand
CO2	Identify the survey adjustment required in survey works	Apply
CO3	Execute the precise survey by using total station	Apply
CO4	Recognize the basic concepts and GPS surveying	Understand
CO5	Implement hydrographic surveying and astronomical surveying	Apply

Course Contents:

UNIT- I Control Surveying **9**

Horizontal and vertical control – Methods – specifications – triangulation- baseline – instruments and accessories – corrections – satellite stations – reduction to centre- trigonometrical levelling – single and reciprocal observations – traversing – Gale's table.

UNIT- II Survey Adjustment **9**

Errors Sources- precautions and corrections – classification of errors – true and most probable values- weighed observations – method of equal shifts –principle of least squares - normal equation – correlates- level nets- adjustment of simple triangulation networks.

UNIT - III Total Station Surveying **9**

Basic Principle – Classifications -Electro-optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance of Total Station instruments. Modern positioning systems – Traversing and Trilateration.

UNIT- IV GPS Surveying **9**

Basic Concepts - Different segments - space, control and user segments - satellite configuration - signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability- Task of control segment – Hand Held and Geodetic receivers –data processing - Traversing and triangulation.

UNIT- V Advanced Topics in Surveying **9**

Route Surveying - Reconnaissance - Route surveys for highways, railways and waterways - Simple curves – Compound and reverse curves - Setting out Methods – Transition curves - Functions and requirements - Setting out by offsets and angles - Vertical curves - Sight distances- hydrographic surveying – Tides - MSL - Sounding methods - Three-point problem - Strength of fix-Sextants and station pointer- Astronomical Surveying – field observations and determination of Azimuth by altitude and hour angle methods – fundamentals of Photogrammetry and Remote Sensing

Total: 45 Periods

Laboratory Component

S.No	Name of the Experiment	CO Mapping	RBT
1	Measurement of horizontal angles by reiteration and repetition vertical angles	CO1	Apply
2	Theodolite survey traverse	CO1	Apply
3	Height and distance – Triangulation and single plane methods	CO2	Apply
4	Tachometry – tangential system –stadia system- subtense system	CO3	Apply
5	Setting out works – Foundation marking- simple curve (right/left – handed)- transition curve	CO4	Apply
6	Field observation for the calculation of azimuth	CO5	Apply
7	Filed work using total station	CO5	Apply

Total: 30 Periods

Text Books:

1. James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7th Edition, McGraw Hill, 2014.
2. Bannister and S. Raymond, "Surveying", 7th Edition, Longman 2005.

Reference Books:

1. Alfred Leick, "GPS satellite surveying", John Wiley & Sons Inc, 2015.
2. Guocheng Xu, " GPS Theory, Algorithms and Applications", Springer - Berlin, 2016.
3. Satheesh Gopi, rasathishkumar, N. madhu, “Advanced Surveying, Total Station GPS and Remote Sensing" Pearson education , 2017

Additional References:

1. https://nptel.ac.in/courses/105/104/105104100/
2. https://nptel.ac.in/courses/105/107/105107157/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2			3				2			3		2
CO2	3	2			2				2			3		2
CO3	3	2			3				2			3		2
CO4	3	2			3				2			3		2
CO5	3	2			3				2			3		2
	3	High				2	Medium					1	Low	

Summative Assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50]**
	Theory				**Practical's**	
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	Attendance[5]	**Rubric based CIA[10]** / **Model Examination [10 marks]**	
Remember	30	20	10		20	20
Understand	10	20	30		20	40
Apply	10	10	10		40	20
Analyze					20	20
Evaluate						
Create						

20CE405	Applied Hydraulics Engineering	L	T	P	C
		3	0	2	4
Nature of Course	Engineering science				
Pre requisites	Fundamentals of Basic science				

Course Objectives

The course is intended to

1. Learn the basics of open channel flow relationship by applying the fluid property.
2. Gain knowledge on gradually varied flow
3. Impart knowledge on rapidly varied flow and application of momentum application
4. Familiarize on turbines and its various types
5. Get an exposure to understand the various types of pumps

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Interpret the best hydraulic sections for uniform flow	Apply
CO2	Identify an effective section for flow in different cross sections.	Understand
CO3	Solve problems in uniform, gradually and rapidly varied flows in steady state conditions.	Apply
CO4	Explain the performance of turbines.	Understand
CO5	Recognize the operating characteristics of pumps.	Understand

Course Contents:

UNIT- I Uniform Flow **9**

Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Fundamental equations - Velocity distribution in open channel - Steady uniform flow: Chezy equation, Manning equation - Best hydraulic sections for uniform flow - Computation in Uniform Flow - Specific energy and specific force - Critical depth and velocity.

UNIT- II Gradually Varied Flow **9**

Dynamic equations of gradually varied and spatially varied flows - Water surface flow profile classifications: Hydraulic Slope, Hydraulic Curve - Profile determination by Numerical method: Direct step method and Standard step method, Graphical method - Applications.

UNIT - III Rapidly Varied Flow **9**

Application of the energy equation for RVF - Critical depth and velocity - Critical, Sub-critical and Super-critical flow - Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation - Surges and surge through channel transitions

UNIT- IV Turbines **9**

Impact of Jet on vanes - Turbines - Classification - Reaction turbines - Francis turbine, Radial flow turbines, draft tube and cavitation - Propeller and Kaplan turbines - Impulse turbine - Performance of turbine - Specific speed - Runaway speed - Similarity laws.

UNIT- V Pumps **9**

Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitations in pumps - Operating characteristics - Multistage pumps - Reciprocating pumps - Negative slip - Flow separation conditions - Air vessels, indicator diagrams and its variations - Savings in work done - Rotary pumps: Gear pump.

Total: 45 Periods

Laboratory Component

S.No	Name of the Experiment	CO Mapping	RBT
1	**Flow Measurement** 1. Calibration of Rotameter 2. Calibration of Venturimeter / Orificemeter 3. Flow through variable duct area-Bernoulli's Experiment 4. Flow through Rectangular Notch 5. Flow through Triangular Notch	CO1	Apply
2	**Losses in Pipes** 1. Determination of friction factor in pipes 2. Determination of minor losses	CO2	Apply
3	**Pumps** 1. Characteristics of Centrifugal pumps 2. Characteristics of Submersible pump 3. Characteristics of Reciprocating pump	CO3	Apply
4	**Turbines** 1. Characteristics of Pelton wheel turbine 2. Characteristics of Francis turbine 3. Characteristics of Kaplan turbine	CO4	Apply
5	Determination of Metacentric Height	CO5	Apply

Total: 30 Periods

Text Books:

1. Modi P.N and Seth.S.M "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2011.
2. Chandramouli P.N.,"Applied Hydraulic Engineering", Yes Dee Publishing Pvt. Ltd., 2017.

Reference Books:

1. Ven Te Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2009.
2. Subramanya.K ,"Flow in open channels", Tata McGraw Hill, New Delhi, 2019.
3. Bansal, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, 2018.

Additional References:

1. https://nptel.ac.in/courses/105/105/105105203/
2. https://nptel.ac.in/courses/105/103/105103096/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
Cos	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			2	3	3					3		2
CO2	3	3			2	3	3					3		2
CO3	3	3			2	3	3					3		2
CO4	3	3			2	3	3					3		2
CO5	3	3			2	3	3					3		2
	3	High				2	Medium					1	Low	

Summative Assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50]**
	Theory				**Practical's**	
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	Attendance[5]	**Rubric based CIA[10]** / **Model Examination [10 marks]**	
Remember	30	20	10		20	20
Understand	10	20	30		20	40
Apply	10	10	10		40	20
Analyze					20	20
Evaluate						
Create						

20CE406	Strength of Materials Laboratory	L	T	P	C
		0	0	2	1
Nature of Course	Professional core				
Pre requisites	Knowledge on construction materials				

Course Objectives

The course is intended to

1. Gain knowledge on strength of steel in tension, shear and deflection
2. Impart knowledge on compressive strength of wood.
3. Understand the effects of torsion in steel.
4. Familiarize on the hardness and impact strength of steel.
5. Become knowledgeable in understanding the deflection behavior of spring.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Evaluate the tensile, shear strength and deflection behavior of steel.	Apply
CO2	Identify the compressive resistance of wood	Apply
CO3	Evaluate the torsional resistance of steel.	Apply
CO4	Identify the quality of steel by conducting impact and hardness tests.	Apply
CO5	Recognize the deflection behavior of springs	Understand

Course Contents:

S. No	Experiment	CO Mapping	RBT
1	Tension test on steel rod	CO1	Apply
2	Double shear test on metal	CO1	Apply
3	Deflection test on metal beam	CO1	Apply
4	Compression test on wood	CO2	Apply
5	Torsion test on mild steel rod	CO3	Apply
6	Impact test on metal specimen (Izod and Charpy)	CO4	Apply
7	Hardness test on metals (Rockwell and Brinell Hardness Tests)	CO4	Apply
8	Compression test on helical spring	CO5	Understand
9	Deflection test on carriage spring	CO5	Understand

Total: 45 Periods

Reference Books:

1. Strength of Materials Laboratory Manual, Anna University, Chennai - 600 025.
2. IS1786-2008, Specification for cold worked steel high strength deformed bars for concrete reinforcement, 2008

Additional References:

1. https://nptel.ac.in/courses/112/106/112106141/
2. https://nptel.ac.in/courses/112/107/112107147/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
Cos	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2		3							3		2
CO2	3	3	2		3							3		2
CO3	3	3	2		3							3		2
CO4	3	3	2		3							3		2
CO5	3	3	2		3							3		2
	3	High				2	Medium					1	Low	

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Rubric based Continuous Assessment [30 marks]**	**Preparatory Examination [25 Marks]**	**Attendance [5 Marks]**	**Final Examination [40 Marks]**
Remember	20	20		20
Understand	30	20		20
Apply	50	40		40
Analyze		20		20
Evaluate				
Create				

20MC401	SOFT SKILL (Common to All Branches of B.E., / B.Tech., Second Year)	L	T	P	C
		2	0	0	0
Nature of Course	Mandatory Course				
Prerequisites	Nil				

Course Objectives

The course is intended to

1. Improve language skills in personal and professional life
2. Equip students with the vital communication and soft skills to succeed in the highly competitive international professional arena
3. Focus on the fundamental soft skills and of their practical social and work place usage
4. Make the students to identify and overcome the barriers in interpersonal relationships
5. Enhance employability skills and ensure career success

Course Outcomes

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

CO.No.	Course Outcome	Bloom's Level
CO1	Relate the significance and fundamental nature of soft skills	Remember
CO2	Take part in a wide range of Public speaking and professional group discussions	Understand
CO3	Plan one's time effectively and productively, especially at work	Apply
CO4	Make use of leadership skills to manage stress & conflict	Apply
CO5	Organize presentations effectively and participate in interview with confidence.	Apply

Course Contents

Unit - I Introduction to Soft Skills and Interpersonal Communication **6**

Introduction-Definition and Significance of Soft Skills; Interpersonal communication-types of interpersonal communication.

Unit - II Public Speaking and Oral Communication skills **6**

Public Speaking: Skills, Methods ans Strategies -Group Discussion - Importance, Planning and Elements.

Unit – III Time Management and Personality Development **6**

Time Management – Concepts and essentials tips. Personality-development – meaning, SWOT analysis & goal setting- Stress and conflict management.

Unit – IV Leadership skills and Emotional Intelligence **6**

Leadership skills - Concept of Leadership and honing Leadership Skills - Problem-solving Skills - Group influence and Ethical Decision-Making. Emotional Intelligence - Strategies to enhance Emotional Intelligence.

Unit-V Interview Skills **6**

Interviewer - Interviewee perspectives - Self Introduction and Presentation: Types, Content and Essential Tips-before, during and after a presentation, Overcoming Nervousness - Mock Interview.

Total: 30 Periods

Text Books

1. Managing Soft Skills for Personality Development-edited by B.N.Ghosh, McGraw Hill India, 2018.
2. English and Soft Skills-S.P. Dhanavel, Orient Black swan India, 2017

Reference Books:

1. Soft Skill Business and Professional Communication Book by Sutapa Banerjee,2016
2. Communication Skills Book by Pushp Lata and Sanjay Kumar,2015

Additional Reference

https://nptel.ac.in/courses/109/107/109107121/

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1								1	2	3		2			
CO2								1	2	3		2			
CO3								1	2	3		2			
CO4								1	2	3		2			
CO5								1	2	3		2			
	3	**High**				**2**	**Medium**				**1**	**Low**			

Bloom's Level	**Summative Assessment (Internal Mode)**	
	Assessment I (50 Marks)	**Assessment II (50 Marks)**
Remember	10	10
Understand	10	10
Apply	30	30
Analyze		
Evaluate		
Create		

20CE501	Design of Reinforced Cement Concrete Elements	L	T	P	C
		3	2	0	4
Nature of Course	Professional core				
Pre requisites	Concrete Technology				

Course Objectives

The course is intended to

1. Introduce the basic concepts and steps for reinforced concrete sectional design mainly in accordance with Indian Standard codes of practice
2. Underline and discuss basic principles of mechanics regarding the design of reinforced concrete systems and elements.
3. Make students be familiar about the codal provisions for the design of R.C.C structures
4. Impart knowledge on the basic design philosophy of R.C.C structures
5. Know about footing design.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Understand the various design methodologies for the design of RC elements.	Remember
CO2	Know the analysis and design of flanged beams by limit state method and design of beams for shear, bond and torsion.	Understand
CO3	Design the various types of slabs and staircase by limit state method.	Evaluate
CO4	Design columns for axial, uniaxial and biaxial eccentric loadings.	Evaluate
CO5	Design of footing by limit state method.	Evaluate

Course Contents:

UNIT I INTRODUCTION 12

Objective of structural design-Steps in RCC Structural Design Process- Type of Loads on Structures and Load combinations- Code of practices and Specifications - Concept of Working Stress Method, Ultimate Load Design and Limit State Design Methods for RCC -Properties of Concrete and Reinforcing Steel - Analysis and Design of Singly reinforced Rectangular beams by working stress method - Limit State philosophy as detailed in IS code - Advantages of Limit State Method over other methods - Analysis and design of singly and doubly reinforced rectangular beams by Limit State Method.

UNIT II DESIGN OF BEAMS 12

Analysis and design of Flanged beams for – Use of design aids for Flexure - Behaviour of RC members in Shear, Bond and Anchorage - Design requirements as per current code - Behaviour of rectangular RC beams in shear and torsion - Design of RC members for combined Bending, Shear and Torsion.

UNIT III DESIGN OF SLABS AND STAIRCASE 12

Analysis and design of cantilever, one way simply supported and continuous slabs and supporting beams-Two way slab- Design of simply supported and continuous slabs using IS code coefficients- Types of Staircases – Design of dog-legged Staircase.

UNIT IV DESIGN OF COLUMNS 12

Types of columns –Axially Loaded columns – Design of short Rectangular Square and circular columns –Design of Slender columns- Design for Uniaxial and Biaxial bending using Column Curves

UNIT V DESIGN OF FOOTINGS 12

Concepts of Proportioning footings and foundations based on soil properties-Design of wall footing – Design of axially and eccentrically loaded Square, Rectangular pad and sloped footings – Design of Combined Rectangular footing for two columns only.

TOTAL: 60 PERIODS

TEXTBOOKS:

1. Krishnaraju.N " Design of Reinforced Concrete Structurres ", CBS Publishers & Distributors Pvt. Ltd., New Delhi
2. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
3. Gambhir. M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
4. Subramanian,N.,"Design of Reinforced Concrete Structures",Oxford University Press, New Delhi, 2013. .
5. Ramachandra, "Limit state Design of Concrete Structures" Standard Book House, New Delhi .

REFERENCES:

1. Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Roorkee, 1998.
2. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2002.
3. Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., 2009.
4. Punmia. B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publication Pvt. Ltd., New Delhi, 2007.
5. Bandyopadhyay. J.N., "Design of Concrete Structures"., Prentice Hall of India Pvt. Ltd., New Delhi, 2008.
6. IS456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2000.
7. SP16, IS456:1978 "Design Aids for Reinforced Concrete to Bureau of Indian Standards, New Delhi, 1999.

Additional References:

1. https://nptel.ac.in/courses/105/101/105101085/
2. https://nptel.ac.in/courses/105/105/105105109/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3		1					2						1
CO2	3		1					2						1
CO3	3		1					2						1
CO4	3		1					2						1
CO5	3		1					2						1
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CE502	Structural Analysis I	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Strength of materials				

Course Objectives

The course is intended to

1. Understand the basic concepts of Analysis of structures.
2. Gain knowledge on influence lines for determinate beams.
3. Know about the influence lines for indeterminate beams.
4. Acquire knowledge on Slope deflection method.
5. Learn about the moment distribution method.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Analyse the structures by Strain Energy method.	Analyse
CO2	Implement the Concept of moving loads and influence lines for simple structures	Apply
CO3	Illustrate the analysis of indeterminate beams with influence lines.	Apply
CO4	Analyse the structures by slope deflection method	Analyse
CO5	Analyse the structures by moment distribution method	Analyse

Course Contents:

UNIT- I Strain energy method **9**

Determination of Static and Kinematic Indeterminacies – Analysis of continuous beams, plane frames and indeterminate plane trusses by method of strain energy (up to two degree of redundancy).

UNIT- II Moving loads and Influence lines for determinate beams **9**

Influence lines for reactions in statically determinate beams – Influence lines for shear force and bending moment – Calculation of bending moment and shear force due to concentrated and uniformly distributed moving loads – absolute maximum bending moment - influence lines for member forces in pin jointed plane frames.

UNIT- III Influence lines for indeterminate beams **9**

Muller Breslau's principle- Influence line for Shearing force, Bending Moment and support reaction components of propped cantilever, continuous beams (Redundancy restricted to one), and fixed beams.

UNIT- IV Slope deflection method **9**

Slope deflection equations – Joint equilibrium conditions - Analysis of continuous beams and rigid frames (with and without sway)-Support settlements/displacements

UNIT- V Moment distribution method **9**

Stiffness of the members and carry over factors – Distribution and carryover of moments - Analysis of continuous Beams-propped cantilever beams-Plane rigid frames with and without sway

Total: 45 Periods

Text Books:

1. Bhavikatti,S.S, Structural Analysis,Vol.1 & 2, Vikas Publishing House Pvt.Ltd., NewDelhi-4, 2014.
2. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, Theory of structures, Laxmi, Publications,2004.

Reference Books:

1. Negi.L.S and Jangid R.S., Structural Analysis, Tata McGraw-Hill Publishers, 2004.
2. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Co.Ltd.2002.
3. Gambhir.M.L., Fundamentals of Structural Mechanics and Analysis, PHIL earning Pvt. Ltd.,2011.

Additional References:

1. https://nptel.ac.in/courses/105/101/105101085/
2. https://nptel.ac.in/courses/105/105/105105109/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3			2			2						3	
CO2	3			2			2						3	
CO3	3			2			2						3	
CO4	3			2			2						3	
CO5	3			2			2						3	
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CE503	Environmental Engineering I	L	T	P	C
		3	0	2	4
Nature of Course	Professional core				
Pre requisites	Environmental Engineering				

Course Objectives

The course is intended to

1. Gain knowledge about the physical, chemical, and biological characteristics of water.
2. Impart knowledge on transmission of water supply.
3. Acquire knowledge on unit operation and principles of water treatment.
4. Familiarize on various applications of advanced water treatment.
5. Impart knowledge on Water Distribution and Supply to Buildings.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the concept of source of water and their characteristics.	Understand
CO2	Insight into the structure of drinking water supply systems, including water transport, treatment, and distribution.	Understand
CO3	Identify the unit operations and processes in water treatment.	Understand
CO4	Recognize the water quality criteria, standards and their relation to public health.	Understand
CO5	Illustrate the requirements of water distribution and supply in buildings.	Apply

Course Contents:

UNIT- I Planning for Water Supply System **9**

Public water supply system -Planning - Objectives -Design period - Population forecasting -Water demand -Sources of water and their characteristics -Surface and Groundwater- Impounding Reservoir Well hydraulics -Development and selection of source - Water quality - Characterizationand standards- Impact of climate change

UNIT- II Conveyance System **9**

Water supply -intake structures -Functions and drawings -Pipes and conduits for water- Pipe materials - Hydraulics of flow in pipes -Transmission main design -Laying, jointing, and testing of pipes - Drawing's appurtenances - Types and capacity of pumps -Selection of pumps and pipe.

UNIT- III Water Treatment **9**

Objectives - Unit operations and processes - Principles, functions design and drawing of Chemical feeding, Flash mixers, flocculators, sedimentation tanks and sand filters - Disinfection- Residue Management - Construction and Operation & Maintenance aspects of Water Treatment Plants.

UNIT- IV Advanced Water Treatment **9**

Principles and functions of Aeration - Iron and manganese removal, Defluoridation and demineralization - Water softening - Desalination - Membrane Systems - Recent advances.

UNIT- V Water Distribution and Supply to Buildings **9**

Requirements of water distribution -Components -Service reservoirs -Functions and drawings - Network design -Economics -Computer applications -Analysis of distribution networks - Appurtenances -operation and maintenance -Leak detection, Methods. Principles of design of water supply in buildings -House service connection -Fixtures and fittings -Systems of plumbing and drawings of types of plumbing.

Total: 45 Periods

Text Books:

1. Garg, S.K., "Environmental Engineering", Vol.1 Khanna Publishers, New Delhi, 2010
2. Punmia, B.C., Ashok K Jain and Arun K Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2014.

Reference Books:

1. Modi, P.N. "Water Supply Engineering", Vol. I Standard Book House, New Delhi, 2010
2. Government of India, "Manual on Water Supply and Treatment", CPHEEO, Ministry of Urban Development, New Delhi, 2003.
3. Syed R. Qasim and Edward M. Motley Guang Zhu, "Water Works Engineering Planning", Design and Operation, Prentice Hall of India Private Limited, New Delhi, 2006.

References:

1. https://nptel.ac.in/courses/105/106/105106119/
2. https://nptel.ac.in/courses/105/105/105105201/

Laboratory Components

S.No	Name of the Experiment	CO Mapping	RBT
1	Determination of pH, Turbidity and conductivity	CO1	Apply
2	Determination of Hardness	CO1	Apply
3	Determination of Alkalinity and Acidity	CO2	Apply
4	Determination of Chlorides	CO2	Apply
5	Determination of Phosphates and Sulphates	CO3	Apply
6	Determination of iron and fluoride	CO3	Apply
7	Determination of Optimum Coagulant dosage	CO4	Apply
8	Determination of residual chlorine and available chlorine in bleaching powder	CO4	Apply
9	Determination of suspended, settleable, volatile and fixed solids	CO5	Apply
10	Determination Dissolved Oxygen and BOD for the given sample	CO5	Apply

Total: 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
	Pos												**PSOs**	
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1		2	1									3		2
CO2		3	1									3		2
CO3		2	3									3		2
CO4		2	3									3		2
CO5		2	1									3		2
	3	High				2	Medium					1	Low	

Summative Assessment							
Bloom's Level	**Continuous Assessment**						**Final Examination (Theory) [50]**
	Theory				**Practical's**		
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	Attendance[5]	**Rubric based CIA[10]**	**Model Examination [10 marks]**	
Remember	30	20	10		20		20
Understand	10	20	30		20		40
Apply	10	10	10		40		20
Analyze					20		20
Evaluate							
Create							

20CE504	GEOTECHNICAL ENGINEERING II	L	T	P	C
		3	0	2	4

Nature of Course	Professional core
Pre requisites	Geotechnical Engineering I

Course Objectives

The course is intended to

1. Understand basic concepts of site investigation and selection of foundation
2. Study about stress development in the soil
3. Recognize the types of isolated footing, combined footing and Mat foundation
4. Recognize the necessity for shear strength of soil
5. Evaluate the stability of slope

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Conduct site investigation and prepare the report for selection of foundation	Understand
CO2	Compute the bearing capacity and settlement of soil	Apply
CO3	Evaluate the size of shallow foundations	Knowledge
CO4	Estimate the load carrying capacity of piles and settlement of pile groups	Apply
CO5	Analyse the lateral earth pressure on retaining wall	Understand

Course Contents:

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9

Scope and objectives – Methods of exploration – Auguring and boring – Wash boring and rotary drilling – Depth and spacing of bore holes – Soil samples – Representative and undisturbed – Sampling methods – Split spoon sampler, Thin wall sampler, Stationary piston sampler – Penetration tests (SPT and SCPT) – Bore log reportand Selection of foundation.

UNIT II SHALLOW FOUNDATION 9

Location and depth of foundation – Codal provisions – Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – Factors affecting bearing capacity

– Bearing capacity from in-situ tests (SPT, SCPT and plate load) – Allowable bearing pressure –Seismic considerations in bearing capacity evaluation - Determination of Settlement of foundations on granular and clay deposits – Total and differential settlement – Allowable settlements – Codal provision – Methods of minimizing total and differential settlements.

UNIT III FOOTINGS AND RAFTS 9

Types of Isolated footing, Combined footing, Mat foundation – Contact pressure and settlement distribution – Proportioning of foundations for conventional rigid behaviour – Minimum thickness for rigid behaviour – Applications – Compensated foundation – Codal provision

UNIT IV PILE FOUNDATION 9

Types of piles and their functions – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – Static formula – Dynamic formulae (Engineeringnewsand Hileys) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – Uplift capacity-Group capacity by different methods (Field's rule, Converse – Labarra formula andblock failure criterion) – Settlement of pile groups – Interpretation of pile load test (routine test only), Under reamed piles – Capacity under compression and uplift – Cohesive – expansive

– non expansive –Cohesionless soils – Codal provisions.

UNIT V RETAINING WALLS 9

Plastic equilibrium in soils – Active and passive states – Rankine's theory – Cohesionless and cohesive soil – Coulomb's wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations - Culmann's Graphical method - Pressure on the wall due to line load – Stability analysis of retaining walls – Codal provisions.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2014.
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017 (Reprint).
3. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi,16th Edition 2017.

REFERENCES:

1. Braja M Das, "Principles of Foundation Engineering" (Eigth edition), Cengage Learning 2014.
2. Kaniraj, S.R. "Design aids in Soil Mechanics and Foundation Engineering", Tata McGrawHill publishing company Ltd., New Delhi, 2014.
3. Joseph E bowles, "Foundation Analysis and design", McGraw Hill Education, 5th Edition,28th August 2015.
4. IS Code 6403 : 1981 (Reaffirmed 1997) "Bearing capacity of shallow foundation", Bureauof Indian Standards, New Delhi.
5. IS Code 8009 (Part 1):1976 (Reaffirmed 1998) "Shallow foundations subjected to symmetrical static vertical loads", Bureau of Indian Standards, New Delhi.
6. IS Code 8009 (Part 2):1980 (Reaffirmed 1995) "Deep foundations subjected to symmetricalstatic vertical loading", Bureau of Indian Standards, New Delhi.
7. IS Code 2911 (Part 1): 1979 (Reaffirmed 1997) "Concrete Piles" Bureau of Indian Standards, New Delhi.
8. IS Code 2911 (Part 2): 1979 (Reaffirmed 1997) "Timber Piles", Bureau of Indian Standards,New Delhi.
9. IS Code 2911 (Part 3) : 1979 (Reaffirmed 1997) "Under Reamed Piles", Bureau of IndianStandards, New Delhi.
10. IS Code 2911 (Part 4) : 1979 (Reaffirmed 1997) "Load Test on Piles", Bureau of IndianStandards, New Delhi.
11. IS Code 1904: 1986 (Reaffirmed 1995) "Design and Construction of Foundations in Soils",Bureau of Indian Standards, New Delhi.
12. IS Code 2131: 1981 (Reaffirmed 1997) "Method for Standard Penetration test for Soils",Bureau of Indian Standards, New Delhi.
13. IS Code 2132: 1986 (Reaffirmed 1997) "Code of Practice for thin – walled tube samplingfor soils", Bureau of Indian Standards, New Delhi.
14. IS Code 1892 (1979): Code of Practice for subsurface Investigation for Foundations. Bureau of Indian Standards, New Delhi.
15. IS Code 14458 (Part 1) : 1998 "Retaining Wall for Hill Area – Guidelines, Selection of Typeof Wall" , Bureau of Indian Standards, New Delhi.
16. IS Code 14458 (Part 2) : 1998 "Retaining Wall for Hill Area – Guidelines, Design ofRetaining/Breast Walls" , Bureau of Indian Standards, New Delhi.

Additional References:

1. https://nptel.ac.in/courses/105/101/105101083/
2. https://nptel.ac.in/courses/105/101/105101160/

Laboratory Component

S.No	Name of the Experiment	CO Mapping	RBT
1	Specific gravity of soil solids	CO1	Apply
2	Grain size distribution – Sieve analysis	CO1	Apply
3	Liquid limit and Plastic limit tests	CO1	Apply
4	Field density Test Sand replacement method	CO1	Apply
5	Field density core cutter method	CO1	Apply
6	Determination of moisture – density relationship using standard Proctor compaction test	CO1	Apply
7	Permeability determination (constant head and falling head methods)	CO2	Apply
8	Direct shear test in cohesion less soil	CO4	Apply
9	Unconfined compression test in cohesive soil	CO4	Apply
10	Laboratory vane shear test in cohesive soil	CO4	Apply

Total: 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1			1	3										2
CO2			1	3										2
CO3			3	3										2
CO4			3	3										2
CO5			1	3										2
	3	High				2	Medium					1	Low	

Summative Assessment							
Bloom's Level	**Continuous Assessment**						**Final Examination (Theory) [50]**
	Theory				**Practical's**		
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	Attendance[5]	**Rubric based CIA[10]**	**Model Examination [10 marks]**	
Remember	30	20	10		20		20
Understand	10	20	30		20		40
Apply	10	10	10		40		20
Analyze					20		20
Evaluate							
Create							

20CE505	Survey Camp	L	T	P	C
		1 Week			1
Nature of Course	Employability Enhancement course				
Pre requisites	Surveying I & Surveying II				

Course Objectives

The course is intended to

1. Give practical exposure on the application of various basic principles of survey in the field.
2. Provide hands on experience to handle modern surveying equipments using total station.
3. Familiarize on levelling with respect to field work.
4. Create awareness on setting out curves.
5. Give an exposure for preparing a contour map.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Understanding the traversing methods and measuring quantity for before and after execution of a project.	Understand
CO2	Knowledge in area measuring and time calculating	Understand
CO3	Understanding the gradient of earth surface and to calculate level different.	Understand
CO4	Understanding the curve setting and marking in the field.	Understand
CO5	Identify the design requirements of water supply in buildings	Apply

Course Contents:

One weeks Survey Camp will be conducted during summer vacation in the following activities:

- Groups of not more than six members will carry out each exercise in survey camp.
- The camp must involve work on a large area of not less than 40 acres outside the campus.
- At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

S. No	Experiment	CO Mapping	RBT
1	Traverse - using Total station	CO1	Apply
2	L.S & C.S - Road and canal alignment for a length of not less than 1 Km at least L.S at Every 30M and C.S at every 90 m.	CO1	Apply
3	Triangulation to calculate area by angular measurements.	CO2	Apply
4	Sun observation to determine azimuth. (guidelines to be given to the students)	CO2	Apply
5	Fixing gradient for a pipe line.	CO3	Apply
6	Fly leveling for finding difference in levels.	CO3	Apply
7	Curve setting by deflection angle.	CO4	Apply
8	**Contouring:** (i). Radial tachometric contouring - Radial Line at Every 45 Degree. and Length not less than 60 Meter on each Radial Line 65 (ii). Block Level/ By squares of size at least 100 Meter x 100 Meter atleat 20 Meter interval.	CO5	Apply

Total: 45 Periods

Text Books:

1. Punmia.B.C., Ashok K.Jain and Arun K Jain , Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, 2016
2. Bannister and S. Raymond, "Surveying", 7th Edition, Longman 2017

Reference Books:

1. James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7th Edition, McGraw Hill, 2001.
3. Arora K.R."Surveying Vol I & II", Standard Book house, 10th Edition 2008 standard book house Publication.

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3							2					3
CO2	3	2							2					3
CO3	3	3							2					3
CO4	3	2							2					2
CO5	3	3							2					2
	3	High				2	Medium					1	Low	

Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubric based Continuous Assessment [50 marks]**	**End Semester Examination [50 marks]**
Remember	30	30
Understand	70	70
Apply		
Analyze		
Evaluate		
Create		

20CE601	Design of Steel Structural Elements	L	T	P	C
		3	2	0	4
Nature of Course	Professional core				
Pre requisites	Strength of Materials				

Course Objectives

The course is intended to

1. Impart knowledge on Limit State Design Methods for steel Structures
2. Gain knowledge on the codal provisions for the design of steel structures
3. Acquire knowledge on the design of connections, tension members, compression members and beams.
4. Familiarise on design of compression members.
5. Get an exposure on design of flexural members.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Describe the concepts of various design philosophies.	Understand
CO2	Design common bolted and welded connections for steel structures.	Create
CO3	Design tension members and understand the effect of shear leg.	Create
CO4	Implement the design concept of axially loaded columns and column base connections.	Apply
CO5	Interpret specific problems related to the design of laterally restrained and unrestrained steel beams.	Apply

Course Contents:

UNIT I INTRODUCTION AND ALLOWABLE STRESS DESIGN 12

Structural steel types – Mechanical Properties of structural steel- Indian structural steel products-Steps involved in the Deign Process -Steel Structural systems and their Elements- - Type of Loads on Structures and Load combinations- Code of practices, Loading standards and Specifications - Concept of Allowable Stress Method, and Limit State Design Methods for Steel structures-Relative advantages and Limitations-Strengths and Serviceability Limit states. Allowable stresses as per IS 800 section 11 -Concepts of Allowable stress design for bending and Shear -Check for Elastic deflection-Calculation of moment carrying capacity -Design of Laterally supported Solid Hot Rolled section beams-Allowable stress deign of Angle Tension and Compression Members and estimation of axial load carrying capacity.

UNIT II CONNECTIONS IN STEEL STRUCTURES 12

Type of Fasteners- Bolts Pins and welds- Types of simple bolted and welded connections Relative advantages and Limitations-Modes of failure-the concept of Shear lag-efficiency of joints- Axially loaded bolted connections for Plates and Angle Members using bearing type bolts –Prying forces and Hanger connection- Design of Slip critical connections with High strength Friction Grip bolts.- Design of joints for combined shear and Tension- Eccentrically Loaded Bolted Bracket Connections- Welds-symbols and specifications- Effective area of welds-Fillet and but Welded connections-Axially Loaded connections for Plate and angle truss members and Eccentrically Loaded bracket connections.

UNIT III TENSION MEMBERS 12

Tension Members - Types of Tension members and sections –Behaviour of Tension Members-modes of failure-Slenderness ratio- Net area – Net effective sections for Plates ,Angles and Tee in tension –Concepts of Shear Lag- Design of plate and angle tension members-design of built up tension Members-Connections in tension members – Use of lug angles – Design of tension splice.

UNIT IV COMPRESSION MEMBERS 12

Types of compression members and sections – Behaviour and types of failures-Short and slender columns - Current code provisions for compression members- Effective Length, Slenderness ratio – Column formula and column curves- Design of single section and compound Angles-Axially Loaded solid section Columns- Design of Built up Laced and Battened type columns – Design of column bases – Plate and Gusseted bases for Axially loaded columns- Splices for columns.

UNIT V DESIGN OF FLEXURAL MEMBERS 12

Types of steel Beam sections- Behaviour of Beams in flexure- Codal Provisions – Classification of cross sections- Flexural Strength and Lateral stability of Beams –Shear Strength-Web Buckling, Crippling and defection of Beams- Design of laterally supported Beams- Design of solid rolled section Beams- Design of Plated beams with cover plates - Design Strength of Laterally unsupported Beams – Design of laterally unsupported rolled section Beams- Purlin in Roof Trusses-Design of Channel and I section Purlins

TOTAL: 60 PERIODS

TEXTBOOKS:

1. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.

2. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013

3. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005

REFERENCES:

1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002

2. Sai Ram. K.S. “Design of Steel Structures “ Dorling Kindersley (India) Pvt. Ltd., New Delhi, 2nd Edition, 2015, www.pearsoned.co.in/kssairam

3. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2nd Edition, 2013

4. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800– 2007, IK International Publishing House Pvt. Ltd., 2009

5. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800-2007, Structures Publications, 2009.

6. IS800:2007, General Construction in Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007

7. SP 6(1) Hand book on structural Steel Sections

Additional References:

1. https://nptel.ac.in/courses/105/101/105101085/
2. https://nptel.ac.in/courses/105/105/105105109/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3								2				3	
CO2	3								2				3	
CO3	3								2				3	
CO4	3								2				3	
CO5	3								2				3	
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CE602	Structural Analysis II	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Structural Analysis I				

Course Objectives

The course is intended to

1. Understand the Concept of advanced analysis of structures
2. Gain the knowledge of analysis experience with the special structures.
3. Create the new ideas towards the advanced structural analysis
4. Design and create the all kind of structures
5. Get the knowledge of application to advanced analytical techniques

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Analyse the structures by matrix flexibility method.	Analyse
CO2	Analyze the structure by matrix stiffness method.	Analyse
CO3	Identify the arch structures.	Understand
CO4	Analyse and design the cable structures.	Analyse
CO5	Analyse the plastic structures.	Analyse

Course Contents:

UNIT I Flexibility Matrix Method **9**

Primary structures - Compatibility conditions – Computation of flexibility matrices - Analysis of indeterminate pin- jointed plane frames, continuous beams and rigid jointed plane frames with maximum two degrees of static indeterminacy.

UNIT II Stiffness Matrix Method **9**

Restrained structure - equilibrium condition – Computation of stiffness matrices - Analysis of Continuous Beams, Pin-jointed plane frames and rigid frames by direct stiffness method with maximum two degrees of kinematic indeterminacy.

UNIT III Arches **9**

Arches - Classification of arches – Analysis of three hinged, two hinged and fixed arches - Parabolic and circular arches – Settlement and temperature effects.

UNIT IV Cables and Suspension Bridges **9**

Equilibrium of cable – Components and their Functions- length of cable - anchorage of suspension cables – stiffening girders - cables with three hinged stiffening girders - Analysis of cable under concentrated loads and UDL - Bending Moment and Shear Force in suspension bridges with three hinged stiffened girders

UNIT V Plastic Analysis of Structures **9**

Plastic theory - Statically indeterminate structures – Plastic moment of resistance – Section modulus – Shape factor – Load factor – Plastic hinge and mechanism – collapse load - Static and kinematic methods – Upper and lower bound theorems - Plastic analysis of indeterminate beams and frames.

Total: 45 Periods

Text Books:

1. Bhavikatti,S.S, Structural Analysis,Vol.1 & 2, Vikas Publishing House Pvt.Ltd., NewDelhi-4, 2014.
2. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, Theory of structures, Laxmi, Publications,2004.

Reference Books:

1. Negi.L.S and Jangid R.S., Structural Analysis, Tata McGraw-Hill Publishers, 2004.
2. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Co.Ltd.2002.
3. Gambhir.M.L., Fundamentals of Structural Mechanics and Analysis, PHIL earning Pvt. Ltd.,2011.

Additional References:

1. https://nptel.ac.in/courses/105/101/105101085/
2. https://nptel.ac.in/courses/105/105/105105109/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1		2	1				3						3	
CO2		2	1				3						3	
CO3		2	1				3						3	
CO4		2	1				3						3	
CO5		2	1				3						3	
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CE603	Environmental Engineering II	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental Engineering I				

Course Objectives

The course is intended to

1. Educate the students on the principles and design of Sewage Collection, Conveyance, treatment and disposal.
2. Identify the treatment methods of wastages.
3. Estimate sewage generation and design sewer system including sewage pumping stations
4. Know about characteristics and composition of sewage, self-purification of streams.
5. Perform basic design of the unit operations and processes that are used in sewage treatment.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the wastewater generation and estimation of wastes.	Understand
CO2	Design Sewers and select pipes, pumps.	Create
CO3	Describe the primary treatment sewage systems.	Understand
CO4	Summarize the secondary treatment sewage systems.	Understand
CO5	Implement the suitable methods of sludge disposal.	Apply

Course Contents:

UNIT I PLANNING FOR SEWERAGE SYSTEMS **9**

Sources of wastewater generation – Effects – Estimation of sanitary sewage flow – Estimation of storm runoff – Factors affecting Characteristics and composition of sewage and their significance – Effluent standards – Legislation requirements**.**

UNIT II SEWER DESIGN **9**

Sewerage – Hydraulics of flow in sewers – Objectives – Design period - Design of sanitary and storm sewers – Small bore systems - Computer applications – Laying, joining & testing of sewers – appurtenances – Pumps – selection of pumps and pipe Drainage -. Plumbing system for Buildings – One pipe and two pipe system.

.

UNIT III PRIMARY TREATMENT OF SEWAGE **9**

Objective – Selection of treatment processes – Principles, Functions, Design and Drawing of Units - Onsite sanitation - Septic tank with dispersion - Grey water harvesting – Primary treatment – Principles, functions design and drawing of screen, grit chambers and primary sedimentation tanks – Construction, operation and Maintenance aspects.

UNIT IV SECONDARY TREATMENT OF SEWAGE **9**

Objective – Selection of Treatment Methods – Principles, Functions, Design and Drawing of Units - Activated Sludge Process and Trickling filter – Oxidation ditches, UASB – Waste Stabilization Ponds – Reclamation and Reuse of sewage - sewage recycle in residential complex - Recent Advances in Sewage Treatment – Construction and Operation & Maintenance of Sewage Treatment Plants.

UNIT V DISPOSAL OF SEWAGE AND SLUDGE MANAGEMENT **9**

Standards for Disposal - Methods – dilution – Self purification of surface water bodies – Oxygen sag curve – Land disposal – Sludge characterization – Thickening – Sludge digestion – Biogas recovery – Sludge Conditioning and Dewatering – disposal – Advances in Sludge Treatment and disposal.

TOTAL: 45 PERIODS

Text Books:

1. Garg, S.K., "Environmental Engineering" Vol. II, Khanna Publishers, New Delhi, 2003.
2. Punmia, B.C., Jain, A.K., and Jain. A., "Environmental Engineering", Vol.II, Lakshmi Publications, News letter, 2005.

Reference Books:

1. "Manual on Sewerage and Sewage Treatment", CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1997.
2. Metcalf & Eddy, "Wastewater Engineering" – Treatment and Reuse, Tata McGraw Hill Company, New Delhi, 2003.
3. Karia G L & Christian R A, "Wastewater Treatment", Prentice Hall of India, New Delhi, 2013.

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3									3				3
CO2	3									2				3
CO3	3									3				3
CO4	3									2				2
CO5	3									3				2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CE604	HIGHWAY ENGINEERING	L	T	P	C
		3	0	2	4
Nature of Course	Professional core				
Pre requisites	Construction Materials				

Course Objectives

The course is intended to

1. Understand basic concepts of Highways.
2. Gain knowledge on Geometric design of highways.
3. Learn about the design of flexible and rigid pavements.
4. Acquire knowledge on highway construction materials and practice.
5. know about the evaluation and maintenance of pavements.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Demonstrate on highway planning and alignment.	Apply
CO2	Illustrate the Geometric design of highways.	Apply
CO3	Design the flexible and rigid pavements.	Create
CO4	Interpret on the quality of highway construction materials.	Apply
CO5	Identify the pavement management system.	Understand

Course Contents:

UNIT I HIGHWAY PLANNING AND ALIGNMENT **9**

Significance of highway planning – Modal limitations towards sustainability - History of road development in India – factors influencing highway alignment – Soil suitability analysis - Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods - Classification of highways – Locations and functions – Typical cross sections of Urban and Rural roads

UNIT II GEOMETRIC DESIGN OF HIGHWAYS **9**

Cross sectional elements - Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves - Gradients, Special consideration for hill roads - Hairpin bends – Lateral and vertical clearance at underpasses**.**

UNIT III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS 9

Pavement components and their role - Design principles -Design practice for flexible and rigid Pavements (IRC methods only) – Embankments- Problems in Flexible pavement design.

UNIT IV HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE 9

Highway construction materials, properties, testing methods – CBR Test for subgrade - tests on aggregate & bitumen – Test on Bituminous mixes-Construction practice including modern materials and methods, Bituminous and Concrete road construction, Polymer modified bitumen, Recycling, Different materials – Glass, Fiber, Plastic, Geo-Textiles, Geo-Membrane (problem not included) – Quality control measures - Highway drainage — Construction machineries.

UNIT V EVALUATION AND MAINTENANCE OF PAVEMENTS 9

Pavement distress in flexible and rigid pavements – Types of maintenance – Pavement Management Systems - Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements – Strengthening of pavements –Highway Project formulation**.**

Total: 45 Periods

Text books:

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2014. (Revised edition).
2. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010.
3. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications, 8th edition Delhi, 2013.

Reference book:

1. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Third Revision), IRC: 37-2012.
2. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC: 58-2012
3. Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Nineth Impression, South Asia, 2012
4. Ian D. Walsh, "ICE manual of highway design and management", ICE Publishers, Ist Edition, USA, 2011

5. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, "Principles of Highway Engineering and Traffic Analysis", Wiley India Pvt. Ltd., New Delhi, 2011

6. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010.

7. O'Flaherty.C.A "Highways, Butterworth – Heinemann, Oxford, 2006 8. IRC-37-2012,The Indian roads Congress, Guidelines for the Design of Flexible Pavements, New Delhi 9. IRC 58-2012. The Indian Road Congress, Guideline for the Design of Rigid Pavements for Highways, New Delhi.

Additional References:

1. https://nptel.ac.in/courses/105/101/105101087/#

2. https://nptel.ac.in/courses/105/107/105107123/

Laboratory Component:

S.NO	NAME OF THE EXPERIMENT	CO MAPPING	RBT
I	**Test on aggregates:**		
1	Specific gravity test	CO4	Apply
2	Los Angeles abrasion test	CO4	Apply
3	Water absorption of aggregates	CO4	Apply
4	Deval's attrition test	CO4	Apply
II	**Test on bitumen:**		
4	Test on penetration test	CO4	Apply
5	Test on viscosity	CO4	Apply
6	Test on softening point	CO4	Apply
7	Ductility test	CO4	Apply
III	**Test on bituminous mixes:**		
8	Determination of binder content	CO4	Apply
9	Marshall stability and flow values	CO4	Apply

Total: 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3							3					3
CO2	3	2							2					3
CO3	3	3							3					3
CO4	3	2							2					2
CO5	3	3							3					2
	3	High				2	Medium					1	Low	

Summative Assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50]**
	Theory				**Practical's**	
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	Attendance[5]	**Rubric based CIA[10]** / **Model Examination [10 marks]**	
Remember	30	20	10		20	20
Understand	10	20	30		20	40
Apply	10	10	10		40	20
Analyze					20	20
Evaluate						
Create						

20CE605	Mini Project	L	T	P	C
		0	0	2	1
Nature of Course	Professional core				
Pre requisites	Concrete Technology				

Course Objectives

The course is intended to

1. Develop knowledge in construction field.
2. Know about various construction materials.
3. Learn construction techniques in practice.
4. Gain knowledge on reading the structural drawings.
5. Prepare the project report.

Guideline for Review and Evaluation

1. The students may be grouped into 2 to 4 and work under a project supervisor. The device/ system/component(s) to be fabricated may be decided in consultation with the supervisor and if possible with an industry.
2. A project report to be submitted by the group and the fabricated model, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department.
3. At the end of the semester examination the project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the knowledge gained in the construction field.	Understand
CO2	Identify suitable construction materials.	Understand
CO3	Implement the construction techniques in the field.	Apply
CO4	Execute the construction as per structural drawings.	Apply
CO5	Develop knowledge in preparing a detailed project report.	Understand

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3					3							3	
CO2	3					3							3	
CO3	3					3							3	
CO4	3					3							3	
CO5	3					3							3	
	3	High				2	Medium					1	Low	

	Continuous Assessment (50 Marks)						**Final Viva Voce Examination (50 Marks)**
	Review I (10)	**Review II (10)**	**Review III (10)**	**Report (10)**	**Viva (10)**	**Total CA (50 Marks)**	
Marks	20	20	20	20	20	100	50

20CE606	Internship	L	T	P	C
		2 Weeks			
Nature of Course	Professional Core				
Pre requisites	NA				

Course Objectives

The course is intended

1. To train the students in the construction of buildings as per plan
2. To develop skills in preparing project report
3. To compare the theoretical and construction field practical knowledge
4. To understand the practical difficulties and find suitable solutions
5. To get an industrial exposure of various construction projects.

Guideline for Review and Evaluation

1. The students individually undertake training in reputed engineering companies / Govt organisations / NGOs / Educational Institutions who work in the area of Civil Engineering for the specified duration.
2. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Train in tackling a practical field/industry orientated problem related to construction projects	Apply
CO2	Schedule the construction activities from the knowledge gained	Apply
CO3	Implement the construction activities based on the practical knowledge gained	Apply
CO4	Solve the problems and find the solution for the work execution.	Apply
CO5	Identify the various types of construction projects.	Apply

Course Contents:

1. The students individually undertake training in reputed Industries during the summer vacation for a specified period of two weeks.
2. At the end of training, a detailed report on the work done should be submitted within ten days from the commencement of the semester.
3. The students will be evaluated through a viva-voce examination by a team of internal staff.

Total: 2 Weeks

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3					3							2	2
CO2	3					3							2	2
CO3	3					3							2	2
CO4	3					-							2	2
CO5	3					3							2	2
	3 - High					2 - Medium					1 - Low			

	Continuous Assessment (50 Marks)						**Final Viva Voce Examination (50 Marks)**
	Review I (10)	**Review II (10)**	**Review III (10)**	**Report (10)**	**Viva (10)**	**Total CA (50 Marks)**	
Marks	20	20	20	20	20	100	50

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20CE701	Structural Dynamics and Earthquake Engineering	L	T	P	C
		3	0	2	4
Nature of Course	Professional core				
Pre requisites	Engineering Mechanics				

Course objectives:

The course is intended to:

1) Impart knowledge on structural Dynamics.
2) Gain knowledge on engineering seismology.
3) Understand the earthquake effects on structures.
4) Get an exposure on earthquake load analysis..
5) Familiarize on earthquake resistant design.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Develop the equations of motion for SDOF and MDOF system.	Apply
CO2	Explain the elements of engineering seismology, characteristics of earthquake and seismic instrumentation.	Understand
CO3	Describe the behavior of various types of structures under earthquake.	Understand
CO4	Determine the forces in a structure due to earthquake	Evaluate
CO5	Design earthquake resistant structures.	Create

Course Contents:

UNIT I INTRODUCTION TO DYNAMICS 9

Dynamics - Degree of freedom – Free and forced vibration - Idealization of structure as Single Degree of Freedom (SDOF) and Multi degree of freedom (MDOF) system – D' Alemberts Principles - Formulation of equation of motion for SDOF system and MDOF system –- Evaluation of natural frequencies and modes - Effect of damping.

UNIT II SEISMOLOGY 9

Elements of Engineering Seismology – Seismic hazard - Earthquake phenomenon – Seismotectonics – Seismic Instrumentation – Characteristics of Strong Earthquake motion – Estimation of Earthquake Parameters – Soil Structure Interaction – Liquefaction of soil - Seismic zone map – Response spectra.

UNIT III EARTHQUAKE EFFECTS ON STRUCTURES 9

Inertia force on structures – load transfer path – Effect of architectural features on behavior of structures – Hysteretic Behaviour of RCC, steel and prestressed concrete - Pinching Effect – Bouchinger Effects - Energy dissipation - P-delta effect - storey drift - Behavior of brick masonry, stone masonry and reinforced concrete structures under past earthquakes – typical failures - Causes of damage –- Lessons learnt from past earthquakes.

UNIT IV EARTHQUAKE LOAD ANALYSIS 9

Design spectra – Codal provision – Different methods of earthquake analysis –- Analysis of structure by Equivalent static method – Analysis of structure by Response spectrum method – Introduction to time-history method of analysis

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UNIT V EARTHQUAKE RESISTANT DESIGN 9

Philosophy of earthquake resistant design - Planning considerations and Architectural concepts - Design and detailing as per codal provisions - Design and detailing of typical flexural member and column member, Ductile detailing of beam-column joints and footing – Concept and principle of shear wall - Introduction to performance based seismic design - Seismic isolation principles and methods.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Mario Paz, Structural Dynamics – Theory and Computations, Fifth Edition 2nd printing, CBS publishers, 2006.
2. Agarwal.P and Shrikhande.M. Earthquake Resistant Design of Structures, Prentice Hall of India Pvt. Ltd. 2011.

REFERENCES:

1. Clough.R.W, and Penzien.J, Dynamics of Structures, Second Edition, McGraw Hill International Edition, 1995.
2. Minoru Wakabayashi, Design of Earthquake Resistant Buildings, Mc Graw – Hill Book Company, 1986.
3. Anil K Chopra, Dynamics of structures – Theory and applications to Earthquake Engineering,
Prentice Hall Inc., 2007.
4. Moorthy.C.V.R., Earthquake Tips, NICEE, IIT Kanpur,2002.

Publication of Bureau of Indian Standards:

a. IS 4326: 2013 Earthquake Resistant Design And Construction Of Buildings – Code of Practice

b. IS 1893: 2016 Criteria For Earthquake Resistant Design Of Structures – Part 1 General Provisions and Buildings.

IS 13920:2016 Ductile Design And Detailing Of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice

Additional References:

1. https://nptel.ac.in/courses/105/101/105101083/
2. https://nptel.ac.in/courses/105/101/105101160/

Total: 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	1	1	1	1	1	1	1	2	3	3
CO2	3	2	2	2	1	1	1	1	1	1	1	2	3	3
CO3	3	3	3	3	1	3	2	1	1	1	1	2	3	3
CO4	3	3	3	2	2	2	3	1	1	1	1	3	3	3
CO5	3	3	3	3	2	3	3	1	1	1	1	3	3	3
	3	High				2	Medium					1	Low	

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Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CE702	Estimating Costing and Valuation Engineering	L	T	P	C
		3	0	2	4
Nature of Course	Professional core				
Pre requisites	Structural Design				

Course objectives:

1) Understand the basic concepts in quantity estimation.
2) Gain knowledge on rate analysis and costing.
3) Acquire knowledge on specifications, reports and Tenders.
4) Learn about the type of contract.
5) Know about the types of valuation.

Course Outcomes:

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

CO. No.	Course Outcome	Bloom's Level
CO1	Identify the suitable method for estimation of quantities.	Understand
CO2	Implement the rate analysis for all building works, canals, roads and its cost estimates.	Apply
CO3	Describe the types of specifications, principles for report preparation and types of tender notices.	Understand
CO4	Illustrate a contract for labour, materials, design and construction.	Understand
CO5	Evaluate valuation for building and land.	Evaluate

Course Contents:

UNIT I QUANTITY ESTIMATION 9

Philosophy – Purpose – Methods of estimation – Centre line method – Long and short wall method – Types of estimates – Approximate estimates – Detailed estimate – Estimation of quantities for buildings, bituminous and cement concrete roads, septic tank, soak pit, retaining walls – Culverts (additional practice in class room using computer softwares- qE Pro)

UNIT II RATE ANALYSIS AND COSTING 9

Standard Data – Observed Data – Schedule of rates – Market rates – Materials and Labour – Standard Data for Man Hours and Machineries for common civil works – Rate Analysis for all Building works, canals, and Roads – Cost Estimates (additional practice in class room using Computer softwares) – (Analysis of rates for the item of work asked, the data regarding labour, rates of material and rates of labour to be given in the Examination Question Paper)

UNIT III SPECIFICATIONS, REPORTS AND TENDERS 9

Specifications – Detailed and general specifications – Constructions – Sources – Types of specifications – Principles for report preparation – report on estimate of residential building – Culvert – Roads – TTT Act 2000 – Tender notices – types – tender procedures – Drafting model tenders , E-tendering- e NOI – e NOT -Digital signature certificates – Encrypting -Decrypting – Reverse auctions.

UNIT IV CONTRACTS 9

Contract – Types of contracts – BOT – Types - Formation of contract – Contract conditions – Contract for labour, material, design, construction – Drafting of contract documents based on IBRD / MORTH Standard bidding documents – Construction contracts – Contract problems – Arbitration ,litigation and legal requirements.

UNIT V VALUATION 9

Definitions – Various types of valuations – Valuation methods - Necessity –Year's purchase-sinking fund- Capitalised value – Depreciation – Escalation – Valuation of land – Buildings – Calculation of Standard rent – Mortgage – Lease - Types of lease

TOTAL: 45 PERIODS

TEXTBOOKS:

1. B.N Dutta 'Estimating and Costing in Civil Engineering', CBS Publishers & Distributors (P) Ltd, Twenty eighth revised edition, 2020.
2. B.S.Patil, 'Civil Engineering Contracts and Estimates', 7th edition, University Press, 2015
3. D.N. Banerjee, 'Principles and Practices of Valuation', V Edition, Eastern Law House, 2015

REFERENCES:

1. Hand Book of Consolidated Data – 8/2000, Vol.1, TNPWD
2. Tamil Nadu Transparencies in Tenders Act, 1998 and rules 2000
3. Arbitration and Conciliation Act, 1996
4. Standard Bid Evaluation Form, Procurement of Good or Works, The World Bank, April 1996
5. Standard Data Book for Analysis and Rates, IRC, New Delhi, 2019

Additional References:

1. https://nptel.ac.in/courses/105/101/105101083/
2. https://nptel.ac.in/courses/105/101/105101160/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3		2	1	1		1			1	2	3	
CO2	3	2		2	1	1		1			1	2	3	
CO3	3	3		3	1	3		1			1	2	3	
CO4	3	3		2	2	2		1			1	3	3	
CO5	3	3		3	2	3		1			1	3	3	
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CE703	Water Resource and Irrigation Engineering	L	T	P	C
		3	0	2	4
Nature of Course	Professional core				
Pre requisites	Environmental Engineering				

Course objectives:

1) Impart knowledge on water resources
2) Gain knowledge on water resources management.
3) Acquire knowledge on Irrigation Engineering.
4) Understand about the canal irrigation.
5) Become knowledge on irrigation methods and management

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Describe planning of water resources.	Understand
CO2	Interpret the national water policy.	Evaluate
CO3	Estimate consumptive use of water.	Create
CO4	Explain the type of impounding structures.	Understand
CO5	Implement a suitable irrigation method.	Apply

Course Contents:

UNIT I WATER RESOURCES 9

Water resources survey – Water resources of India and Tamilnadu – Description of water resources planning – Estimation of water requirements for irrigation and drinking- Single and multipurpose reservoir – Multi objective - Fixation of Storage capacity -Strategies for reservoir operation - Design flood-levees and flood walls.

UNIT II WATER RESOURCE MANAGEMENT 9

Economics of water resources planning; – National Water Policy – Consumptive and non-consumptive water use - Water quality – Scope and aims of master plan - Concept of basin as a unit for development - Water budget- Conjunctive use of surface and ground water

UNIT III IRRIGATION ENGINEERING 9

Need – Merits and Demerits – Duty, Delta and Base period – Irrigation efficiencies – Crops and Seasons - Crop water Requirement – Estimation of Consumptive use of water.

UNIT IV CANAL IRRIGATION 9

Types of Impounding structures: Gravity dam – Diversion Head works - Canal drop – Cross drainage works – Canal regulations – Canal outlets – Canal lining - Kennady's and Lacey's Regime theory

UNIT V IRRIGATION METHODS AND MANAGEMENT 9

Lift irrigation – Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation - Merits and demerits – Irrigation scheduling – Water distribution – Participatory irrigation management with a case study

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Linsley R.K. and Franzini J.B, "Water

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Resources Engineering", McGraw-Hill Inc, 2000.
2. Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009.
3. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009.

REFERENCES:

1. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2005
2. Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGraw-Hill Inc., New Delhi, 1997.
3. Michael A.M., Irrigation Theory and Practice, 2nd Edition, Vikas Publishing House Pvt. Ltd., Noida, Up, 2008
4. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
5. Asawa, G.L., "Irrigation Engineering", New Age International Publishers, New Delhi, 2000

Additional References:

1. https://nptel.ac.in/courses/105/101/105101083/
2. https://nptel.ac.in/courses/105/101/105101160/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	2	1	1		1	1		1	2	3	3
CO2	3	2	2	2	1	1		1	1		1	2	3	3
CO3	3	3	3	3	1	3		1	1		1	2	3	3
CO4	3	3	3	2	2	2		1	1		1	3	3	3
CO5	3	3	3	3	2	3		1	1		1	3	3	3
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

Passed in Board of studies meeting *Approved in Academic Council meeting*

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20CE704	Computer Aided Building Design and Drawing Laboratory	L	T	P	C
		0	0	4	2
Nature of Course	Professional Core				
Pre requisites	Design of RCC Elements and Steel Structural Elements.				

Course Objectives

The course is intended to

1. Understand the design and drawing of flat slabs.
2. Gain knowledge on design and drawing of retaining walls.
3. Acquire knowledge on design and drawing of RCC bridges and water tanks.
4. Become knowledgeable on design and drawing of steel bridges.
5. Learn the design concepts and drawing of hemispherical bottomed steel tank.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Design and draw the details of RCC Continuous Flat slab.	Create
CO2	Prepare design and drawing of RCC Retaining Walls.	Apply
CO3	Design and draw the details of RCC water tanks.	Create
C04	Develop the drawings and design details of Steel Bridges.	Apply
CO5	Design and draw the details of steel water tank.	Create

Course Content:

S. No.	List of Experiment	CO Mapping	RBT
1	Design and drawing of RCC Continuous flat slab with drops.	**CO1**	Apply
2	Design and drawing of RCC Continuous flat slab without drops.	**CO1**	Apply
3	Design and drawing of RCC cantilever type retaining walls with reinforcement details.	**CO2**	Apply
4	Design and drawing of RCC counter fort type retaining walls with reinforcement details.	**CO2**	Apply
5	Design and drafting of On ground Head Circular RCC water tanks.	**CO3**	Apply
6	Design and drafting of Over Head Circular RCC water tanks.	**CO3**	Apply
7	Design and drafting of Under Ground Rectangular RCC water tanks.	**CO3**	Apply
8	Design of plate Girder Bridge - Detailed Drawings including connections.	**CO4**	Apply

9	Design of Truss Girder bridges – Detailed Drawings including connections.	**CO4**	Apply
10	Design of hemispherical bottomed steel tank.	**CO5**	Apply

Total: 45 Periods

Textbooks:

1. Krishnaraju,N. “Structural Design & Drawing, Universities Press, 2009.
2. Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, “Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., 2003.

References:

1. Krishnamurthy, D., “Structural Design & Drawing – Vol. II and III, CBS Publishers, 2010.
2. Shah V L and Veena Gore, “Limit State Design of Steel Structures” IS800-2007, Structures Publications, 2009

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	**3**		**3**		**3**								**3**	
CO2	**3**		**3**		**3**								**3**	
CO3	**3**		**3**		**3**								**3**	
CO4	**3**		**3**		**3**								**3**	
CO5	**3**		**3**		**3**								**3**	
	3	High				2	Medium					1	Low	

Summative assessment based on Continuous and End Semester Examination				
Bloom’s Level	**Rubric based Continuous Assessment [30 marks]**	**Preparatory Examination [25 Marks]**	**Attendance [5 Marks]**	**Final Examination [40 Marks]**
Remember	20	20		20
Understand	30	20		20
Apply	50	40		40
Analyze		20		20
Evaluate				
Create				

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20CE705	Design Project	L	T	P	C
		0	0	2	1

Nature of Course	Professional core
Pre requisites	Design of Concrete and Steel Elements

Course Objectives

The course is intended to

1. Develop knowledge in design field.
2. Know about using the analysis software.
3. Learn design of the structural elements of the framed structures.
4. Gain knowledge on preparing the structural drawings.
5. Prepare the project report.

Guideline for Review and Evaluation

1. The students may be grouped into 2 to 4 and work under a project supervisor. The framed structure may be selected as per consultation with the supervisor.
2. The frame analysis is to be done by using a analysis software and all the structural elements are to be designed as per the codal provision.
3. At the end of the semester examination the project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the knowledge gained in the design field.	Understand
CO2	Identify suitable structural elements as per needs.	Understand
CO3	Implement the design of structural elements in the frame.	Apply
CO4	Execute the construction as per structural drawings.	Apply
CO5	Develop knowledge in preparing a detailed project report.	Understand

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3					3							3	
CO2	3					3							3	
CO3	3					3							3	
CO4	3					3							3	
CO5	3					3							3	
	3	High				2	Medium					1	Low	

	Continuous Assessment (50 Marks)						**Final Viva Voce Examination (50 Marks)**
	Review I (10)	**Review II (10)**	**Review III (10)**	**Report (10)**	**Viva (10)**	**Total CA (50 Marks)**	
Marks	20	20	20	20	20	100	50

CHAIRMAN - BOARD OF STUDIES

20CE801	Major Project	L	T	P	C
		0	0	20	10
Nature of Course	Employability Enhancement Course				
Pre requisites	Knowledge in Construction Materials and Technologies				

Course Objectives :

The course is intended to

1 Develop the ability to solve a specific problem right from its identification.

2 Review the literature till finding the successful solution.

3 Train the students in preparing project reports.

4 Face reviews and viva voce examination.

5 Understand the application of software package in the project.

On successful completion of the course, Students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Identify Civil Engineering problems by reviewing literature.	Understand
CO2	Identify appropriate techniques to analyse complex Civil Engineering problems.	Apply
CO3	Apply Engineering and Management principles through efficient handling of project.	Apply
CO4	Carry out the project in a systematic way.	Apply
CO5	Familiarise on developing models by using software packages .	Apply

Course Contents : Major Project 300

The student works on a topic approved by the Head of the Department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction.

The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

Total Hours: 300

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**Pos**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	1	1	3								3			
CO2	3	3	1	3								3			
CO3	2	2	2	3								3			
CO4	2	1	1	3								3			
CO5	2	1	1	3								3			
	3	High				2	Medium					1	Low		

Continuous Assessment [50 marks]							**Final Viva Voce Examination**
Marks	**Review I**	**Review II**	**Review III**	**Publication**	**Report**	**Total**	
	[10]	**[10]**	**[10]**	**[10]**	**[10]**	**[50]**	**[50 marks]**

Passed in Board of studies meeting *Approved in Academic Council meeting*

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PROFESSIONAL ELECTIVES (PE)

STREAM – I

ENVIRONMENTAL AND WATER RESOURCE ENGINEERING

CHAIRMAN - BOARD OF STUDIES

20CEE01	HYDROLOGY	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental and Water Resource Engineering				

Course Objectives

The course is intended to

1. Gain knowledge on types of precipitation
2. Acquire knowledge on abstraction from precipitation
3. Know about hydrograhs.
4. Learn about floods and flood routing
5. Get an exposure on Ground water hydrology

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Describe hydrologic cycle, hydrometeorology and formation of precipitation.	Understand
CO2	Implement the various methods of field measurements and empirical formulae for estimating the various losses of precipitation, stream flow, flood and flood routing.	Apply
CO3	Interpret the basics of ground water and hydraulics of subsurface flows.	Apply
CO4	Apply the flood control and frequency studies of flood by various methods	Apply
CO5	Illustrate about the various types of aquifer and tests in Ground water hydrology	Apply

Course Contents:

UNIT I PRECIPITATION **9**

Hydrologic cycle – Types of precipitation – Forms of precipitation – Measurement of Rainfall – Spatial measurement methods – Temporal measurement methods – Frequency analysis of point rainfall – Intensity, duration and frequency relationship – Probable maximum precipitation**.**

UNIT II ABSTRACTION FROM PRECIPITATION **9**

Losses from precipitation – Evaporation process – Reservoir evaporation – Infiltration process – Infiltration capacity – Measurement of infiltration – Infiltration indices – Effective rainfall.

UNIT III HYDROGRAPHS **9**

Factors affecting Hydrograph – Base flow separation – Unit hydrograph – Derivation of unit hydrograph – S curve hydrograph – Unit hydrograph of different deviations - Synthetic Unit Hydrograph

UNIT IV FLOODS AND FLOOD ROUTING **9**

Flood frequency studies – Recurrence interval – Gumbel‟s method – Flood routing – Reservoir flood routing – Muskingum‟s Channel Routing – Flood control

UNIT V GROUND WATER HYDROLOGY **9**

Types of aquifers – Darcy‟s law – Dupuit‟s assumptions – Confined Aquifer – Unconfined Aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only

Total: 45 Periods

TEXTBOOKS:

1. Subramanya, K., “Engineering Hydrology”, Tata McGraw Hill Publishing Co., Ltd., 2000

2. Raghunath, H.M., “Hydrology”, Wiley Eastern Ltd., 2000

3. Jayarami Reddy .P. Hydrology, Tata McGraw Hill, 2008.

4. Madan Mohan das and Mimi Das Saikia, Hydrology, Prentice Hall of India, 2013.

REFERENCES:

1. Chow, V.T. and Maidment D.R. , “Hydrology for Engineers”, McGraw-Hill Inc., Ltd., 2000

2. Singh, V.P., “Hydrology”, McGraw Hill Inc., Ltd., 2000.

Additional References:

1. https://nptel.ac.in/courses/105/105/105105168/
2. https://nptel.ac.in/courses/105/101/105101084/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	1	3			2					3		2
CO2	3	2	1	3			2					3		2
CO3	3	3	1	3			2					3		2
CO4	3	2	1	3			2					3		2
CO5	3	3	1	3			3					3		2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE02	Ground Water Engineering	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental and Water Resource Engineering				

Course Objectives

The course is intended to

1. Gain knowledge on Hyrogeological parameters
2. Acquire knowledge on Well hydraulics
3. Know about Ground water management
4. Learn the qualities of Ground water
5. Understand the techniques of development and management of Ground water

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Identify the properties of aquifer.	Understand
CO2	Describe the tests on steady state flow and unsteady state flow.	Understand
CO3	Develop a model on Ground water management.	Create
CO4	Express the health and aesthetic aspects of water quality.	Understand
CO5	Interpret the artificial recharge techniques, Ground water pollution and legislation.	Understand

Course Contents:

UNIT I HYDROGEOLOGICAL PARAMETERS **9**

Introduction – Water bearing Properties of Rock – Type of aquifers - Aquifer properties – permeability, specific yield, transmissivity and storage coefficient – Methods of Estimation- Ground water table fluctuation and its interpretations – Groundwater development and Potential in India – GEC norms.

UNIT II WELL HYDRAULICS **9**

Objectives of Groundwater hydraulics – Darcy‟s Law - Groundwater equation – steady state flow - Dupuit Forchheimer assumption - Unsteady state flow - Theis method - Jacob method -Slug tests - Image well theory – Partial penetrations of wells.

UNIT III GROUNDWATER MANAGEMENT **9**

Need for Management Model – Database for groundwater management –groundwater balance study – Introduction to Mathematical model – Conjunctive use – Collector well and Infiltration

gallery.

UNIT IV GROUNDWATER QUALITY **9**

Ground water chemistry - Origin, movement and quality - Water quality standards – Health and aesthetic aspects of water quality - Saline intrusion – Environmental concern and Regulatory requirements

UNIT V GROUNDWATER CONSERVATION **9**

Artificial recharge techniques – Remediation of Saline intrusion– Ground water management studies – Protection zone delineation, Contamination source inventory, remediation schemes - Ground water Pollution and legislation.

Total: 45 Periods

TEXTBOOKS:

1. Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010.

2. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000.

REFERENCES:

1. Fitts R Charles, "Groundwater Science". Elsevier, Academic Press, 2002.

2. Ramakrishnan, S, Ground Water, K.J. Graph arts, Chennai, 1998.

Additional References:

1. https://nptel.ac.in/courses/105/105/105105168/
2. https://nptel.ac.in/courses/105/101/105101084/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	1	3			2					3		2
CO2	3	3	1	2			2					3		2
CO3	3	2	1	3			2					3		2
CO4	3	2	1	2			2					3		2
CO5	3	3	1	3			3					3		2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE03	Air Pollution and Control Engineering	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental Engineering				

Course Objectives

The course is intended to

1. Know about structure and composition of atmosphere.
2. Gain knowledge on Meteorology
3. Acquire knowledge on control of particulate contaminants.
4. Learn about control of gaseous contaminants.
5. Get an exposure on indoor air quality management.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management	Understand
CO2	Identify, formulate and solve air and noise pollution problems.	Understand
CO3	Design stacks and particulate air pollution control devices to meet applicable standards.	Create
CO4	Select control equipments for gaseous contaminants.	Understand
CO5	Interpret sources, types and control of indoor air pollutants.	Apply

Course Contents:

UNIT I INTRODUCTION **9**

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution - Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards -Ambient and stack sampling and Analysis of Particulate and Gaseous Pollutants.

UNIT II METEOROLOGY **9**

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT III CONTROL OF PARTICULATE CONTAMINANTS **9**

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle, Design and performance equations of Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators – Operational Considerations.

UNIT IV CONTROL OF GASEOUS CONTAMINANTS **9**

Factors affecting Selection of Control Equipment – Working principle, Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters – Process

control and Monitoring - Operational Considerations.

UNIT V INDOOR AIR QUALITY MANAGEMENT **9**

Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards -Control and Preventive measures.

TOTAL: 45 PERIODS

Text Books:

1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, springer science + science media LLC,2004.
2. Noel de Nevers, "Air Pollution Control Engineering", Waveland press,Inc 2017.
3. Anjaneyulu. Y, "Air Pollution and Control Technologies" , Allied Publishers (P) Ltd., India 2002.

Reference Books:

1. David H.F. Liu, Bela G. Liptak, "Air Pollution", Lweis Publishers, 2000.
2. Arthur C. Stern, "Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
3. Wayne T.Davis, "Air Pollution Engineering Manual", John Wiley & Sons, Inc, 2000.
4. M.N Rao and HVN Rao, "Air Pollution",Tata Mcgraw Hill Publishing Company limited,2007.
5. C.S.Rao, "Environmental Pollution Control Engineering",New Age International(P) Limited Publishers,2006

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE04	WATER RESOURCES SYSTEMS ANALYSIS	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental and Water Resource Engineering				

Course Objectives

The course is intended to

1. Introduce the concept of Mathematical approaches for managing the water resources system.
2. Collet Physical and Socio Economic data for analysing the water resources system
3. Gain knowledge on analysis of water resources system by linear programming
4. Acquire knowledge on water resources system analysis by dynamic programming
5. Learn the principles of simulation for analysis of water resources system.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the basic concepts of water resources system analysis	Understand
CO2	Develop the integrated planning of water resources project	Understand
CO3	Interpret the various methods of linear programming in the analysis of water resources system.	Understand
CO4	Get the skill on determine the solutions of dynamic programming.	Understand
CO5	Gain knowledge on methodology and model development of simulation.	Understand

Course Contents:

UNIT I SYSTEM APPROACH **9**

Philosophy of modelling – Goals and Objectives – Basics of system analysis concept – scopes and steps in systems engineering.

UNIT II PHYSICAL AND SOCIO - ECONOMIC DATA **9**

Collection, evaluation and processing – project appraisal – public involvement, master Comprehensive and integrated planning of water resources project.

UNIT III LINEAR PROGRAMMING **9**

Operation research - introduction - Problem Formulation-graphical solution- Simplex method – Sensitivity analysis - simple applications

UNIT IV DYNAMIC PROGRAMMING **9**

Optimality criteria Stage coach problem – Bellman‟s optimality criteria Problem formulation and Solution - simple applications

UNIT V SIMULATION **9**

Basic principles – Methodology and Philosophy – Model development – input and outputs – Deterministic simulation - simple applications

Total: 45 Periods

TEXT BOOK:

1. Vedula, S., and Majumdar, P.P. "Water Resources Systems" – Modeling Techniques and Analysis Tata McGraw Hill, 5 th reprint, New Delhi, 2010.

REFERENCES BOOK:

1. Hall Warren, A. and John A. Dracup., " Water Resources System Engineering", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1998
2. Chadurvedi M.C., "Water resource Systems Planning and Management", Tata McGraw Hill inc., New Delhi, 1997
3. Taha H.A., "Operation Research", McMillan Publication Co., New York, 1995.
4. Maass A., Husfchimidt M.M., ,Dorfman R., ThomasH A., Marglin S.A and Fair G. M., "Design of Water Resources System", Hardward University Press, Cambridge, Mass.,1995.
5. Goodman Aluvin S., "Principles of Water Resources Planning", Prentice Hall of India, 1984

Additional References:

1. https://nptel.ac.in/courses/105/105/105105168/
2. https://nptel.ac.in/courses/105/101/105101084/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1	2			2					3		2
CO2	3	2	1	2			2					3		2
CO3	3	3	1	3			2					3		2
CO4	3	2	1	2			2					3		2
CO5	3	3	1	3			3					3		2

3	High	2	Medium	1	Low

Passed in Board of studies meeting *Approved in Academic Council meeting*

CHAIRMAN - BOARD OF STUDIES

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE05	Integrated Water Resources Management	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental and Water Resource Engineering				

Course Objectives

The course is intended to

1. Know about the framework of integrated water resources management
2. Gain knowledge on contextualzing IWRM
3. Acquire knowledge on the emerging issues in water management
4. Know about the development of water resources in India
5. Get an exposure on the integrated development aspects.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Understand objectives, principles and evolution of integrated water resources management.	Understand
CO2	Develop an idea of cotextualizing IWRM	Understand
CO3	Interpret the emerging issues in emerging issues in water management, flood, drought, pollution and poverty	Understand
CO4	Explain the water resources development in India and waste water reuse.	Understand
CO5	Express the solutions for effective integrated water management..	Understand

Course Contents:

UNIT I IWRM FRAMEWORK **9**

Definition – Objectives – Principles - Evolution of IWRM - IWRM relevance in water resources management – Paradigm shift: Processes and prospective outcomes.

UNIT II CONTEXTUALIZING IWRM **9**

UN formulations - SDG goals - IWRM in Global, Regional and Local water partnership – Institutional transformation - Bureaucratic reforms - Inclusive development

UNIT III EMERGING ISSUES IN WATER MANAGEMENT **9**

Emerging Issues – Drinking water management in the context of climate change - IWRM and irrigation - Flood – Drought – Pollution – Linkages between water, health and poverty

UNIT IV IWRM AND WATER RESOURCES DEVELOPMENT IN INDIA **9**

Rural Development - Ecological sustainability- -Watershed development and conservation - Ecosystem regeneration – Wastewater reuse - Sustainable livelihood - Food security

Passed in Board of studies meeting *Approved in Academic Council meeting*

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UNIT V ASPECTS OF INTEGRATED DEVELOPMENT **9**

Capacity building - Conceptual framework of IWRM – Problems and policy issues - Solutions for effective integrated water management - Case studies

Total: 45 Periods

TEXTBOOKS:

1. Mollinga P. et al. “Integrated Water Resources Management”, Water in South Asia Volume I, Sage Publications, 2006.

2. Sithamparanathan, Rangasamy, A., and Arunachalam, N., “Ecosystem Principles and Sustainable Agriculture”, Scitech Publications (India) Pvt.Lt, Chennai, 1999.

REFERENCES BOOK:

1. Cech Thomas V., Principles of Water Resources: History, Development, Management and Policy. John Wiley and Sons Inc., New York. 2003.

2. Murthy, J.V.S., “Watershed Management in India”, Wiley Eastern Ltd., New York, 1995.

3. Dalte, S.J.C., “Soil Conservation and Land Management”, International Book Distribution, India, 1986.

Additional References:

1. https://nptel.ac.in/courses/105/105/105105168/
2. https://nptel.ac.in/courses/105/101/105101084/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1	3			2					3		2
CO2	3	2	1	2			2					3		2
CO3	3	2	1	2			2					3		2
CO4	3	2	1	3			2					3		2
CO5	3	3	1	3			3					3		2
	3	High			2	Medium				1	Low			

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE06	Hospital Waste Management	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental Engineering				

Course Objectives

The course is intended to

1. Know about the health care hazard control and accident.
2. Understand the biomedical waste management.
3. Learn about hazard materials.
4. Gain knowledge on facility safety.
5. Acquire knowledge on infection control, prevention and patient safety.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain health care, hazard control and management.	Understand
CO2	Identify major and minor sources of biomedical waste.	Understand
CO3	Interpret hazardous materials and DOT regulations.	Apply
CO4	Implement facility safety and guidelines.	Apply
CO5	Illustrate health care immunization and infection control.	Apply

Course Contents:

UNIT I HEALTHCARE HAZARD CONTROL AND UNDERSTANDING ACCIDENTS 9

Healthcare Hazard Control: Introduction, Hazard Control: Management & Responsibilities, Hazard Analysis, Hazard Correction, Personal Protective Equipment, Hazard Control Committees, Accident Causation Theories, Accident Reporting, Accident Investigations, Accident Analysis, Accident Prevention, Workers‟ Compensation, Orientation, Education, and Training.

UNIT II BIOMEDICAL WASTE MANAGEMENT 9

Biomedical Waste Management : Types of wastes, major and minor sources of biomedical waste, Categories and classification of biomedical waste, hazard of biomedical waste, need for disposal of biomedical waste, waste minimization, waste segregation and labeling, waste handling and disposal.

UNIT III HAZARDOUS MATERIALS 9

Hazardous Materials : Hazardous Substance Safety, OSHA Hazard Communication Standard, DOT Hazardous Material Regulations, Healthcare Hazardous Materials, Medical Gas Systems, Respiratory Protection.

UNIT IV FACILITY SAFETY 9

Introduction, Facility Guidelines: Institute, Administrative Area Safety, Slip, Trip, and Fall

Prevention, Safety Signs, Colors, and Marking Requirements, Tool Safety, Electrical Safety,

Control of Hazardous Energy, Landscape and Ground Maintenance, Fleet and Vehicle Safety.

UNIT V INFECTION CONTROL, PREVENTION AND PATIENT SAFETY 9

Healthcare Immunizations, Centers for Disease Control and Prevention, Disinfectants, Sterilants, and Antiseptics, OSHA Bloodborne Pathogens Standard, Tuberculosis, Healthcare Opportunistic Infections, Healthcare-Associated Infections, Medication Safety.

TOTAL: 45 PERIODS

Text Books:

1. Tweedy, James T., Healthcare hazard control and safety management-CRC Press_Taylor and Francis (2014).
2. Anantpreet Singh, Sukhjit Kaur, Biomedical Waste Disposal, Jaypee Brothers Medical Publishers (P) Ltd (2012)

Reference Books:

1. Mittal K M , “Non-Conventional Energy Systems”, Wheeler Publishing Co. Ltd, New Delhi, 2003.
2. Kothari D.P, Singhal ., K.C., “Renewable energy sources and emerging technologies”, P.H.I, New Delhi, 2010

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE07	Municipal Solid Waste Management	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental Engineering				

Course Objectives

The course is intended to

1. Know about the sources and types of Municipal solid waste.
2. Learn about reduction of sources of waste, storage and recycling.
3. Gain knowledge on collection and transfer of wastes.
4. Acquire knowledge on processing of waste.
5. Get an exposure on waste disposal.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Identify the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management.	Understand
CO2	Interpret the source reduction, reuse and recycling of waste.	Apply
CO3	Develop plan and design systems for storage, collection, transport, processing and disposal of municipal solid waste.	Create
CO4	Explain the issues on solid waste management from an integrated and holistic perspective, as well as in the local and international context.	Understand
CO5	Design and operation of sanitary landfill.	Create

Course Contents:

UNIT I SOURCES AND CHARACTERISTICS **9**

Sources and types of municipal solid wastes- Public health and environmental impacts of improper disposal of solid wastes- sampling and characterization of wastes - factors affecting waste generation rate and characteristics - Elements of integrated solid waste management – Requirements and salient features of Solid waste management rules (2016) –- Role of public and NGO"s- Public Private participation – Elements of Municipal Solid Waste Management Plan.

UNIT II SOURCE REDUCTION , WASTE STORAGE AND RECYCLING **9**

Waste Management Hierarchy - Reduction, Reuse and Recycling - source reduction of waste – On-site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and economic aspects of open storage – case studies under Indian conditions – Recycling of Plastics and Construction/Demolition wastes.

UNIT III COLLECTION AND TRANSFER OF WASTES **9**

Methods of Residential and commercial waste collection – Collection vehicles – Manpower – Collection routes – Analysis of waste collection systems; Transfer stations –location, operation and maintenance; options under Indian conditions – Field problems- solving.

Passed in Board of studies meeting *Approved in Academic Council meeting*

CHAIRMAN - BOARD OF STUDIES

UNIT IV PROCESSING OF WASTES **9**

Objectives of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions.

UNIT V WASTE DISPOSAL **9**

Land disposal of solid waste- Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor – Dumpsite Rehabilitation

TOTAL: 45 PERIODS

Text Books:

1. William A. Worrell, P. Aarne Vesilind (2012) Solid Waste Engineering, Cengage Learning, 2012.
2. John Pitchel (2014), Waste Management Practices-Municipal, Hazardous and industrial – CRC Press, Taylor and Francis, New York.

Reference Books:

3. CPHEEO (2014), "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi.
4. George Tchobanoglous and FrankKreith (2002).Handbook of Solid waste management, McGraw Hill, New York.

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE08	Participatory Water Resources Management	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental and Water Resource Engineering				

Course Objectives

The course is intended to

1. Understand the basics of weather and climate
2. Have an insight omg atmospheric dynamics and transport of heat.
3. Develop the global climate models
4. Know about climate system processes
5. Learn about the climate changes from the model.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the parameters temperature, humidity, wind, pressure and precipitation.	Understand
CO2	Interpret on Green house effect and Global warming.	Understand
CO3	Demonstrate the components and phenomena in the climate system.	Understand
CO4	Illustrate the climate system processes.	Understand
CO5	Construct a climate model and predict climate changes .	Understand

Course Contents:

UNIT I FUNDAMENTALS: SOCIOLOGY AND PARTICIPATORY APPROACH 6

Sociology – Basic concepts – Perspectives- Social Stratification – Irrigation as a Socio technical Process – Participatory concepts– Objectives of participatory approach

UNIT II UNDERSTANDING FARMERS PARTICIPATION 10

Farmers participation –need and benefits – Comparisons of cost and benefit -Sustained system performance – Kinds of participation – Context of participation, factors in the environment – WUA - Constraints in organizing FA – Role of Community Organiser – Case Studies.

UNIT III ISSUES IN WATER MANAGEMENT 9

Multiple use of water – Issues in Inter-sectoral Water Allocation - domestic, irrigation, industrial sectors - modernization techniques – Rehabilitation – Command Area Development - Water delivery

systems

UNIT IV PARTICIPATORY WATER CONSERVATION **10**

Global Challenges -Social – Economic – Environmental - Solutions -Political - Water Marketing – Water Rights -Consumer education – Success Stories Case Studies

UNIT V PARTICIPATORY WATERSHED DEVELOPMENT **10**

Concept and significance of watershed - Basic factors influencing watershed development –- Principles of watershed management - Definition of watershed management – Identification of problems - Watershed approach in Government programmes -- People"s participation – Entry point activities - Evaluation of watershed management measures.

Total: 45 Periods

TEXTBOOKS:

1. Sivasubramaniyan, K. Water Management, SIMRES Publication, Chennai, 2011

2. Uphoff.N., Improving International Irrigation management with Farmer Participation – Getting the process Right – Studies in water Policy and management, No.11, Westview press, Boulder,CO, 1986.

3. Tideman, E.M., "Watershed Management", Omega Scientific Publishers, New Delhi, 1996.

REFERENCE:

1. Chambers Robert, Managing canal irrigation, Cambridge University Press, 1989

Additional References:

1. https://nptel.ac.in/courses/105/105/105105168/
2. https://nptel.ac.in/courses/105/101/105101084/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	1	3			2					3		2
CO2	3	2	1	3			2					3		2
CO3	3	2	1	2			2					3		2
CO4	3	3	1	3			2					3		2
CO5	3	2	1	3			3					3		2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE09	Air Pollution Management	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental Engineering				

Course Objectives

The course is intended to

1. Know about sources and effects of air pollutants.
2. Learn about dispersion of pollutants.
3. Gain knowledge on air pollution control.
4. Acquire knowledge on air quality management
5. Become knowledgeable on noise pollution.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Classify air pollutants and its effects.	Understand
CO2	Identify dispersion of pollutants and develop models	Understand
CO3	Illustrate the principles and design of air pollution control measures.	Apply
CO4	Describe the air quality standards and monitoring.	Understand
CO5	Interpret the sources of noise pollution, its effects and control methods	Apply

Course Contents:

UNIT I SOURCES AND EFFECTS OF AIR POLLUTANTS **9**

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.

UNIT II DISPERSION OF POLLUTANTS **9**

Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate - Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models –Applications.

UNIT III AIR POLLUTION CONTROL **9**

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries.

UNIT IV AIR QUALITY MANAGEMENT **9**

Air quality standards – Air quality monitoring – Preventive measures - Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality

UNIT V NOISE POLLUTION **9**

Sources of noise pollution – Effects – Assessment - Standards – Control methods – Prevention

TOTAL: 45 PERIODS

Text Books:

5. Anjaneyulu, D., “Air Pollution and Control Technologies”, Allied Publishers, Mumbai, 2002.
6. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
7. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata McGraw Hill, New Delhi, 1996

Reference Books:

1. Heumann. W.L., "Industrial Air Pollution Control Systems", McGraw Hill, New Yark, 1997.
2. Mahajan S.P., "Pollution Control in Process Industries", Tata McGraw Hill Publishing Company, New Delhi, 1991.
3. Peavy S.W., Rowe D.R. and Tchobanoglous G. "Environmental Engineering", McGraw Hill, New Delhi, 1985.
4. Garg, S.K., “Environmental Engineering Vol. II”, Khanna Publishers, New Delhi, 1998
5. Mahajan, S.P., “Pollution Control in Process Industries”, Tata McGraw Hill, New Delhi, 1991.
6. Thod Godesh, "Air Quality, Lewis India Edition, 2013

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE10	Industrial Waste Management	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental Engineering				

Course Objectives

The course is intended to

1. Know about types of industries and industrial pollution.
2. Learn about Waste management Approach.
3. Gain knowledge on pollution from major industries.
4. Acquire knowledge on treatment technologies.
5. Become knowledgeable on hazardous waste management.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the characteristics of industrial wastes.	Understand
CO2	Plan for minimization of industrial wastes.	Create
CO3	Identify the pollution from major industries including the sources and characteristics of pollutants.	Understand
CO4	Implement the various technologies for treatment of waste.	Apply
CO5	Interpret the method of hazardous waste treatment.	Apply

Course Contents:

UNIT I INTRODUCTION **9**

Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes

UNIT II CLEANER PRODUCTION **9**

Waste management Approach – Waste Audit – Volume and strength reduction – Material and process modifications – Recycle, reuse and byproduct recovery – Applications.

UNIT III POLLUTION FROM MAJOR INDUSTRIES **9**

Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants – Wastewater reclamation concepts

UNIT IV TREATMENT TECHNOLOGIES **9**

Equalisation – Neutralisation – Removal of suspended and dissolved organic solids - Chemical oxidation – Adsorption - Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management – Dewatering – Disposal

UNIT V HAZARDOUS WASTE MANAGEMENT **9**

Hazardous wastes - Physico chemical treatment – solidification – incineration – Secure land fills

TOTAL: 45 PERIODS

Text Books:

1. Rao M. N. & Dutta A. K. , “Wastewater Treatment”, Oxford - IBH Publication, 1995.
2. Eckenfelder W.W. Jr., “Industrial Water Pollution Control”, McGraw Hill Book Company, New Delhi, 2000.
3. Patwardhan. A.D., Industrial Wastewater Treatment", Prentice Hall of India, New Delhi 2010.

Reference Books:

1. Shen T.T., “Industrial Pollution Prevention”, Springer, 1999.
2. Stephenson R.L. and Blackburn J.B., Jr., “Industrial Wastewater Systems Hand book”, Lewis Publisher, New York, 1998
3. Freeman H.M., “Industrial Pollution Prevention Hand Book”, McGraw Hill Inc., New Delhi, 1995.
4. Bishop, P.L., “Pollution Prevention: Fundamental & Practice”, McGraw Hill, 2000.
5. Pandey, "Environmental Management" Vikas Publications, 2010.
6. Industrial Wastewater Management, Treatment and Disposal",(WEF - MOP - FD3) McGraw Hill, 2008

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom’s Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE11	Environmental and Social Impact Assessment	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental Engineering				

Course Objectives

The course is intended to

1. Know about Impacts of Development on Environment.
2. Learn about environmental assessment
3. Gain knowledge on preparing environmental management plan**.**
4. Acquire knowledge on socio economic assessment.
5. Get an exposure of EIA from case studies.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Describe the principles of sustainable developments.	Understand
CO2	Implement scoping and screening of developmental projects for environmental and social assessments.	Create
CO3	Plan Environmental impact assessment and environmental management.	Create
CO4	Evaluate environmental impact assessment report.	Evaluate
CO5	Illustrate the Environmental impact assessments from case studies.	Apply

Course Contents:

UNIT I INTRODUCTION **9**

Impacts of Development on Environment – Rio Principles of Sustainable Development-Environmental Impact Assessment (EIA) – Objectives – Historical development – EIA Types – EIA in project cycle –EIA Notification and Legal Framework–Stakeholders and their Role in EIA-Selection & Registration Criteria for EIA Consultants.

UNIT II ENVIRONMENTAL ASSESSMENT **9**

Screening and Scoping in EIA – Drafting of Terms of Reference, Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna - Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction – Analysis of alternatives.

UNIT III ENVIRONMENTAL MANAGEMENT PLAN **9**

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan – EIA Report Preparation – Review of EIA Reports – Public Hearing-Environmental Clearance Post Project Monitoring.

UNIT IV SOCIO ECONOMIC ASSESSMENT **9**

Baseline monitoring of Socio economic environment – Identification of Project Affected Personal Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit

Analysis.

UNIT V CASE STUDIES **9**

EIA case studies pertaining to Infrastructure Projects – Real Estate Development - Roads and Bridges – Mass Rapid Transport Systems - Ports and Harbor – Airports - Dams and Irrigation projects - Power plants – CETPs- Waste Processing and Disposal facilities – Mining Projects

TOTAL: 45 PERIODS

Text Books:

1. Canter, R.L, "Environmental impact Assessment ", 2nd Edition, McGraw Hill Inc, New Delhi,1995.
2. Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L. Tu, "Environmental Impact Assessment for Developing Countries in Asia", Volume 1 – Overview, Asian Development Bank,1997.
3. Peter Morris, Riki Therivel "Methods of Environmental Impact Assessment", Routledge Publishers,2009.

Reference Books:

1. Becker H. A., Frank Vanclay,"The International handbook of social impact assessment" conceptual and methodological advances, Edward Elgar Publishing, 2003.
2. Barry Sadler and Mary McCabe, "Environmental Impact Assessment Training Resource Manual", United Nations Environment Programme, 2002.
3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I and II", Blackwell Science New York, 1998.
4. Ministry of Environment and Forests EIA Notification and Sectoral Guides, Government of India, New Delhi, 2010.

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE12	Geo - Environmental Engineering	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental Engineering				

Course Objectives

The course is intended to

1. Know about the generation of wastes and consequences of soil pollution.
2. Understand the current practice waste dispose.
3. Learn about transport of contaminates.
4. Gain knowledge on waste stabilization.
5. Acquire knowledge on remediation of contaminated soil.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Assess the contamination in the soil.	Evaluate
CO2	Select the site for land fills and safe disposal of waste.	Understand
CO3	Implement the suitable disposal system for particular waste.	Apply
CO4	Execute the waste stabilization and utilization of solid waste for soil improvement.	Apply
CO5	Interpret the suitable remediation methods based on contamination.	Apply

Course Contents:

UNIT I GENERATION OF WASTES AND CONSEQUENCES OF SOIL POLLUTION 9

Introduction to Geo environmental engineering – Environmental cycle – Sources, production and classification of waste – Causes of soil pollution – Factors governing soil pollution interaction clay minerals - Failures of foundation due to waste movement.

UNIT II SITE SELECTION AND SAFE DISPOSAL OF WASTE 9

Safe disposal of waste – Site selection for landfills – Characterization of land fill sites and waste – Risk assessment – Stability of landfills – Current practice of waste disposal – Monitoring facilities – Passive containment system – Application of geosynthetics in solid waste management – Rigid or flexible liners.

UNIT III TRANSPORT OF CONTAMINANTS 9

Contaminant transport in sub surface – Advection, Diffusion, Dispersion – Governing equations – Contaminant transformation – Sorption – Biodegradation – Ion exchange – Precipitation – Hydrological consideration in land fill design – Ground water pollution.

UNIT IV WASTE STABILIZATION 9

Stabilization - Solidification of wastes – Micro and macro encapsulation – Absorption, Adsorption, Precipitation – Detoxification – Mechanism of stabilization – Organic and inorganic stabilization –

Utilization of solid waste for soil improvement – case studies.

UNIT V REMEDIATION OF CONTAMINATED SOILS **9**

Exsitu and Insitu remediation-Solidification, bio-remediation, incineration, soil washing, phyto remediation, soil heating, vetrification, bio-venting.

TOTAL: 45 PERIODS

Text Books:

1. Hari D. Sharma and Krishna R. Reddy, "Geo-Environmental Engineering" -John Wiley and Sons, INC, USA, 2004.
2. Daniel B.E., "Geotechnical Practice for waste disposal", Chapman & Hall, London 1993.
3. Manoj Datta," Waste Disposal in Engineered landfills", Narosa Publishing House, 1997.
4. Manoj Datta, B.P. Parida, B.K. Guha, "Industrial Solid Waste Management and Landfilling Practice", Narosa Publishing House, 1999.

Reference Books:

1. Westlake, K, "Landfill Waste pollution and Control", Albion Publishing Ltd., England, 1995.
2. Wentz, C.A., "Hazardous Waste Management", McGraw Hill, Singapore, 1989
3. Proceedings of the International symposium on "Environmental Geotechnology" (Vol.I and II). Environmental Publishing Company, 1986 and 1989.
4. Ott, W.R., "Environmental indices, Theory and Practice", Ann Arbor, 1978.
5. Fried, J.J., "Ground Water Pollution", Elsevier, 1975.
6. ASTM Special Tech. Publication 874, Hydraulic Barrier in Soil and Rock, 1985.
7. Lagrega, M.D., Buckinham, P.L. and Evans, J.C., "Hazardous Waste Management" McGraw Hill Inc. Singapore, 1994.

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

STREAM-II: STRUCTURAL ENGINEERING

Passed in Board of studies meeting *Approved in Academic Council meeting*

CHAIRMAN - BOARD OF STUDIES

20CEE21	Building Services	L	T	P	C
		3	0	0	3
Nature of Course	Professional elective				
Pre requisites	Basic Civil Engineering				

Course Objectives

The course is intended to

1. To Understand basic concepts building services
2. To know about the safety installations
3. To gain the knowledge of lighting and electrification system
4. To know the maintenance of refrigeration and air conditioner
5. To understand the concepts of fire safety in buildings

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Understand the concepts of elevators and conveyors	Understand
CO2	Understand the knowledge of electrical system and usages in buildings.	Understand
CO3	Gain the knowledge of illumination and lighting and sources	Understand
CO4	Understand the concept of refrigerators and Air-conditioning system	Understand
CO5	Gain the knowledge and understand the fire safety and installations	Apply

Course Contents:

UNIT- I Elevators And Conveyors **9**

Elevators - Lifts and Escalators - parallel and criss cross escalators - Special features required for physically handicapped and elderly people-Conveyors - horizontal belt conveyors- horizontal moving walkways - design criteria, speed size, capacity, number.

UNIT- II Electrical Systems In Buildings **9**

Basics of electricity- Single / Three phase supply - Motors and generators - Protective devices in electrical installations - ISI specifications - Electrical wiring systems in domestic and commercial buildings- Types of wires- Electrical wiring layout for building -Earthing - Types of earthing – ISI specifications - Main and distribution boards - substations- Lightening arrester

UNIT- III Principles Of Illumination **9**

Visual tasks - Factors affecting visual tasks - Synthesis of light - Additive and subtractive synthesis of colour - Luminous flux - Candela - Solid angle illumination - Utilisation factor - Depreciation factor -MSCP - MHCP - Laws of illumination - Classification of lighting - Artificial light sources – LED lightings - Daylight factor - Luminous efficiency - Colour temperature - Colour rendering – Special features required and minimum level of illumination required for physically handicapped and elderly in building types - Specifications of National Building Code of India.

UNIT- IV Refrigeration Principles **9**

Thermodynamics - Heat - Temperature - Change of state - Sensible heat - Latent heat of fusion,evaporation, sublimation - Saturation temperature - Super heated vapour - Subcooled liquid - Refrigerants - Vapour compression cycle - Starters - Air handling units - Water piping - Window type and packaged air-conditioners - Chilled water plant - Vapour Absorption Machine(VAM) – Air conditioning systems for different types of buildings

UNIT- V Fire Safety Installation **9**

Causes of fire in buildings - Safety regulations - NBC - Planning considerations in buildings like noncombustible materials, construction, staircases and lift lobbies, fire escapes systems -Types- Heat and smoke detectors - Fire Fighting pump and water storage - Dry and wet risers - Automatic sprinklers.

Total: 45 Periods

Text Books:

1. Roger Greeno and Fred Hall, Building Services Handbook (8th edition), Routledge Publishers, 2015.
2. G. Steffy, Architectural Lighting Design, John Wiley and Sons, 20082. G. Steffy, Architectural Lighting Design, John Wiley and Sons, 2008
3. J. Killinger and L. Killinger, Heating and Cooling Essentials, Goodheart-Wilcox Publishers, 2003

Reference Books:

1. C. P. Arora, Refrigeration and Air Conditioning, Tata McGraw Hill, New Delhi, 1988
2. Udhayakumar , A text book of Building services, Eswar Press, 2007
3. SP 7 (2005) : National Building Code of India 2005

Additional References:

1. https://nptel.ac.in/courses/105/107/105107156/
2. https://nptel.ac.in/courses/105/102/105102176/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	1	2									1		2
CO2	3	2	1									1		2
CO3	3	3	2									1		2
CO4	3	1	2									1		2
CO5	1	2	3									1		2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE22	Disaster Management	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Structural Engineering				

Course Objectives

The course is intended to

1. provide students an exposure to disasters, their significance and types.
2. ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
3. gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR).
4. enhance awareness of institutional processes in the country.

   develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	differentiate the types of disasters, causes and their impact on environment and society.	Understand
CO2	assess vulnerability and various methods of risk reduction measures as well as mitigation.	Understand
CO3	Draw the hazard and vulnerability profile of India.	Understand
CO4	Identify scenarious in the Indian context.	Understand
CO5	disaster damage assessment and management.	Apply

Course Contents:

UNIT I INTRODUCTION TO DISASTERS **9**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don‟ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT:

APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

Text Books:

1. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

Reference Books:

6. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005

7. Government of India, National Disaster Management Policy,2009.

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE23	Industrial Structures	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Strength of Materials				

Course Objectives

The course is intended to

1. To impart knowledge on classification of industries and their functional requirements.
2. To familiarize the students on the design of silos, bunkers and chimneys.
3. To impart knowledge on the transmission structures.
4. To learn the planning, layout, functional aspects of industries and
5. To design of major steel and R.C structures needed for industries.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Know the requirements of various industries and get an idea about the materials used and planning of various industrial components	Remember
CO2	Understand the functional requirements for industrial structures.	Understand
CO3	Design special steel structures like bunkers, silos, crane girders, chimneys and pre-engineered buildings.	Evaluate
CO4	Design special RC structures like corbels, silos, bunkers, chimneys, plates and shells.	Evaluate
CO5	Understand the principles of prefabrication and prestressing	Understand

Course Contents:

UNIT I PLANNING **9**

Classification of industries and industrial structures – Site Planning and Selection – Exterior and interior Layout for Industries and buildings - Guidelines from factories act

UNIT II FUNCTIONAL REQUIREMENTS **9**

Lighting – Ventilation – Noise and Vibration control – Fire safety

UNIT III DESIGN OF STEEL STRUCTURES **9**

Pre-engineered and Mill buildings – Transmission Lines Towers – plate girders. Bunkers and Silos – pipe/cable racks- Chimney.

UNIT IV DESIGN OF R.C. STRUCTURES **9**

Corbels, Brackets and Nibs - Silos and bunkers –Chimney –Cooling Towers (Principles only)

UNIT V PREFABRICATION **9**

Principles of prefabrication and pre cast construction – Prestressed precast roof trusses - Floor slabs - Wall panels- Handling and erection stresses –joints in precast structures.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Ramamrutham.S., Design of Reinforced Concrete Structures, Dhanpat Rai Publishing Company, 2007.

2. Varghese.P.C., Advanced Reinforced Concrete Design, PHI, Eastern Economy Editions, Second Edition, 2005.

3. Subramanian, N., Design of Steel Structures, Oxford University Press, 2008.

4. Ramachandra and Virendra Gehlot, Design of steel structures –Vol. 2, Scientific Publishers, 2012.

REFERENCES:

1. Henn W. Buildings for Industry, Vol.I and II, London Hill Books, 1995

2. Handbook on Functional Requirements of Industrial buildings, SP32-1986, Bureau of Indian Standards, 1990.

3. Handbook of Industrial Lighting, Stanley L.Lyons, Butterworths, London.1981

4. Koncz, J., Manual of Precast Construction Vol. I and II, Bauverlay GMBH, 1971.

5. Handbook on Precast Construction, An Indian Concrete Institute Publication, 2016.

Additional References:

1. https://nptel.ac.in/courses/105/101/105101085/
2. https://nptel.ac.in/courses/105/105/105105109/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1						3					
CO2	3	2	1						3					
CO3	3	2	1						3					
CO4	3	2	1						3					2
CO5	1	1	1						3				2	

3	High	2	Medium	1	Low

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE24	Maintenance, Repair and Rehabilitation of Structures	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Construction Materials, Concrete Technology				

Course Objectives

The course is intended to

1. Understand basic concepts of damage of distress structures
2. Study about the corrosion factors and control methods
3. Know about the Serviceability and Durability of Concrete Structures
4. Recognize the proper repair materials and its application
5. Evaluate the method to strengthen the distressed structures

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Diagnosis a damaged structure.	Apply
CO2	Investigate the Corrosion factors and control methods	Understand
CO3	Illustrate the serviceability and durability of concrete structures	Apply
CO4	Interpret the suitable techniques for repair works in structures.	Apply
CO5	Describe about the strengthening of structural elements.	Understand

Course Content:

UNIT I IMAINTENANCE AND REPAIR STRATEGIES **9**

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating damaged structure, causes ofdeterioration.

NIT II STRENGTH AND DURABILITY OF CONCRETE **9**

Quality assurance for concrete-Strength, Durability- Cracks, different types, causes-Effects due to climate, temperature, Sustained elevated temperature, Corrosion

UNIT III SPECIAL CONCRETES **9**

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

UNIT IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS 9

Non-destructive Testing Techniques, Load Test for Stability-Epoxy injection, Shoring, Underpinning, Corrosion protection techniques-Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

UNIT V REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES 9

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, leakage, earthquake-Transportation of Structures from one place to other -Structural Health Monitoring- demolition techniques-Engineered demolition methods-Case studies

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Shetty.M.S.ConcreteTechnology-Theory and Practice,S.Chandand Company, 2008.
2. Vidivelli.B Rehabilitation of Concrete Structures Standard Publishes Distribution.1st edition2 009.
3. Varghese.P.C Maintenance Repair and Rehabilitation & Minor works of building, PrenticeHall India Pvt Ltd 2014.
4. Dodge Woodson.R Concrete Structures, Protection, Repair and Rehabilitation,Butterworth- Heinemann,Elsevier,New Delhi 2012

REFERENCES:

1. DovKominetzky.M.S.,-Design and Construction Failures, Galgotia, PublicationsPvt.Ltd.,2001
2. Ravishankar.K. Krishnamoorthy.T.S, Structural Health Monitoring, Repair AndRehabilitation of Concrete Structures, Allied Publishers, 2004.
3. Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, NarosaPublishers, 2008.
4. Hand Book on “Repair and Rehabilitation of RCC Buildings”-Director General works CPWD ,Govt of India , New Delhi-2002

Additional References:

1. https://nptel.ac.in/courses/105/106/105106202/
2. https://nptel.ac.in/noc/courses/noc21/SEM1/noc21-ce13/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3		3	3	2		2						2	
CO2	3		3	3	2		2						2	
CO3	3		3	3	2		2						2	
CO4	3		3	3	2		2						2	
CO5	3		3	3	2		2						2	
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE25	Design of Prestressed Concrete Structures	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Design of Reinforced Cement Concrete Elements				

Course Objectives

The course is intended to

1. Iintroduce the need for prestressing in a structure.
2. introduce the students the effect of prestressing in the flexural and shear behaviour of structural elements.
3. know about deflection and design of anchorae zone .
4. Learn about analysis and design of composit beams.
5. Gain knowledge on design of tension and compression members.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Understand the behaviour of prestressed concrete members and able to analyze the prestressed concrete beams.	Remember
CO2	Design the prestressed concrete members for flexure and shear as per the relevant design code (IS 1343).	Evaluate
CO3	Analyze for deflection of prestressed concrete members and design the anchorage zone.	Analyze
CO4	Analyze and design of composite beams and continuous beams.	Analyze
CO5	Design of prestressed concrete structures - sleepers, Tanks, pipes and poles.	Evaluate

Course Contents:

UNIT I INTRODUCTION – THEORY AND BEHAVIOUR 9

Basic concepts – Advantages and disadvantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections - Losses of prestress – Estimation of crack width.

UNIT II DESIGN FOR FLEXURE AND SHEAR 9

Basic assumptions of flexural design – Permissible stresses in steel and concrete as per

I.S.1343 Code – Different Types of sections - Design of sections of Type I and Type II post-tensioned and pre tensioned beams – Check for flexural capacity based on I.S. 1343 Code – Influence of Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.

UNIT III DEFLECTION AND DESIGN OF ANCHORAGE ZONE **9**

Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit states. Determination of anchorage zone stresses in post-tensioned beams – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.

UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAMS **9**

Analysis and design of composite beams – Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

UNIT V TENSION AND COMPRESSION MEMBERS **9**

Role of prestressing in members subjected to Tensile forces and compressive forces - Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012

2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012

REFERENCES:

1. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.

2. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013

3. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.

4. IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012

5. IS 3370- Part 4 (2008) Indian standard Code of practice for concrete structures for the storage of liquid- Design tables, code of practice, bureau of Indian standards, new Delhi.

Additional References:

1. https://nptel.ac.in/courses/105/101/105101085/
2. https://nptel.ac.in/courses/105/105/105105109/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	3	2	2								3	
CO2	3	2	3	2	2								3	
CO3	3	2	3	2	2								3	
CO4	3	2	3	2	2								3	
CO5	3	1	3	2	2								3	
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE26	Experimental Analysis of Stress	L	T	P	C
		3	0	0	3
Nature of Course	Professional elective				
Pre requisites	Physics				

Course Objectives

The course is intended to

1. Study the various experimental techniques
2. Study about techniques involved for measuring displacements, stresses, strains in structural components.
3. Understand the concept of Stress and strain
4. Know about the evaluation of the stress and strain components
5. Learn the advanced techniques of measuring the stress and strain

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Understand the concept of measurements and accuracy	Understand
CO2	Understand the various gauges and application	Apply
CO3	Able to handle the photoelasticity materials	Apply
CO4	Determine the strain value	Apply
CO5	Understand the concept of non destructive testing methods	Understand

Course Contents:

UNIT- I Extensometers and displacement sensors **9**

Principles of measurements, Accuracy, Sensitivity and range of measurements, Mechanical, Optical, Acoustical and Electrical extensometers and their uses, Advantages and disadvantages, Capacitance gauges, Laser displacement sensors.

UNIT- II Electrical resistance strain gauges **9**

Principle of operation and requirements, Types and their uses, Materials for strain gauges, Calibration and temperature compensation, cross sensitivity, Wheatstone bridge and potentiometer circuits for static and dynamic strain measurements, strain indicators, Rosette analysis, stress gauges, load cells, Data acquisition, six component balance.

UNIT- III Photoelasticity **9**

Two dimensional photo elasticity, Photo elastic materials, Concept of light - photoelastic effects, stress optic law, Transmission photoelasticity, Jones calculus, plane and circular polariscopes, Interpretation of fringe pattern, Calibration of photoelastic materials, Compensation and separation techniques, Introduction to three dimensional photo elasticity.

UNIT- IV Brittle coating and moiré techniques **9**

Relation between stresses in coating and specimen, use of failure theories in brittle coating, Moire method of strain analysis.

UNIT- V Non – Destructive testing **9**

Fundamentals of NDT, Acoustic Emission Technique, Radiography, Thermography, Ultrasonics, Eddy Current testing, Fluorescent Penetrant Testing,

Total: 45 Periods

Text Books:

1. Dally, J.W., and Riley, W.F., "Experimental Stress Analysis", McGraw Hill Inc., New York 1998.
2. . Srinath, L.S., Raghava, M.R., Lingaiah, K., Garagesha, G., Pant B., and Ramachandra, K., "Experimental Stress Analysis", Tata McGraw Hill, New Delhi, 1984.
3. .Sadhu Singh, "Experimental Stress Analysis", Khanna Publishers, New Delhi, 1996.

Reference Books:

1. Hetenyi, M., "Hand book of Experimental Stress Analysis", John Wiley and Sons Inc., New York, 1972.
2. Pollock A.A., Acoustic Emission in Acoustics and Vibration Progress, Ed. Stephens R.W.B., Chapman and Hall,1993.
3. Max Mark Frocht, "Photo Elasticity", John Wiley and Sons Inc., New York, 1968

Additional References:

1. https://nptel.ac.in/courses/112/106/112106068/
2. https://nptel.ac.in/courses/112/106/112106247/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	1	2	2	2	3		2					2		
CO2	1	2	1	2	2		2					2		
CO3	1	2	1	2	2		2					2		
CO4	1	3	1	2	2		2					2		
CO5	1	2	3	2	3		3					2		
	3	High				2	Medium					2	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE27	Bridge Structures	L	T	P	C
		3	0	0	3
Nature of Course	Professional elective				
Pre requisites	Design of Reinforced CementConcrete Elements				

Course Objectives

The course is intended to

1. To impart knowledge on important types of bridge structures
2. To know the select and planning of Bridge structures and structural configurations, assessment of loads,
3. To choose the appropriate method of analysis according to the situation and perform design.
4. To understand the codal provisions for loading and design standards of bridges
5. To understand the design and select materials suitable for bridges

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Understand the concept of bridges and their components	Understand
CO2	Design the substructure including pier and pier cap and well elements.	Apply
CO3	Design the superstructure of bridge using different methods.	Apply
CO4	Understand and design the Pre cast bridges	Understand
CO5	Able to design the steel bridges	Apply

Course Contents:

UNIT I Introduction **9**

Introduction: Historical Developments, Site Selection for Bridges, Classification of Bridges Forces on Bridges. Bridge substructures: Abutments, piers and wing walls Balanced Cantilever Bridge: Introduction and proportioning of components -Frictional resistance of expansion bearings-Secondary Stresses-Temperature Effect-Erection Forces and effects-Width of roadway and footway General Design Requirements.

UNIT II Design of Sub structure **9**

Design of piers and abutments-forces-combinations-design principles of foundations- piers, well, piles (detailed designs not expected). Bearings:- Design of elastomeric bearings, steel bearings.

UNIT III Concrete Bridges **9**

Analysis and design of T - beam bridges. Principles of design of Balanced Cantilever bridges. Design of skew slab culverts. R.C. Bridges: - box culverts - Pigeaud curves - Courbon's theory - Hendry Jaegar method

UNIT IV Pre-Stressed Concrete Bridges **9**

Basic principles-General Design requirements-Mild steel reinforcement in prestessed concrete member-Concrete cover and spacing of prestressing steel-Slender beams-Composite Section-Propped-Design of Propped Composite Section-Unproped composite section-Two-stage Prestressing-Shrinking stresses-General Design requirements for Road Bridges.

UNIT V Steel Bridges **9**

Introduction to continuous girder bridges, box girder bridges, rigid frame bridges and arch bridges - Pratt truss bridges - Suspension and Cable Stayed Bridges. -Introduction to Secondary Effects, Temperature, Shrinkage, Creep. Construction Techniques and Effects of Construction Sequence on Design

Total: 45 Periods

Text Books:

1. "Essentials of Bridge Engineering"- D Johnson Victor, Oxford & IBH Publishing Co New Delhi
2. "Design of Bridges"- N Krishna Raju, Oxford & IBH Publishing Co New Delhi

Reference Books:

1. Raina V.K., "Concrete Bridge Practice"- Tata McGraw Hill
2. "Principles and Practice of Bridge Engineering"- S P Bindra Dhanpat Rai & Sons New Delhi
3. IRC 6 – 1966 "Standard Specifications And Code Of Practice For Road Bridges"- Section II Loads and Stresses, The Indian Road Congress New Delhi
4. IRC 21 – 1966 "Standard Specifications And Code Of Practice For Road Bridges"-Section III Cement Concrete (Plain and reinforced) The Indian Road Congress New Delhi
5. IS 456 – 2000 "Indian Standard Plain and Reinforced Concrete Code of Practice"- (Fourth Revision) BIS New Delhi
6. IS 1343 – "Indian Standard Prestressed Concrete Code of Practice"- BIS New Delhi

Additional References:

1.https://nptel.ac.in/courses/105/105/105105165/
2. https://nptel.ac.in/courses/105/106/105106117/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3		3				2					2	2	
CO2	3		3				2					2	2	
CO3	3		3				2					2	2	
CO4	3		3				2					2	2	
CO5	3		3				2					2	2	
	3	High				2	Medium					1	Low	

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE28	Storage Structures	L	T	P	C
		3	0	0	3
Nature of Course	Professional elective				
Pre requisites	Design of Reinforced CementConcrete Elements				

Course Objectives

The course is intended to

1. To gain the knowledge of Concrete water tanks
2. To know the criteria for select and design of steel water tanks
3. To understand the codal provisions of storage structures
4. To select the types of right structures for the storage
5. To understand the concept of precasting tanks and benifits

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Understand the concept of Concrete water tanks	Understand
CO2	Gain the knowledge of steel storage tanks	Understand
CO3	Design the concrete bunkers and silos	Apply
CO4	Design the steel bunkers and silos	Apply
CO5	Able to design the prestressed concrete water tanks	Apply

Course Contents:

UNIT I Concrete water tanks **9**

Design of Circular tanks – Hinged and fixed at the base – IS method of calculating shear forces and moments – Hoop tension – Design of intze tank – Dome – Ring girders –Conical dome – Staging – Bracings – Raft foundation – Design of rectangular tanks –Approximate methods and IS methods – Design of underground tanks – Design of base slab and side wall – Check for uplift.

UNIT II Steel water tanks **9**

Design of rectangular riveted steel water tank – Tee covers – Plates – Stays –Longitudinal and transverse beams – Design of staging – Base plates – Foundation and anchor bolts – Design of pressed steel water tank – Design of stays – Joints – Design of hemispherical bottom water tank – side plates – Bottom plates – joints – Ring girder – Design of staging and foundation.

UNIT III Concrete bunkers and silos **9**

Design of square bunker – Side Walls – Hopper bottom – Top and bottom edge beams – Design of cylindrical silo – Wall portion – Design of conical hopper – Ring beam at junction.

UNIT IV Steel bunkers and silos **9**

Design of square bunker – Jansen"s and Airy"s theories – IS Codal provisions – Design of side plates – Stiffeners – Hooper – Longitudinal beams – Design of cylindrical silo – Side plates – Ring girder – stiffeners.

UNIT V Pre-stressed concrete water tanks **9**

Principles of circular prestressing – Design of prestressed concrete circular water tanks

Total: 45 Periods

Text Books:

3. Rajagopalan K., "Storage Structures", Tata McGraw Hill, New Delhi, 1998.
4. Krishna Raju N., "Advanced Reinforced Concrete Design", CBS Publishers and Distributors, New Delhi, 1998.

Reference Books:

1. Punmia B.C, Ashok Kumar Jain, Arun K.Jain, "R.C.C. Designs Reinforced Concrete Structures", Laxmi Publications Pvt. Ltd., New Delhi, 2006.
2. Gambhir.M.L., "Design of Reinforced Concrete Structures", Prentice Hall of India Private Limited, 2012.

Additional References:

1. https://nptel.ac.in/courses/105/105/105105110/
2. https://nptel.ac.in/courses/105/105/105105162/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3		3				2					2	2	
CO2	3		3				2					2	2	
CO3	3		3				2					2	2	
CO4	3		3				2					2	2	
CO5	3		3				2					2	2	
	3	High				2	Medium					1	Low	

	Formative assessment		
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE29	Ground Improvement Techniques	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Geotechnical Engineering I & II				

Course Objectives

The course is intended to

1. Know the various techniques for ground improvement.
2. Analyze the systems for de-watering.
3. Know about the methods for stabilization.
4. Recognize the machineries and equipments for grouting.
5. Evaluate the ground improvement techniques effectively.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Implement the suitable Ground improvement technique.	Apply
CO2	Interpret the various dewatering techniques.	Understand
CO3	Execute an appropriate method for stabilization	Apply
CO4	Select appropriate machinery and equipments for grouting	Apply
CO5	Assess the effectiveness of a ground improvement technique by analytically /numerically	Understand

Course Contents:

UNIT I PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES 9

Role of ground improvement in foundation engineering – Methods of ground improvement — Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions.

UNIT II DEWATERING 9

Dewatering Techniques - Well points – Vacuum and electroosmotic methods – Seepage analysisfor two dimensional flow for fully and partially penetrated slots in homogeneous deposits —Design for simple cases.

UNIT III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS 9

Insitu densification of cohesionless soils – Shallow as deep compaction – Dynamic compaction - Vibroflotation, Sand compaction piles and deep compaction. Consolidation of cohesionless soils - Preloading with sand drains, and fabric drains, Stabilization of soft clay ground using stone columns and Lime piles-Installation techniques — Simple design - Relative merits of above methods and their limitations.

UNIT IV EARTH REINFORCEMENT 9

Concept of reinforcement – Types of reinforcement material – Reinforced earth wall – Mechanism - Simple design - Applications of reinforced earth; Functions of Geotextiles in filtration, drainage, separation, road works and containment applications.

UNIT V GROUTING TECHNIQUES 9

Types of grouts – Grouting equipments and machinery – Injection methods – Grout monitoring – Stabilization with cement, lime and chemicals – Stabilization of expansive soil.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Purushothama Raj. P, "Ground Improvement Techniques", Lakshmi Publications, 2nd Edition, 2016.
2. Koerner, R.M. "Construction and Geotechnical Methods in Foundation Engineering", McGraw Hill, 1994.
3. Nihar Ranjan Patra, "Ground Improvement Techniques", Vikas Publishing House, FirstEdition, 2012.
4. Mittal.S, "An Introduction to Ground Improvement Engineering", Medtech Publisher, First Edition, 2013.

REFERENCES:

1. Moseley, M.P., "Ground Improvement" Blockie Academic and Professional, 1992.
2. Moseley, M.P and Kirsch. K., „Ground Improvement", Spon Press, Taylor and FrancisGroup, London, 2nd Edition, 2004.
3. Jones C.J.F.P. "Earth Reinforcement and Soil Structure", Thomas Telford Publishing, 1996.
4. Winterkorn, H.F. and Fang, H.Y. "Foundation Engineering Hand Book". Van Nostrand Reinhold, 1994.
5. Das, B.M., "Principles of Foundation Engineering" (seventh edition), Cengage learning,2010.
6. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of IndiaPvt.Ltd. New Delhi, 2011.
7. Koerner, R.M., "Designing with Geosynthetics" (Sixth Edition), Xlibris Corporation, U.S.A,2012.

8. IS Code 9759 : 1981 (Reaffirmed 1998) "Guidelines for Dewatering During Construction",Bureau of Indian Standards, New Delhi.
9. IS Code 15284 (Part 1): 2003 "Design and Construction for Ground Improvement —Guidelines" (Stone Column), Bureau of Indian Standards, New Delhi.

Additional References:

1. https://nptel.ac.in/courses/105/108/105108075/
2. https://nptel.ac.in/courses/105/105/105105210/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3		3				2					2	2	
CO2	3		3				2					2	2	
CO3	3		3				2					2	2	
CO4	3		3				2					2	2	
CO5	3		3				2					2	2	
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE30	Cost Effective Construction and Green Building	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Construction materials				

Course Objectives

The course is intended to

1. Know the selection of cost effective construction materials and green buildings
2. Recognize the different types of cost effective systems
3. Understand the applications of global warming
4. Evaluate the principle of sustainable development
5. Select the process of green energy and sustainable development

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Interpret the concept of cost effective construction	Apply
CO2	Identify the different types of cost effective systems.	Understand
CO3	Summarize the application of global warming and relevance to green building.	Apply
CO4	Implement the principle of sustainable development in Green building design.	Apply
CO5	Explain the process of green energy and sustainable development.	Understand

Course Contents:

UNIT I INTRODUCTION TO COST EFFECTIVE CONSTRUCTION 9

Introduction to the concept of cost effective construction -Uses of different types of materials and their availability -Stone and Laterite blocks- Burned Bricks- Concrete Blocks- Stabilized Mud Blocks- Lime-Pozzolana Cement- Gypsum Board- Light Weight Beams- Fiber Reinforced Cement Components- Fiber Reinforced Polymer Composite- Bamboo- Recycling of building materials - Brick- Concrete- Steel- Plastics - Environmental issues related to quarrying of building.

UNIT II COST EFFECTIVE SYSTEMS 9

Environment friendly and cost effective Building Technologies - wall construction- Flemish Bond - Rat Trap Bond -Arches- Cavity Wall - Ferro Cement and Ferro Concrete constructions - Wall

and Roof Panels -Beams columns - Door and Window frames - Alternate roofing systems - Filler Slab – Composite Beam and Panel Roof -Pre-engineered building elements - wood products - steel and plastic

UNIT III GLOBAL WARMING **9**

Definition - Causes and Effects - Contribution of Buildings towards Global Warming - Carbon Footprint -Global Efforts to reduce carbon Emissions - Features- Necessity - Environmental benefit - Health and Social benefits - Major Energy efficient areas for buildings- Embodied Energy in Materials-Green Materials - Comparison of Initial cost of Green V/s Conventional Building – Life cycle cost of Buildings.

UNIT IV GREEN BUILDING DESIGN **9**

Green Design Definition - Principles of sustainable development in Building Design – Characteristics of Sustainable Buildings- Sustainably managed Materials - Integrated Lifecycle design of Materials and Structures

UNIT V GREEN ENERGY AND SUSTAINABLE DEVELOPMENT **9**

Criteria for choosing appropriate green energy technologies, life cycle cost; the emerging trends process/product innovation-, technological/ environmental leap-frogging; Eco/green technologies for addressing the problems of Water, Energy, Health, Agriculture and Biodiversity- WEHAB (ecorestoration/phyto-remediation, ecological sanitation, renewable energy technologies, industrial ecology, agro ecology and other appropriate green technologies); design for sustainability (D4S).

TOTAL: 45 PERIODS

Text Books:

1. Kibert, C. Sustainable Construction: Green Building Design and Delivery, John Wiley & Sons, 2005

2. Edward G Pita,An Energy Approach- Air-conditioning Principles and Systems,Pearson Education, 2003.

3. Alternative Building Materials and Technologies By K S Jagadeesh, B V Venkatta Rama Reddy & K S Nanjunda Rao New Age International Publishers

Reference Books:

4. Integrated Life Cycle Design of Structures By Asko Sarja SPON Press 3. Non conventional Energy Resources By D S Chauhan and S K Sreevasthava New Age International Publishers

5. Lever More G J,Building Energy Management Systems, E and FN Spon, London, 2000

6. John Littler and Randall Thomas,Design with Energy: The Conservation and Use of Energy in Buildings, Cambridge University Press, 1984

Additional References:

1. https://nptel.ac.in/courses/124/107/124107011/
2. https://nptel.ac.in/courses/124/106/124106157/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3		3				2					2	2	
CO2	3		3				2					2	2	
CO3	3		3				2					2	2	
CO4	3		3				2					2	2	
CO5	3		3				2					2	2	
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE31	Tall Buildings	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Design of Reinforced Structures				

Course Objectives

The course is intended to

1. To study the behaviour of tall structures.
2. To learn analysis and design of buildings for wind loads
3. To study design criteria for tall structures.
4. To familiarize the students about stability analysis of tall structures.
5. To study behaviour of various structural systems under wind loads.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	To apply all types loads on tall buildings according IS code	Apply
CO2	To analyse and Design tall buildings	Understand
CO3	To understand behavior of various structural systems under different loading conditions	Apply
CO4	To design towers chimneys and shear walls	Apply
CO5	To check stability of tall structures against buckling, Torsion	Understand

Course Contents:

Unit I Introduction **9**

Basic Introduction and Importance of Tall Structures, Dead load, Live load, Impact load, Construction load, Sequential loading. Wind Loading – Static and Dynamic Approach, Analytical method, Wind Tunnel Experimental methods. Earthquake Loading – Equivalent lateral Load analysis, Response Spectrum Method, Combination of Loads.

Unit II Analysis and Design of Tall Buildings **9**

Modelling for approximate analysis, Accurate analysis and reduction techniques, Analysis of structures as an integral unit, Analysis for member forces. Analysis of tall building for lateral loads, cantilever method, Portal method, Factor method; Design of structures for wind drift and Twist, Computer application in analysis & design

Unit III Behavior of Structural Systems **9**

Factors affecting the growth, height and structural form, Behaviour of Braced frames, Rigid Frames, In-filled frames, Shear walls, Coupled Shear walls, Wall-Frames, Tubular, Outrigger braced, Hybrid systems under wind loads.

Unit IV Design of Various Tall Structures **9**

Introduction, Loads on towers, Analysis of towers, Masts, Trestles, Stresses in trestles due to vertical loads and horizontal loads, Design of members in towers. Design of Chimneys (RCC and Steel) and Design of shear wall according to IS code for wind loads.

Unit V Stability Analysis **9**

Overall buckling analysis of frames, wall-frames, Approximate methods, Second order effect of gravity loading, P-Delta Effects, Simultaneous first order and P-Delta analysis, Translational instability, Torsional Instability, Out of plumb effects, Effect of stiffness of members and foundation rotation in stability of structures.

TOTAL: 45 PERIODS

TEXT BOOKS

1. WOLFGANG SCHUELLER " High - rise building Structures", John Wiley and Sons.
2. Bryan Stafford Smith and Alex Coull, " Tall Building Structures ", Analysis and Design, John Wiley and Sons, Inc., 1991.
3. S.N. Manohar, “Tall Chimneys: Design and Construction”, McGraw-Hill, 1988.

REFERENCES

1. COULL, A. and SMITH, STAFFORD, B. " Tall Buildings ", Pergamon Press, London, 1997.
2. LinT.Y. and Burry D.Stotes, " Structural Concepts and Systems for Architects and Engineers ", John Wiley, 1994.
3. Lynn S.Beedle, Advances in Tall Buildings, CBS Publishers and Distributors, Delhi, 1996.
4.Taranath B.S, “Structural Analysis and Design of Tall Buildings”, McGraw-Hill, 1988
5.Design of Reinforced Concrete Structures by Pillai and Devdas Menon.

Additional References:

1. https://nptel.ac.in/courses/124/107/124107011/
2. https://nptel.ac.in/courses/124/106/124106157/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3		3				2					2	2	
CO2	3		3				2					2	2	
CO3	3		3				2					2	2	
CO4	3		3				2					2	2	
CO5	3		3				2					2	2	
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE32	Prefabricated Structures	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Structural Engineering				

Course Objectives:

The course is intended to

1. impart knowledge to students on modular construction, industrialised construction and design of prefabricated elements and construction methods.
2. ensure behaviour and types of structural components.
3. gain a knowledge of design principels.
4. Enhance the fundamentals of structural joints and connection.
5. Getting knowledge of design for an abnormal loads.

Course Outcomes:

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

CO. No.	Course Outcome	Bloom's Level
CO1	Will have good knowledge about design principles, layout of factory and stages of loading in precast construction.	Understand
CO2	Acquire knowledge about panel systems, slabs, connections used in precast construction and they will be in a position to design the elements.	Understand
CO3	Acquire knowledge about types of floor systems, stairs and roofs used in precast construction.	Understand
CO4	Acquire knowledge about types of walls used in precast construction, sealants, design of joints.	Understand
CO5	Acquire knowledge about components in industrial building.	Apply

Course Contents:

UNIT I INTRODUCTION **9**

Need for prefabrication – Principles of prefabrication – Modular coordination – Standarization – Materials – Systems – Production – Transportation – Erection.

UNIT II PREFABRICATED COMPONENTS **9**

Behaviour and types of structural components – Large panel systems – roof and floor slabs – Walls panels - Beams - Columns - Shear walls

UNIT III DESIGN PRINCIPLES **9**

Design philosophy- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation - Demountable precast concrete systems.

UNIT IV JOINTS AND CONNECTIONS IN STRUCTURAL MEMBERS **9**

Types of Joints – based on action of forces - compression joints - shear joints - tension joints - based on function - construction, contraction, expansion. Design of expansion joints - Dimensions and detailing - Types of sealants - Types of structural connections - Beam to Column - Column to Column - Beam to Beam - Column to foundation.

UNIT V DESIGN FOR ABNORMAL LOADS **9**

Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

TOTAL: 45 PERIODS

Text Books:

1. Bruggeling A.S. G and Huyghe G.F. "Prefabrication with Concrete", A.A. Balkema Publishers,USA,1991.
2. Lewitt,M. " Precast Concrete- Materials, Manufacture, Properties And Usage", Applied Science Publishers , London And New Jersey, 1982.
3. Bachmann, H. and Steinle, A. "Precast Concrete Structures", Ernst & Sohn, Berlin, 2011.

Reference Books:

1. Koncz T., "Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH, 1976.
2. "Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.
3. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE33	Rock Mechanics	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Geotechnical Engineering				

Course Objectives:

The course is intended to

1. Know about the classification of rocks
2. Gain knowledge on strength criteria of rocks.
3. Acquire knowledge on design aspects in rocks.
4. Learn about slope stability of rocks
5. Familiarise on reinforcement of rocks.

Course Outcomes:

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

CO. No.	Course Outcome	Bloom's Level
CO1	Identify the type of rock.	Understand
CO2	Describe the behaviour of rock under hydrostatic compression and deviatoric loading.	Understand
CO3	Express the Insitu stresses developed and methods of measurement.	Understand
CO4	Assess the strength parameters of rocks and adopt appropriate measures for stability of critical slope of rocks.	Evaluate
CO5	Interpret suitable remedial measures in fractured rocks.	Apply

Course Contents:

UNIT I CLASSIFICATION OF ROCKS **9**

Rocks of peninsular India and the Himalayas – Index properties and classification of rock masses, competent and incompetent rock – Value of RMR and ratings in field estimations.

UNIT II STRENGTH CRITERIA OF ROCKS **9**

Behaviour of rock under hydrostatic compression and deviatoric loading – Modes of rock failure – Planes of weakness and joint characteristics – Joint testing, Mohr – Coulomb failure criterion and tension cut-off, Hoek and Brown Strength criteria for rocks with discontinuity sets.Value of RQD rating in field estimations.

UNIT III DESIGN ASPECTS IN ROCKS **9**

Insitu stresses and their measurements, flat jack – Over and under coring methods – stress around underground excavations – Design aspects of openings in rocks – Case studies.

UNIT IV SLOPE STABILITY OF ROCKS **9**

Rock slopes – Role of discontinuities in slope failure, slope analysis and factor of safety – Remedial measures for critical slopes – Case studies.

UNIT V REINFORCEMENT OF ROCKS **9**

Reinforcement of fractured and jointed rocks – Shotcreting – Bolting – Anchoring – Installation methods – Case studies.

TOTAL: 45 PERIODS

Text Books:

1. Goodman, R.E., Introduction to Rock Mechanics, John Wiley and Sons, 1989.
2. Hool, E and Bray, J., Rock Slope Engineering, Institute of Mining and Metallurgy, U.K. 1981.
3. Hoek, E and Brown, E.T., Underground Excavations in Rock, Institute of Mining and Metallurgy, U.K. 1981.

Reference Books:

1. Obvert, L. and Duvall, W., Rock Mechanics and the Design of Structures in Rock, John Wiley, 1967.
2. Bazant, Z.P., Mechanics of Geomaterials Rocks, Concrete and Soil, John Wiley and Sons, Chichester, 1985.
3. Wittke, W., Rock Mechanics:Theroy and Applications with Case Histories, Springerverlag, Berlin, 1990.

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2		3	3		2				3			2
CO2	3	2		3	3		2				3			2
CO3	3	2		3	3		2				3			2
CO4	3	2		3	3		2				3			2
CO5	3	2		3	3		2				3			2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE34	Reinforced Soil Structure	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Design of reinforced Concrete structures, Geotechnical Engineering				

Course Objectives:

The course is intended to

1. Learn about the principles of soil
2. Understand the materials used in reinforced soil structure
3. Impart knowledge on design aspects of reinforced soil.
4. Gain knowledge on Geosynthetics and applications
5. Acquaire knowledge on soil nailing.

Course Outcomes:

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

CO. No.	Course Outcome	Bloom's Level
CO1	Describe the concepts and mechanism of reinforced soil Understand	Understand
CO2	Differentiate various fill materials. and reinforcing materials to be used in reinforced soil structure	Analyse
CO3	3)Develop a detailed knowledge on soil reinforcement functions and the ability to select suitable reinforcing material to suit the functional requirement	Create
CO4	Express the design criteria for use of geosynthetics in landfills	Understand
CO5	Design various soil reinforcement and soil nailing in major projects	Create

Course Contents:

UNIT I PRINCIPLES AND MECHANISMS **(09)**

Historical background – Initial and recent developments – Principles – Concepts and mechanisms of reinforced soil – Factors affecting behaviour and performance of soil – Reinforcement interactions.

UNIT II MATERIALS AND MATERIAL PROPERTIES **(09)**

Materials used in reinforced soil structures – Fill materials, reinforcing materials, metal strips, Geotextile, Geogrids, Geomembranes, Geocomposites, Geojutes, Geofoam, natural fibres, coir Geotextiles – Bamboo – Timber – Facing elements – Properties – Methods of testing – Advantages and disadvantages – Preservation methods.

UNIT III DESIGN PRINCIPLES AND APPLICATIONS **(09)**

Design aspects of reinforced soil – Soil reinforcement function – Separator, Filtration, Drainage, Barrier function – Design and applications of reinforced soil of various structures – Retaining walls – Foundations – Embankments and slopes.

UNIT IV GEOSYNTHETICS AND APPLICATIONS **(09)**

Introduction – Historical background – Applications – Design criteria – Geosynthetics in roads – Design – Giroud and Noiray approach – Geosynthetics in landfills – Geosynthetic clay liner – Design of landfills – Barrier walls.

UNIT V SOIL NAILING AND CASE HISTORIES **(09)**

Soil nailing – Introduction – Overview – Soil-Nail interaction – Behaviour – Design procedure – Behaviour in seismic conditions. Performance studies of reinforced dams, embankments, Pavements, Railroads, Foundations– Case studies.

TOTAL: 45 PERIODS

Text Books:

1. Jewell, R.A., Soil Reinforcement with Geotextile, CIRIA, London, 1996.
2. John, N.W.M., Geotextiles, John Blackie and Sons Ltd., London, 1987.
3. Jones, C.J.F.P., Earth Reinforcement and Soil Structures, Earthworks, London, 1982.
4. Koerner, R.M., Designing with Geosynthetics, (Third Edition), Prentice Hall, 1997.

Reference Books:

1. Proc. Conference on polymer and Reinforcement, Thomas Telford Co., London, 1984.
2. Gray, D.H., and Sotir, R.B., Biotechnical and Soil Engineering Slope Stabilization. A Practical Guide for Erosion Control, John Wiley & Son Inc., New York, 1996.
3. RamanathaAyyar, T.S., Ramachandran Nair, C.G. and Balakrishna Nair, N., Comprehensive reference book on Coir Geotextile, Centre for Development for Coir Technology, 2002.

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3			3	2		2				3			2
CO2	3			3	2		2				3			2
CO3	3		3	3	2		2				3			2
CO4	3			3	2		2				3			2
CO5	3			3	2		2				3			2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE35	Geotechnical Exploration and Instrumentation	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Engineering Geology, Geotechnical Engineering				

Course Objectives:

The course is intended to

1. Know about the various types of soil.
2. Gain knowledge on methods of boring
3. Acquaire knowledge on soil sampling and borehole logging.
4. Learn the various field tests on soil and rock.
5. Familiarise on preparing soil exploration report.

Course Outcomes:

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

CO. No.	Course Outcome	Bloom's Level
CO1	Identify the type of solid and rock.	Understand
CO2	Implement the various soil exploration methods in soil and rock.	Apply
CO3	Illustrate the methods of soil sampling and borehole logging.	Understand
CO4	Work the relevant instrumentation required for characterizing the soil and rock.	Apply
CO5	Interpret the field and laboratory data to produce soil investigation report.	Apply

Course Contents:

UNIT I Introduction **9**

Soil Formation, types of soils, physical and biological weathering, soil transport, deposition and stratification phenomena and Soil and Rock Classification. Soil & Rock Exploration: Soil Exploration Programme for different Civil Engineering Projects Number and Depth of Boreholes

UNIT II Exploration Methods 9

Methods of Boring, Auguring and Drilling. Machinery used for drilling, types of augers and their usage for various projects.

UNIT III Soil Sampling **9**

Sampling methods, types of samples, storage of samples and their transport. Sample preparation, sample sizes, types of sampler‟s specifications for testing. Borehole Logging: Logging of Boreholes-logging methods- Ground water observations – water table fluctuations and effects - Preparation of soil profiles – calculations

UNIT IV Field testing of soils & Rocks **9**

Methods and specifications – visual identification tests, Geo Physical Test- vane shear test, penetration tests (SPT, CPT, DMT, PMT), Plate Load Test, CBR Test, Block Vibration Test, analysis

of test results.

UNIT V Field Instrumentation & Monitoring **9**

Pressure meters, Piezometer, Pressure cells, O-Cell, Sensors, Inclinometers, Strain gauges, Accelerometers etc. **Report writing**: Soil exploration Reports- identification, calculations and preparation.

TOTAL: 45 PERIODS

Text Books:

1. J. E. Bowles, “Foundation Analysis and Design”, McGraw Hill Companies, 1997.
2. M. D. Desai, “Ground Property Characterization from In-Situ Testing”, Published by IGS-Surat Chapter, 2005.
3. M. J. Hvorslev, “Sub-Surface Exploration and Sampling of Soils for Civil Engineering Purposes”, US Waterways Experiment Station, Vicksburg, 1949.
4. C.R. Clayton, M.C. Matthews, and N.E. Simons, “Site Investigation”, 1995.

Reference Books:

5. N.N. Som and S.C. Das, “Theory and Practice of Foundation Design”, PHI Learning, 2003.
6. D. Choudhury, “Foundation Engineering”, NPTEL Web Course, MHRD, Govt. India, 2006.
7. K. Deb, “Advanced Foundation Engineering”, NPTEL Video Course, MHRD, Govt. India, 2013.

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3			3	3		2				3			2
CO2	3			3	3		2				3			2
CO3	3			3	3		2				3			2
CO4	3			3	3		2				3			2
CO5	3			3	3		2				3			2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination(60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE36	Design of Masonry, Timber & Steel Elements	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Engineering Mechanics, Mechanics of solids I, II				

Course Objectives:

The course is intended to

8. Know about the mix design and design of masonry walls.
9. Learn about allowable stresses in timber and ifs design
10. Impart knowledge on structural steel connections
11. Acquaire knowledge on design of beams and its connections
12. Familiarise on design of compression, tension members and its connections.

Course Outcomes:

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

CO. No.	Course Outcome	Bloom's Level
CO1	1)Illustrate the basic requirements of Indian standards for the design of masonry walls	Apply
CO2	Design the timber beams for strength and stiffness	Create
CO3	Identify the different failure modes of bolted and welded connections and design connections subjected to both axial and eccentric load	Understand
CO4	Compute the design strength of beams and connections	Apply
CO5	Implement the design of columns, lattices, battens and connections.	Apply

Course Contents:

UNIT I – MASONRY **9**

Mix proportions – compressive strength of mortars – basic compressive stress – design of masonry walls – eccentrically loaded walls – shape factor for masonry units – stability of piers and walls – design as per IS Codes.

UNIT II - TIMBER **9**

Allowable stresses in compression, tension and flexure – types of joints with nails and bolts – Design of simple compression members – design of beams for strength and stiffness as per BIS code

UNIT III - STRUCTURAL STEEL CONNECTIONS **9**

Steel standard sections – properties – permissible stresses as per BIS codes Bolted connections Types of bolts – permissible stresses for black bolt, HSFG bolts as per BIS code – Resistance of a bolt in single shear and double shear and bearing – Design for eccentric loading - Field examples. Welded connections Principle of welding – methods of welding – weld symbols – edge preparation – welding electrodes – types of welded joints – strength of fillet and butt weld – design of welded connections for lap and butt joint and detailing - Design for eccentric loading - Field examples.

UNIT IV - BEAMS (Bolted and welded connections only) **9**

Beams – permissible bending stress as per BIS code - section classification– Design of laterally supported and unsupported simply supported beams – Design of built – up beams – curtailment of

flange plate – connection between flange plate and beam – need for lateral support of compression flange and their design – strength of beams in shear.

UNIT V - COMPRESSION AND TENSION MEMBER (Bolted and welded connections only) 9

Axially loaded columns – effective length of compression members – slenderness ratio –strength of compression members – design of columns – built up columns – design of lattices and battens – design of their base – Gusseted base – design of simple and built up members subjected to tension – effective area of angle and Tee sections connected to Gussets –Tension splice – lug angle.

TOTAL: 45 PERIODS

Text Books:

1. Arya, ¯ Structural Design in Steel, Masonry And Timber‖, Nemchand & Bros., Roorkee, 1993.
2. Subramanian.N ¯Design of Steel Structures‖, Oxford University Press, New Delhi, 2008.
3. Duggal.S.K., ¯Limit State Design of Steel Structures‖, Tata McGraw Hill ,New Delhi, 2010.

Reference Books:

1. Ramachandra, ¯ Design of Steel Structures‖, Vol. I & II, Standard publishing house, New Delhi, 2007.
2. B. C. Punmia, Ashok Kumar Jain and Arunkumar Jain, ¯Design of Steel Structures, Vol. I & II‖, Arhant Publications, Bombay, 2004
3. P. Dayaratnam, ¯Brick and reinforced brick structures‖, Oxford and IBH publishing house, 1997.
4. BIS: 1905 – 1980, Code of practice for structural safety in buildings reinforced masonry
5. IS: 800 – 2007, Code of practice for general construction in steel (Third revision) 6. BIS – SP 6(I) – Handbook for structural steel sections

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3		3		3		2		2		3		3	2
CO2	3		3		3		2		2		3		3	2
CO3	3		3		3		2		2		3		3	2
CO4	3		3		3		2		2		3		3	2
CO5	3		3		3		2		2		3		3	2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

STREAM-III: CONSTRUCTION ENGINEERING AND MANAGEMENT

Passed in Board of studies meeting *Approved in Academic Council meeting*

CHAIRMAN - BOARD OF STUDIES

20CEE41	Construction Planning and Scheduling	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental Engineering				

Course Objectives

The course is intended to

1. Know about the basic concepts of construction planning.
2. Prepare the construction schedule and bar charts.
3. Know about the cost control problems.
4. Gain knowledge quality control and safety during construction.
5. Learn organization and use of project information.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Identify the basic concepts of construction planning.	Understand
CO2	Schedule the construction activities.	Apply
CO3	Forecast and control the cost in a construction.	Understand
CO4	Illustrate the quality control by statistical methods.	Apply
CO5	Organize information in Centralized database Management systems.	Understand

Course Contents:

UNIT I CONSTRUCTION PLANNING **9**

Basic concepts in the development of construction plans-Choice of Technology and Construction method-Defining Work Tasks- Work breakdown structure- Definition- Precedence relationships among activities-Estimating Activity Durations-Estimating Resource Requirements for work activities-coding systems.

UNIT II SCHEDULING PROCEDURES AND TECHNIQUES **9**

Relevance of construction schedules-Bar charts - The critical path method-Calculations for critical path scheduling-Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity-on-node and with leads, Lags and Windows-Calculations for scheduling with leads, lags and windows-Resource oriented scheduling-Scheduling with resource constraints and precedences - Use of Advanced Scheduling Techniques-Scheduling with uncertain durations- Crashing and time/cost tradeoffs -Improving the Scheduling process – Introduction to application software.

UNIT III COST CONTROL MONITORING AND ACCOUNTING **9**

The cost control problem-The project budget-Forecasting for Activity cost control - financial accounting systems and cost accounts-Control of project cash flows-Schedule control-Schedule and Budget updates-Relating cost and schedule information.

UNIT IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9

Quality and safety Concerns in Construction-Organizing for Quality and Safety-Work and Material Specifications-Total Quality control-Quality control by statistical methods -Statistical Quality control with Sampling by Attributes-Statistical Quality control by Sampling and Variables-Safety.

UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION 9

Types of project information-Accuracy and Use of Information-Computerized organization and use of Information - Organizing information in databases-relational model of Data bases-Other conceptual Models of Databases-Centralized database Management systems-Databases and application programs-Information transfer and Flow.

TOTAL: 45 PERIODS

Text Books:

8. Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 2009.
9. Srinath,L.S., "Pert and CPM Principles and Applications", Affiliated East West Press, 2001

Reference Books:

1. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamentals Concepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000.
2. Moder.J., Phillips. C. and Davis E, "Project Management with CPM", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., 3rd Edition, 1985..
3. Willis., E.M., "Scheduling Construction projects", John Wiley and Sons, 1986..
4. Halpin,D.W., "Financial and Cost Concepts for Construction Management", John Wiley and Sons, New York, 1985

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE42	Modern Construction Materials	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Construction Materials				

Course Objectives

The course is intended to

1. Learn about special concrete and it's application.
2. Familiarise on steel and aluminum products and its advantages..
3. Gain knowledge on composites and applications.
4. Acquire knowledge on water proofing compounds and applications.
5. Get an awareness on smart and intelligent materials.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Investigate alternate materials to concrete on high performance and high strength.	Create
CO2	Interpret the properties and advantages of steel and Aluminium alloys.	Apply
CO3	Illustrate the applications of fiber reinforced polymer.	Apply
CO4	Summarize the wide applications of concrete admixtures and construction chemicals.	Understand
CO5	Differentiate between smart and intelligent materials.	Analyse

Course Contents:

UNIT I SPECIAL CONCRETES 9

Concretes, Behaviour of concretes – Properties and Advantages of High Strength and High Performance Concrete – Properties and Applications of Fibre Reinforced Concrete, Self compacting concrete, Alternate Materials to concrete on high performance & high Strength concrete..

UNIT II METALS 9

– . Types of Steels – Manufacturing process of steel – Advantages of new alloy steels – Properties and advantages of aluminium and its products – Types of Coatings & Coatings to reinforcement – Applications of Coatings.

UNIT III COMPOSITES 9

Types of Plastics – Properties & Manufacturing process – Advantages of Reinforced polymers – Types of FRP – FRP on different structural elements – Applications of FRP.

UNIT IV OTHER MATERIALS 9

Types and properties of Water Proofing Compounds – Types of Non-weathering Materials and its uses – Types of Flooring and Facade Materials and its application, concrete admixtures and construction chemicals.

UNIT V SMART AND INTELLIGENT MATERIALS 9

Types & Differences between Smart and Intelligent Materials – Special features – Case studiesshowingapplications of smart & Intelligent Materials.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Shetty, M. S., "Concrete Technology" S. Chand Publication
2. Krishnaraju .N., Advanced Concrete Technology, CBS Published

REFERENCES:

1. Ghambhir M.L."Concrete Technology" Tata McGraw Hill education private Limited.
2. A.R. Santhakumar, Concrete Technology, Oxford University Press.
3. Building Materials, P.C. Varghese, Prentice-Hall India.

Additional References:

1. https://nptel.ac.in/courses/105/106/105106206/
2. https://nptel.ac.in/courses/105/102/105102088/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Passed in Board of studies meeting *Approved in Academic Council meeting*

CHAIRMAN - BOARD OF STUDIES

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE43	Housing Planning and Management	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Construction Materials, Construction Management				

Course Objectives

The course is intended to

1. Understand basic concepts of housing policies.
2. Study about the housing programs.
3. Know about the planning and design of housing projects.
4. Recognize the construction types and cost effective materials.
5. Evaluate the housing finance and project appraisal.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Classify the housing policies.	Apply
CO2	Identify a suitable housing program.	Understand
CO3	Implement the planning and design of housing projects.	Apply
CO4	Utilise the cost effective construction materials and techniques.	Apply
CO5	Describe the various sources of housing finance and project appraisal.	Understand

Course Contents:

UNIT-I INTRODUCTION TO HOUSING **9**

Definition of Basic Terms – House, Home, Household, Apartments, Multi storied Buildings, Special Buildings, Objectives and Strategies of National Housing Policies including Slum Housing Policy, Principle of Sustainable Housing – Integrated approach on arriving holding capacity and density norms - All basic infrastructure consideration - Institutions for Housing at National, State and Local levels.

UNIT-II HOUSING PROGRAMS **9**

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighborhoods- Plotted land development programs, Open Development Plots, Apartments, Gated communities, Townships, Rental Housing, Co-operative Housing, Slum Housing Programmes – Slum improvement – Slum redevelopment and Relocation – Use of GIS and MIS in Slum Housing Projects,, Role of Public housing agencies, and Private sector in supply , quality, infrastructure and pricing – Role of Non-Government Organizations in slum housing

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS **9**

Formulation of Housing Projects – Land Use and Soil suitability analysis -Building Byelaws and Rules and Development Control Regulations - Site Analysis, Layout Design, Design of Housing Units (Design Problems) – Housing Project Formulation.

UNIT-IV CONSTRUCTION TYPES AND COST EFFECTIVE MATERIALS **9**

New Constructions Techniques – Cost Effective Modern Materials and methods of Construction- Green building concept- Building Centers – Concept, Functions and Performance Evaluation.

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL **9**

Evaluation of Housing Projects for sustainable principles – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy- Public Private Partnership Projects - Viability Gap Funding - Pricing of Housing Units (Problems).

Total: 45 Periods

TEXTBOOKS:

1. Meera Mehta and Dinesh Mehta, "Metropolitan Housing Markets", Sage Publications Pvt. Ltd., New Delhi, 1999.

2. Francis Cherunilam and Odeyar D Heggade, "Housing in India", Himalaya Publishing House, Bombay, 1997.

REFERENCES:

1. Wiley- Blackwell, "Neufert Architects" Data, 4 th Edition, Blackwell Publishing Ltd, 2012

2. Donald Watson and Michael J.Crosbie, "Time Saver Standards for Architectural Design", 8 th Edition, Tata McGraw Hill Edition, 2011

3. Walter Martin Hosack, "Land Development Calculations", McGraw Hill 2 nd Edition, USA 2010

4. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2004.

5. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS Habitat, Nairobi, 1994

6. Government of India, National Housing Policy, 1994

Additional References:

1. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ar04/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE44	Construction Project Management	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental Engineering				

Course Objectives

The course is intended to

1. Know about types of construction and services.
2. Gain knowledge on organizing for project management.
3. Familiarize on design and construction process.
4. Gain knowledge on labour materials and equipment utilization.
5. Learn on cost estimation in construction projects.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Identify the professional services in construction.	Understand
CO2	Implement the modern trends in project management.	Apply
CO3	Execute the construction project as per design.	Apply
CO4	Illustrate the labour productivity and materials management.	Understand
CO5	Summarize the cost associated with constructed facilities.	Understand

Course Contents:

UNIT I THE OWNERS' PERSPECTIVE **9**

Introduction - Project Life Cycle - Types of Construction - Selection of Professional Services - Construction Contractors - Financing of Constructed Facilities - Legal and Regulatory Requirements - Changing Environment of the Construction Industry - Role of Project Managers.

UNIT II ORGANIZING FOR PROJECT MANAGEMENT **9**

Project Management – modern trends - Strategic Planning - Effects of Project Risks on Organization - Organization of Project Participants -Traditional Designer-Constructor Sequence - Professional Construction Management - Owner-Builder Operation - Turnkey Operation - Leadership and Motivation for the Project Team.

UNIT III DESIGN AND CONSTRUCTION PROCESS **9**

Design and Construction as an Integrated System - Innovation and Technological Feasibility - Innovation and Economic Feasibility - Design Methodology - Functional Design - Construction Site Environment.

UNIT IV LABOUR, MATERIAL AND EQUIPMENT UTILIZATION **9**

Historical Perspective - Labour Productivity - Factors Affecting Job-Site Productivity - Labour

Relations in Construction - Problems in Collective Bargaining - Materials Management - Material

Procurement and Delivery - Inventory Control - Tradeoffs of Costs in Materials Management. - Construction Equipment - Choice of Equipment and Standard Production Rates - Construction Processes Queues and Resource Bottlenecks.

UNIT V COST ESTIMATION **9**

Costs Associated with Constructed Facilities - Approaches to Cost Estimation - Type of Construction Cost Estimates - Effects of Scale on Construction Cost - Unit Cost Method of Estimation - Methods for Allocation of Joint Costs - Historical Cost Data - Cost Indices - Applications of Cost Indices to Estimating - Estimate Based on Engineer's List of Quantities - Estimation of Operating Costs.

TOTAL: 45 PERIODS

Text Books:

1. Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", Tata McGraw-Hill Publishing Company, New Delhi, 1998.
2. Choudhury S , "Project Management", McGraw-Hill Publishing Company, New Delhi, 1988.
3. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders", Prentice Hall, Pittsburgh, 2000.

Reference Books:

1. Frederick E. Gould, "Construction Project Management", Wentworth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology, 2000.
2. George J.Ritz , "Total Construction Project Management" - McGraw-Hill Inc, 1994

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE45	Economic and Finance Management in Construction	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Construction Engineering and Management				

Course Objectives:

The course is intended to

1. Know about time value of money.
2. Gain knowledge on alternative proposals.
3. Acquire knowledge on alternative investments.
4. Learn about funds management in construction projects.
5. Familiarise on Management accounting.

Course Outcomes:

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain time value of money and cash flow in projects	Understand
CO2	Compare alternative proposals and select the best.	Analysie
CO3	Evaluate alternative investment on property.	Evaluate
CO4	Identify the sources of finance in construction projects.	Understand
CO5	Prepare fund flow statement in construction projects.	Apply

Course Contents:

UNIT I BASIC PRINCIPLES **9**

Time Value of Money – Cash Flow diagram – Nominal and effective interest- continuous interest . Single Payment Compound Amount Factor (P/F,F/P) – Uniform series of Payments (F/A,A/F,F/P,A/P)- Problem time zero (PTZ)- equation time zero (ETZ). Constant increment to periodic payments – Arithmetic Gradient(G), Geometric Gradient (C).

UNIT II COMPARING ALTERNATIVES PROPOSALS **9**

Comparing alternatives- Present Worth Analysis, Annual Worth Analysis, Future Worth Analysis, Rate of Return Analysis (ROR) and Incremental Rate of Return (IROR)Analysis, Benefit/Cost Analysis, Break Even Analysis.

UNIT III EVALUATING ALTERNATIVE INVESTMENTS **9**

Real Estate - Investment Property, Equipment Replace Analysis, Depreciation – Tax before and after depreciation – Value Added Tax (VAT) – Inflation.

UNIT IV FUNDS MANAGEMENT **9**

Project Finance – Sources of finance - Long-term and short -term finance, Working Capital Management, Inventory valuation, Mortgage Financing - International financial management foreign currency management.

UNIT V FUNDAMENTALS OF MANAGEMENT ACCOUNTING **9**

Management accounting, Financial accounting principles- basic concepts, Financial statements – accounting ratios - funds flow statement – cash flow statement.

TOTAL: 45 PERIODS

Text Books:

1. Blank, L.T., and Tarquin,a.J (1988) Engineering Economy,4th Edn. Mc-Graw Hill Book Co.
2. Collier C and GlaGola C (1998) "Engineering Economics & Cost Analysis", 3nd Edn. Addison Wesley Education Publishers.
3. Patel, B M (2000) "Project management- strategic Financial Planning, Evaluation and Control", Vikas Publishing House Pvt. Ltd. New Delhi.

Reference Books:

1. Shrivastava,U.K., (2000)"Construction Planning and Management",2nd Edn. Galgotia Publications Pvt. Ltd. New Delhi.
2. Steiner, H.M. (1996) "Engineering Economic principles", 2nd Edn. Mc-Graw Hill Book

Additional References:

1. https://nptel.ac.in/content/syllabus_pdf/105103023.pdf
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE46	System Integration in Construction	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core				
Pre requisites	Construction Equipments and Practices				

Course Objectives:

The course is intended to

1. Gain knowledge on structural integration.
2. Familiarise on environmental quality.
3. Know about provision of building services.
4. Acquire knowledge on maintenance of buildings.
5. Get awareness on safety measures in construction.

Course Outcomes:

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

CO. No.	Course Outcome	Bloom's Level
CO1	Describe the structural system for enclosing buildings (Understand)	Understand
CO2	Identify the environmental factors for maintaining quality in construction (Understand)	Understand
CO3	Implement the essential services to be provided in construction (Apply)	Apply
CO4	Interpret the correct planning system for least maintenance in construction (Apply)	Apply
CO5	Assess the suitable safety installations to protect fire(Evaluate	Evaluate

Course Contents:

UNIT I STRUCTURAL INTEGRATION **9**

Structural System, Systems for enclosing Buildings, Functional aesthetic system, Materials Selection and Specification.

UNIT II ENVIRONMENTAL FACTORS **9**

Qualities of enclosure necessary to maintain a specified level of interior environmental quality – weather resistance – Thermal infiltration – Acoustic Control – Transmission reduction – Air quality – illumination – Relevant systems integration with structural systems.

UNIT III SERVICES **9**

Plumbing – Electricity – Vertical circulation and their interaction – HVAC.

UNIT IV MAINTENANCE **9**

Component longevity in terms of operation performance and resistance to deleterious forces - Planning systems for least maintenance materials and construction – access for maintenance – Feasibility for replacement of damaged components – equal life elemental design – maintenance free exposed and finished surfaces.

UNIT V SAFETY **9**

Ability of systems to protect fire – Preventive systems – fire escape system design – Planning for pollution free construction environmental – Hazard free Construction execution.

TOTAL: 45 PERIODS

Text Books:

1. A.J.Elder and Martiz Vinden Barg, "Handbook of Building Enclosure", McGraw-Hill Book Company, 1983.
2. David V.Chadderton, "Building Services Engineering", Taylar and Francis, 2007.
3. Jane Taylor and Gordin Cooke, "The Fire Precautions" Act in Practices, 1987.

Reference Books:

1. Peter R. Smith and Warren G. Julian, "Building Services", Applied Science Publishers Ltd., London, 1993.
2. William T. Mayer, "Energy Economics and Building Design" , McGraw-Hill Book Company, 1983.

Additional References:

1. https://nptel.ac.in/courses/105/104/105104101/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE47	Contract Laws and Regulation	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Construction Planning and Scheduling				

Course Objectives:

The course is intended to

1. Create awareness about construction contracts.
2. Gain knowledge on tenders in construction projects.
3. Know about Arbitration in construction projects.
4. Familiarise on legal requirements in construction works.
5. Become knowledgeable on labour regulations in construction.

Course Outcomes:

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

CO. No.	Course Outcome	Bloom's Level
CO1	Express the types of contracts and its suitability in construction.	Understand
CO2	Evaluate the tender from technical, contractual and commercial point of view.	Evaluate
CO3	Implement the conditions of Arbitration in case of violations	Apply
CO4	Illustrate the laws governing sale, purchase and use of urban and rural land.	Apply
CO5	Execute the construction project by following insurance and safety regulations.	Apply

Course Contents:

UNIT I CONSTRUCTION CONTRACTS **9**

Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents - International Contract Document - Standard Contract Document - Law of Torts.

UNIT II TENDERS **9**

Prequalification - Bidding - Accepting - Evaluation of Tender from Technical, Contractual and Commercial Points of View - Contract Formation and Interpretation - Potential Contractual Problems - World Bank Procedures and Guidelines - Tamilnadu Transparency in Tenders Act.

UNIT III ARBITRATION **9**

Comparison of Actions and Laws - Agreements - Subject Matter - Violations - Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs.

UNIT IV LEGAL REQUIREMENTS **9**

Insurance and Bonding - Laws Governing Sale, Purchase and Use of Urban and Rural Land - Land Revenue Codes - Tax Laws - Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs - Legal Requirements for Planning - Property Law - Agency Law - Local Government Laws for Approval - Statutory Regulations.

UNIT V LABOUR REGULATIONS **9**

Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration – Insurance and Safety Regulations – Workmen"s Compensation Act – Indian Factory Act – Tamilnadu Factory Act – Child Labour Act - Other Labour Laws.

TOTAL: 45 PERIODS

Text Books:

1. Gajaria G.T., "Laws Relating to Building and Engineering" Contracts in India,
2. Jimmie Hinze, "Construction Contracts", McGraw Hill, 2001.
3. Joseph T. Bockrath, "Contracts and the Legal Environment for Engineers and Architects", McGraw Hill, 2000

Reference Books:

1. Kwaku, A., Tenah,P.E. Jose M.Guevara, P.E.,"Fundamentals of Construction Management and Organisation", Printice Hall, 1985.M.M.Tripathi Private Ltd., Bombay, 1982.
2. Patil. B.S, "Civil Engineering Contracts and Estimates", Universities Press (India) Private Limited, 2006.

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment

Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment

Bloom's Category	Internal Assessment Examination			Final Examination (60)
	IAE 1 (5)	IAE 2 (10)	IAE3 (10)	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				

20CEE48	Resource Management and Control in Construction	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Construction planning and scheduling				

Course Objectives

The course is intended to

1. Know about resource planning.
2. Learn about labour management in construction.
3. Gain knowledge on materials and equipments in construction.
4. Familiarise on time management in construction projects.
5. Get an exposure on resources allocation and levelling.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO 1	Identify the type of resources, manpower, equipment, material, money and time.	Understand
CO 2	Interpret the characteristics of resources and tools for measurement of resources.	Apply
CO 3	Execute the optimistic choice of materials and equipment in construction.	Knowledge
CO 4	Predict the time of completing the construction project.	Apply
CO 5	Implement the resource allocation and levelling as per plan.	Understand

Course Contents:

UNIT I RESOURCE PLANNING **9**

Resource Planning, Procurement, Identification, Personnel, Planning for material, Labour, time schedule and cost control, Types of resources, manpower, Equipment, Material, Money, Time.

UNIT II LABOUR MANAGEMENT **9**

Systems approach, Characteristics of resources, Utilization, measurement of actual resources required, Tools for measurement of resources, Labour, Classes of Labour, Cost of Labour, Labour schedule, optimum use Labour.

UNIT III MATERIALS AND EQUIPMENT **9**

Material: Time of purchase, quantity of material, sources, Transportation, Delivery and Distribution. Equipment: Planning and selecting by optimistic choice with respect to cost, Time, Source and handling.

UNIT IV TIME MANAGEMENT **9**

Personnel time, Management and planning, managing time on the project, forecasting the future, Critical path measuring the changes and their effects - Cash flow and cost control

UNIT V RESOURCE ALLOCATION AND LEVELLING **9**

Time-cost trade off, Computer application - resource leveling, resource list, resource allocation, Resource loading, Cumulative cost - Value Management.

TOTAL: 45 PERIODS

Text Books:

1. Andrew,D., Szilagg, Hand Book of Engineering Management, 1982.
2. James.A., Adrain, Quantitative Methods in Construction Management, American Elsevier Publishing Co., Inc., 1973.

Reference Books:

3. Harvey, A., Levine, Project Management using Micro Computers, Obsorne- McGraw Hill C.A.Publishing Co., Inc. 1988.
4. Oxley Rand Poslcit, Management Techniques applied to the Construction Industry, Granda Publishing Ltd., 1980.

Additional References:

1. https://nptel.ac.in/courses/105/103/105103093/
2. https://nptel.ac.in/courses/105/104/105104161/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Passed in Board of studies meeting *Approved in Academic Council meeting*

CHAIRMAN - BOARD OF STUDIES

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE49	Quality Control and Assurance in Construction	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Construction planning and Scheduling				

Course Objectives

The course is intended to

1. Gain knowledge on quality management in construction
2. Know about the quality system standards
3. Become knowledgeable in planning for quality in construction
4. Learn quality assurance and control in construction
5. Get an exposure on quality improvement techniques

Course Outcomes:

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

CO. No.	Course Outcome	Bloom's Level
CO 1	Describe the factors influencing the construction quality (Understand)	Understand
CO 2	Prepare the quality system documents in construction (Apply)	Apply
CO 3	Implement the quality policy in construction projects (Apply)	Apply
CO 4	Interpret the techniques and needs of quality assurance and control in construction (Apply)	Apply
CO 5	Identify the quality improvement techniques, specification and standardization (Understand)	Understand

Course Contents:

UNIT I QUALITY MANAGEMENT **9**

Introduction – Definitions and objectives – Factor influencing construction quality - Responsibilities and authority - Quality plan - Quality Management Guidelines – Quality circles.

UNIT II QUALITY SYSTEMS **9**

Introduction - Quality system standard – ISO 9000 family of standards – Requirements – Preparing Quality System Documents – Quality related training – Implementing a Quality system – Third party Certification.

UNIT III QUALITY PLANNING **9**

Quality Policy, Objectives and methods in Construction industry - Consumers satisfaction, Ergonomics - Time of Completion - Statistical tolerance – Taguchi‟s concept of quality – Codes and Standards – Documents – Contract and construction programming – Inspection procedures - Processes and products – Total QA / QC

programme and cost implication.

UNIT IV QUALITY ASSURANCE AND CONTROL **9**

Objectives - Regularity agent, owner, design, contract and construction oriented objectives, methods - Techniques and needs of QA/QC - Different aspects of quality - Appraisals, Factors influencing construction quality - Critical, major failure aspects and failure mode analysis, -Stability methods and tools, optimum design - Reliability testing, reliability coefficient and reliability prediction.

UNIT V QULAITY IMPROVEMENT TECHNIQUES **9**

Selection of new materials - Influence of drawings, detailing, specification, standardization - Bid preparation - Construction activity, environmental safety, social and environmental factors - Natural causes and speed of construction - Life cycle costing - Value engineering and value analysis.

TOTAL: 45 PERIODS

REFERENCES:

1. James, J.O‟ Brian, Construction Inspection Handbook – Quality Assurance and Quality Control, Van Nostrand, New York, 1989.

2. Kwaku, A., Tena, Jose, M. Guevara, Fundamentals of Construction Management and Organisation, Reston Publishing Co., Inc., Virginia, 1985.

3. Juran Frank, J.M. and Gryna, F.M. Quality Planning and Analysis, Tata McGraw Hill, 1993

4. Hutchins.G, ISO 9000, Viva Books, New Delhi, 2000

5. Clarkson H. Oglesby, Productivity Improvement in Construction, McGraw-Hill, 1989.

6. John L. Ashford, The Management of Quality in Construction, E & F.N.Spon, New York, 1989.

7. Steven McCabe, Quality Improvement Techniques in Construction, Addison Wesley Longman Ltd, England.1998.

Additional References:

1. https://nptel.ac.in/courses/105/103/105103093/
2. https://nptel.ac.in/courses/105/104/105104161/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE50	Design of Energy Efficient Building	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Construction Planning and Scheduling				

Course Objectives:

The course is intended to

1. Learn about climate adapted and climate rejecting buildings.
2. Know about general Principles of passive Solar Heating.
3. Gain a knowledge of materials, components and details.
4. Enhance the fundamentals of thermal performance of Building sections.
5. Getting knowledge of design concepts and architectural Interventions.

Course Outcomes:

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain about Climate adapted and climate rejecting buildings.	Understand
CO2	Identify the passive solar heating and cooling.	Understand
CO3	Explain about day lighting and electrical lighting	Understand
CO4	Enhance the heat control and ventilation	Understand
CO5	Illustrate about the energy efficiency.	Apply

Course Contents:

UNIT I INTRODUCTION **9**

Climate adapted and climate rejecting buildings – Heat Transfer – Measuring Conduction – Thermal Storage – Measurement of Radiation – The Green house Effect – Convection – Measuring latent and sensible heat – Psychrometry Chart – Thermal Comfort – Microclimate, Site Planning and Development – Temperature – Humidity – Wind – Optimum Site Locations – Sun Path Diagrams – Sun Protection – Types of Shading Devices – Design responses to energy conservation strategies.

UNIT II PASSIVE SOLAR HEATING AND COOLING **9**

General Principles of passive Solar Heating – Key Design Elements – Sunspace – Direct gain – Trombe Walls, Water Walls – Convective Air loops – Concepts – Case Studies – General Principles of Passive Cooling – Ventilation – Principles – Case studies – Courtyards – Roof Ponds – Cool Pools – Predicting ventilation in buildings – Window Ventilation Calculations – Room Organization Strategies for Cross and Stack Ventilation – Radiation – Evaporation and dehumidification – Wind Catchers – Mass Effect – Zoning – Load Control – Air Filtration and odor removal.

UNIT III DAYLIGHTING AND ELECTRICAL LIGHTING **9**

Materials, components and details - Insulation - Optical materials - Radiant Barriers - Glazing materials - Glazing Spectral Response - Day lighting - Sources and concepts -Building Design Strategies – Case Studies – Daylight apertures – Light Shelves – Codal requirements – Day lighting design - Electric Lighting - Light Distribution - Electric Lighting control for day lighted buildings - Switching controls - Coefficient of utilization - Electric Task Lighting - Electric Light Zones – Power Adjustment Factors.

UNIT IV HEAT CONTROL AND VENTILATION **9**

Hourly Solar radiation – Heat insulation – Terminology – Requirements – Heat transmission through building sections - Thermal performance of Building sections - Orientation of buildings – Building characteristics for various climates – Thermal Design of buildings – Influence of Design Parameters - Mechanical controls - Examples. Ventilation - Requirements - Minimum standards for ventilation - Ventilation Design - Energy Conservation in Ventilating systems - Design for Natural Ventilation - Calculation of probable indoor wind speed.

UNIT V DESIGN FOR CLIMATIC ZONES **9**

Energy efficiency - An Overview of Design Concepts and Architectural Interventions - Embodied Energy - Low Embodied Energy Materials - Passive Downdraft Evaporative Cooling - Design of Energy Efficient Buildings for Various Zones - Cold and cloudy - Cold and sunny - Composite - Hot and dry – Moderate – Warm and humid – Case studies of residences, office buildings and other buildings in each zones - Commonly used software packages in energy efficient building analysis and design - Energy Audit – Certification.

TOTAL: 45 PERIODS

Text Books:

3. Brown, G.Z. and DeKay, M., "Sun, Wind and Light - Architectural Design Strategies", John Wiley and Sons Inc, 2001
4. Energy Conservation Building Code, Bureau of Energy Efficiency, New Delhi,2007.
5. Handbook on Functional Requirements of Buildings Part 1 to 4 SP : 41 (S and T) 1995

Reference Books:

1. Majumdar, M (Ed), "Energy - Efficient Buildings" in India, Tata Energy Research Institute, Ministry of Non Conventional Energy Sources, 2002.
2. Moore, F., "Environmental Control System", McGraw Hill Inc. 2002.
3. Tyagi, A.K. (Ed). "Handbook on Energy Audits and Management Tata Energy Research Institute", 2000.

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3		3			3				3
CO2	3	2			3		2			2				3
CO3	3	3			2		3			3				3
CO4	3	2			3		2			2				2
CO5	3	3			3		3			3				2

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE51	Project Formulation and Appraisal	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Construction Planning and Scheduling				

Course Objectives:

The course is intended to

1. Learn about project formulation and concepts.
2. Know about time value of money.
3. Gain a knowledge of project appraisal.
4. Enhance the fundamentals of project financing.
5. Getting knowledge of private sector participation.

Course Outcomes:

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the project formulation	Understand
CO2	Identify the project costing.	Understand
CO3	Illustrate about the project appraisal.	Understand
CO4	Assess the project financing	Evaluate
CO5	Explain the private sector participation.	Understand

Course Contents:

UNIT I PROJECT FORMULATION **9**

Project – Concepts – Capital investments - Generation and Screening of Project Ideas – Project identification – Preliminary Analysis, Market, Technical, Financial, Economic and Ecological - Pre-Feasibility Report and its Clearance, Project Estimates and Techno-Economic Feasibility Report, Detailed Project Report – Different Project Clearances required.

UNIT II PROJECT COSTING **9**

Project Cash Flows – Time Value of Money – Cost of Capital.

UNIT III PROJECT APPRAISAL **9**

NPV – BCR – IRR – ARR – Urgency – Pay Back Period – Assessment of Various Methods – Indian Practice of Investment Appraisal – International Practice of Appraisal – Analysis of Risk – Different Methods – Selection of a Project and Risk Analysis in Practice.

UNIT IV PROJECT FINANCING **9**

Project Financing – Means of Finance – Financial Institutions – Special Schemes – Key Financial Indicators – Ratios.

UNIT V PRIVATE SECTOR PARTICIPATION **9**

Private sector participation in Infrastructure Development Projects - BOT, BOLT, BOOT - Technology Transfer and Foreign Collaboration - Scope of Technology Transfer.

TOTAL: 45 PERIODS

Text Books:

1. Barcus, S.W. and Wilkinson.J.W., "Hand Book of Management Consulting Services", McGraw Hill, New York, 1986.
2. Joy P.K., "Total Project Management - The Indian Context", New Delhi, Macmillan India Ltd., 1992

Reference Books:

1. Prasanna Chandra, "Projects – Planning, Analysis, Selection, Implementation Review", McGraw Hill Publishing Company Ltd., New Delhi. 2006.
2. "United Nations Industrial Development Organisation (UNIDO) Manual" for the Preparation of Industrial Feasibility Studies, (IDBI Reproduction) Bombay, 1987.

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE52	Project Safety Management	L	T	P	C
		3	0	0	3
Nature of Course	Professional elective				
Pre requisites	Construction Management				

Course Objectives

The course is intended to

1. To study and understand the various safety concepts and requirements applied to construction projects
2. To study the of construction accidents, safety programmes.
3. To understand the contractual obligations & design for safety.
4. To understand the designing for safety
5. To gain the knowledge towards the successive project management

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Understand the construction accidents and Legal Implications	Understand
CO2	Clearly explain the Elements of an Effective Safety Programme.	Remember
CO3	Elaborate the concept on Safety in Construction Contracts.	Apply
CO4	Understand the Safety Procedures and Workers Compensation.	Apply
CO5	Clearly explain the contractual obligations and owners‟ and designers‟ outlook	Understand

Course Contents:

UNIT I Construction Accidents **9**

Accidents and their Causes – Human Factors in Construction Safety - Costs of Construction Injuries – Occupational and Safety Hazard Assessment – Legal Implications

UNIT II Safety Programmes **9**

Problem Areas in Construction Safety – Elements of an Effective Safety Programme – Job-Site Safety Assessment – Safety Meetings – Safety Incentives .

UNIT III Contractual Obligations **9**

Safety in Construction Contracts – Substance Abuse – Classification – Public Health, Medical, Drug misuse – Signs and Symptoms – Safety Record Keeping

UNIT IV Designing For Safety **9**

Safety Culture – Safe Workers – Safety and First Line Supervisors – Safety and Middle Managers – Top Management Practices, Company Activities and Safety – Safety Personnel – Sub contractual Obligation – Project Coordination and Safety Procedures – Workers Compensation

UNIT V Owners' And Designers' Outlook **9**

Owners responsibility and safety –owners responsibility clause, general clause paramount, seaworthiness – deviation clause – laydays and canceling day - owners preparedness – role of designers in ensuring safety – safety clause in design document.

Total: 45 Periods

Text Books:

1. Albert lester "Project Management Planning and Control", BH Publishers 7th Edition.
2. Paul SV "Safety Management System And Documentation Training Programme Handbook (Pb 2019)" CBS Publishers & Distributors 2019

Reference Books:

1. Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997.

2. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, Prentice Hall Inc., 2001. 3. Tamilnadu Factory Act, Department of Inspectorate of factories, Tamil nadu.

Additional References:

1. https://nptel.ac.in/courses/110/104/110104073/
2. https://nptel.ac.in/courses/110/105/110105160/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1			2				2	2	2		3	2		3
CO2			2				2	2	2		3	2		3
CO3			2				2	2	2		3	2		3
CO4			2				2	2	2		3	2		3
CO5			2				2	2	2		3	2		3
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEE53	Railway, Airport, Docks and Harbor Engineering	L	T	P	C
		3	0	0	3

Nature of Course	Professional core
Pre requisites	Highway Engineering

Course Objectives

The course is intended to

1. Implement the methods of route alignment and construction.
2. Explain the construction techniques, Maintenance of track laying and Railway stations.
3. Gain knowledge on the planning and site selection.
4. Evaluate the design elements of runways.
5. Express the various features in harbors and ports to be adopted.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Understand the methods of route alignment and design elements in Railway Planning and Constructions.	Apply
CO2	Understand the Construction techniques and Maintenance of Track laying and Railway stations.	Understand
CO3	Gain an insight on the planning and site selection of Airport Planning and design.	Apply
CO4	Analyze and design the elements for orientation of runways and passenger facility systems.	Apply
CO5	Understand the various features in Harbours and Ports, their construction, coastal protection works and coastal Regulations to be adopted	Understand

Course Contents:

UNIT I RAILWAY PLANNING AND CONSTRUCTION 9

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods--Geometric design of railway, gradient, super elevation, widening of gauge on curves- Level Crossings. .

UNIT II RAILWAY CONSTRUCTION AND MAINTENANCE 9

Earthwork – Stabilization of track on poor soil - Track drainage – Calculation of Materials required for track laying - Construction and maintenance of tracks – Railway Station and

yards and passenger amenities-Signalling

UNIT III AIRPORT PLANNING 9

Air transport characteristics - airport classification – ICAO - airport planning: Site selection typicalAirport Layouts, Case Studies, parking and Circulation Area

UNIT IV AIRPORT DESIGN 9

Runway Design: Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design – Elements of Taxiway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings.

UNIT V HARBOUR ENGINEERING 9

Definition of Basic Terms: Harbour, Port, Satellite Port, Docks, Waves and Tides – Planning andDesign of Harbours: Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – InlandWater Transport – Wave action on Coastal Structures and Coastal Protection Works – Coastal Regulation Zone, 2011

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering, V Scitech Publications (India), Chennai, 2010
2. Saxena Subhash, C.and Satyapal Arora, A Course in Railway Engineering, Dhanapat Raiand Sons, Delhi, 1998
3. Khanna.S.K. Arora.M.G and Jain.S.S, Airport Planning and Design, Nemachand and Bros,Roorkee, 1994

REFERENCES:

1. Venkatramaiah. C., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels.,Universities Press (India) Private Limited, Hyderabad, 2015.
2. Mundrey J S, Railway Track Engineering, McGraw Hill Education (India) Private Ltd, New Delhi, 2013

Additional References:

1. https://nptel.ac.in/courses/105/107/105107123/
2. https://nptel.ac.in/courses/114/106/114106025/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3		3				2					2	2	3
CO2	3		3				2					2	2	3
CO3	3		3				2					2	2	3
CO4	3		3				2					2	2	3
CO5	3		3				2					2	2	3
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

OPEN ELECTIVE COURSES

(For Other Branches)

Passed in Board of studies meeting *Approved in Academic Council meeting*

CHAIRMAN - BOARD OF STUDIES

20CEO01	Energy Conservation and Management	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental Engineering				

Course Objectives

The course is intended to

1. Know about the current scenario of energy.
2. Learn about electricity consumption and billing.
3. Gain knowledge on Stoichiometry.
4. Acquire knowledge on Refrigeration and Air Conditioning Systems.
5. Get an exposer on Energy Economics.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the energy data of industries	Understand
CO2	Identify the suitable electrical systems.	Understand
CO3	Illustrate about the thermal systems.	Understand
CO4	Assess the energy conservation in major utilities	Evaluate
CO5	Interpret the energy economics aspects.	Apply

Course Contents:

UNIT I INTRODUCTION **9**

Energy - Power – Past & Present scenario of World; National Energy consumption Data – Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.

UNIT II ELECTRICAL SYSTEMS **9**

Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.

UNIT III THERMAL SYSTEMS **9**

Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and encon measures. Steam: Distribution &U sage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories

UNIT IV ENERGY CONSERVATION IN MAJOR UTILITIES **9**

Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets

UNIT V ECONOMICS **9**

Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept

TOTAL: 45 PERIODS

Text Books:

1. Energy Manager Training Manual (4 Volumes) available at www.energymanager training.com,a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.

Reference Books:

2. Witte. L.C., P.S. Schmidt, D.R. Brown, "Industrial Energy Management and Utilisation" Hemisphere Publ, Washington, 1988.
3. Callaghn, P.W. "Design and Management for Energy Conservation", Pergamon Press, Oxford, 1981.
4. Dryden. I.G.C., "The Efficient Use of Energy" Butterworths, London, 1982
5. Turner. W.C., "Energy Management Hand book", Wiley, New York, 1982.
6. Murphy. W.R. and G. Mc KAY, "Energy Management", Butterworths, London 1987

Additional References:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEO02	ENVIRONMENT AND AGRICULTURE	L	T	P	C
		3	0	0	3
Nature of Course	Environmental Engineering				
Pre requisites	Environmental Science				

Course Objectives

The course is intended to

1. Acquire the concepts of environmental concerns.
2. Acquaint the environmental impacts& learn the concept of environmental impacts.
3. Learn the knowledge of Climate Change.
4. Learn the theory and applications of ecological diversity and agriculture.
5. To emphasize on the importance of environment and agriculture on changing global scenario and the emerging issues connected to it.

Course Outcomes

On successful completion of the course students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Students will appreciate the role of environment in the current practice of agriculture and concerns of sustainability, especially in the context of climate change and emerging global issues.	Apply
CO2	Ecological context of agriculture and its concerns will be understood.	Understand
CO3	Get the Knowledge of Global warming and changing environment &Ecosystem changes	Apply
CO4	Collect the Knowledge of Ecological diversity, wild life and agriculture &GM crops and their impacts on the environment	Apply
CO5	Earn the Knowledge of Global environmental governance , alternate culture systems & Mega farms and vertical farms	Understand

Course contents:

UNIT I ENVIRONMENTAL CONCERNS 8

Environmental basis for agriculture and food – Land use and landscape changes – Water quality issues – Changing social structure and economic focus – Globalization and its impacts – Agro ecosystems.

UNIT II ENVIRONMENTAL IMPACTS 9

Irrigation development and watersheds – mechanized agriculture and soil cover impacts – Erosion and problems of deposition in irrigation systems – Agricultural drainage and downstream impacts –Agriculture versus urban impacts.

UNIT III CLIMATE CHANGE 8

Global warming and changing environment – Ecosystem changes – Changing blue-green-grey water cycles– Water scarcity and water shortages – Desertification.

UNIT IV ECOLOGICAL DIVERSITY AND AGRICULTURE 10

Ecological diversity, wild life and agriculture – GM crops and their impacts on the environment – Insets and agriculture – Pollination crisis – Ecological farming principles – Forest fragmentation

and agriculture – Agricultural biotechnology concerns.

UNIT V EMERGING ISSUES **10**

Global environmental governance – alternate culture systems – Mega farms and vertical farms – Virtual water trade and its impacts on local environment – Agricultural environment policies and its impacts– Sustainable agriculture.

Total: 45 Periods

Textbooks

1. M. Lakshmi Narasaiah, Environment and Agriculture, Discovery Pub. House, 2006.
2. Arvind Kumar, Environment and Agriculture, ABH Publications, New Delhi, 2005.

Reference books

1. T.C. Byerly, Environment and Agriculture, United States. Dept. of Agriculture. Economic Research Service,2006.
2. Robert D. Havener, Steven A. Breth, Environment and agriculture: rethinking development issues for the 21st century : proceedings of a symposium, Winrock International Institute for Agricultural Development,1994
3. Environment and agriculture: environmental problems affecting agriculture in the Asia and Pacific region; World Food Day Symposium,Bangkok,Thailand.1989

Additional References:

1.nptel.ac.in/course/111/105/111105121
2.nptel.ac.in/course/122/104/122104017

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2										1	
CO2	3	3	2										2	
CO3	2	3	2										1	
CO4	3	3	1										2	
CO5	3	3	2										1	
	3 High					2 Medium						1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEO03	RENEWABLE ENERGY SOURCES	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Construction Materials				

Course Objectives

The course is intended to

1. Get exposure on solar radiation and it's environmental impact to power.
2. Gain knowledge on the various solar energy collectors used for storing solar energy
3. Acquire knowledge on the solar energy storage and applications
4. learn about the wind energy and biomass
5. know about geothermal energy and other energy sources.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Implement the principles of solar radiation	Apply
CO2	Identify the solar energy collectors and methodologies of storing solar energy.	Understand
CO3	Interpret the methods of applying solar energy in a useful way.	Apply
CO4	Demonstrate the sources and potentials of wind energy with its economic aspects	Apply
CO5	Explain the methods of harnessing the energy sources like wind, biogas and geothermal energies	Understand

Course Contents:

UNIT I PRINCIPLES OF SOLAR RADIATION 9

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT II SOLAR ENERGY COLLECTION 9

Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT III SOLAR ENERGY STORAGE AND APPLICATIONS 9

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications solar

heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT IV WIND ENERGY **9**

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNIT V GEOTHERMAL ENERGY **9**

Resources, types of wells, methods of harnessing the energy, potential in India. OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics. DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, principles of DEC.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Rai G.D. , Non-Conventional Energy Sources, Khanna Publishers, 2011
2. Twidell and Wier, Renewable Energy Resources, CRC Press (Taylor and Francis), 2011

REFERENCE BOOKS:

1. Tiwari and Ghosal, “Renewable energy resources”, Narosa Publishing House, 2007 2.
2. Ramesh R & Kumar K.U , “Renewable Energy Technologies”,Narosa Publishing House, 2004
3. Mittal K M, “Non-Conventional Energy Systems”, Wheeler Publishing Co. Ltd, New Delhi, 2003
4. Kothari D.P, Singhal ., K.C., “Renewable energy sources and emerging technologies”, P.H.I, New Delhi, 2010

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3			3									3
CO2	3	2			3									3
CO3	3	3			2									3
CO4	3	2			3									2
CO5	3	3			3									2
	3	High				2	Medium					1	Low	

Passed in Board of studies meeting *Approved in Academic Council meeting*

CHAIRMAN - BOARD OF STUDIES

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEO04	Vibration and Noise Control	L	T	P	C
		3	0	0	3
Nature of Course	Open elective				
Pre requisites	Physics				

Course Objectives

The course is intended to

1. Understand basic concepts of vibration.
2. Study about the noises and sources.
3. Study about the noises from automotives.
4. To get the knowledge of noise controls.
5. Evaluate the noise and method of controls.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the classification of vibration.	Understand
CO2	Recognize the concepts of noises and components.	Understand
CO3	Interpret the noise sources from automotives.	Apply
CO4	Eneumerate the noise control techniques.	Remember
CO5	Decide the suitable methods for control of Engine noise	Evaluate

Course Contents:

UNIT I Basics of Vibration **9**

Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, linear and non linear vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, determination of natural frequencies.

UNIT II Basics of Noise **9**

Introduction, amplitude, frequency, wavelength and sound pressure level, addition, subtraction and averaging decibel levels, noise dose level, legislation, measurement and analysis of noise, measurement environment, equipment, frequency analysis, tracking analysis, sound quality analysis.

UNIT III Automotive Noise Sources **9**

Noise Characteristics of engines, engine overall noise levels, assessment of combustion noise, assessment of mechanical noise, engine radiated noise, intake and exhaust noise, engine accessory contributed noise, transmission noise, aerodynamic noise, tyre noise, brake noise.

UNIT IV Control Techniques **9**

Vibration isolation, tuned absorbers, untuned viscous dampers, damping treatments, application dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.

UNIT V Source of Noise and Control **9**

Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound in enclosures, sound energy absorption, sound transmission through barriers

Total: 45 Periods

Text Books:

1. Singiresu S.Rao – "Mechanical Vibrations" – Pearson Education, ISBM –81-297-0179-0 – 2004.
2. Kewal Pujara "Vibrations and Noise for Engineers", Dhanpat Rai & Sons, 1992.

Reference Books:

1. Bernard Challen and Rodica Baranescu – "Diesel Engine Reference Book" – Second edition – SAE International – ISBN 0-7680-0403-9 – 1999.
2. Julian Happian-Smith – "An Introduction to Modern Vehicle Design"- Butterworth-Heinemann, ISBN 0750-5044-3 – 2004
3. John Fenton – "Handbook of Automotive body Construction and Design Analysis – Professional Engineering Publishing, ISBN 1-86058-073- 1998.

Additional References:

1. https://nptel.ac.in/courses/112/104/112104194/
2. https://nptel.ac.in/courses/112/107/112107087/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	3			2		3							2
CO2	2	3			2		3							2
CO3	2	3			2		3							2
CO4	2	3			2		3							2
CO5	2	3			3		3							2
	3	High				2	Medium					1	Low	

Passed in Board of studies meeting *Approved in Academic Council meeting*

CHAIRMAN - BOARD OF STUDIES

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEO05	CLIMATE CHANGE AND ITS IMPACT	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Environmental Engineering				

Course Objectives

The course is intended to

1. Understand the basics of weather and climate
2. Have an insight omg atmospheric dynamics and transport of heat.
3. Develop the global climate models
4. Know about climate system processes
5. Learn about the climate changes from the model.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the parameters temperature, humidity, wind, pressure and precipitation.	Understand
CO2	Interpret on Green house effect and Global warming.	Understand
CO3	Demonstrate the components and phenomena in the climate system.	Apply
CO4	Illustrate the climate system processes.	Apply
CO5	Construct a climate model and predict climate changes.	Understand

Course Contents:

UNIT I BASICS OF WEATHER AND CLIMATE **9**

Shallow film of Air- stratified & disturbed atmosphere – law – atmosphere Engine. Observation of parameters: Temperature – Humidity – Wind - Pressure – precipitation-surface – networks. Constitution of atmosphere: well stirred atmosphere – process around turbopause – in dry air – ozone – carbon Dioxide – Sulphur Dioxide- Aerosol - water. Evolution of atmosphere. State of atmosphere: Air temperature – pressure – hydrostatic – Chemistry – Distribution – circulation

UNIT II ATMOSPHERIC DYNAMICS **9**

Atmosphere dynamics: law – isobaric heating and cooling – adiabatic lapse rates – equation of motion - solving and forecasting. Forces – Relative and absolute acceleration – Earth‟s rotation coriolis on sphere – full equation of motion – Geostrophy;- Thermal winds -departures – small-scale motion. Radiation, convection and advections: sun & solar radiation – energy balance – terrestrial radiation and the atmosphere – Green house effect- Global warming - Global budget –

Passed in Board of studies meeting *Approved in Academic Council meeting*

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radiative fluxes - heat transport. Atmosphere and ocean systems convecting & advecting heat.Surface and boundary layer – smaller scale weather system – larger scale weather system.

UNIT III GLOBAL CLIMATE **9**

Components and phenomena in the climate system: Time and space scales – interaction and parameterization problem. Gradients of Radiative forcing and energy transports by atmosphere and ocean – atmospheric circulation – latitude structure of the circulation - latitude – longitude dependence of climate features. Ocean circulation: latitude – longitude dependence of climate features – ocean vertical structure – ocean thermohaline circulation – land surface processes – carbon cycle.

UNIT IV CLIMATE SYSTEM PROCESSES **9**

Conservation of motion: Force – coriolis - pressure gradient- velocity equations – Application – geotropic wind – pressure co-ordinates. Equation of State – atmosphere – ocean. Application: thermal circulation – sea level rise. Temperature equation: Ocean – air – Application – decay of sea surface temperature. Continuity equation: ocean – atmosphere. Application: coastal upwelling – equatorial upwelling – conservation of warm water mass. Moisture and salinity equation: conservation of mass – moisture. Source & sinks – latent heat. Moist processes – saturation – convection – Wave processes in atmosphere and ocean.

UNIT V CLIMATE CHANGE MODELS **9**

Constructing a climate model – climate system modeling – climate simulation and drift – Evaluation of climate model simulation – regional (RCM) – global (GCM) – Global average response to warming – climate change observed to date.

Total: 45 Periods

TEXTBOOKS:

1. Fundamentals of weather and climate (2nd Edition) Robin Moilveen (2010), Oxford University Press
2. Climate change and climate modeling, J. David Neelin (2011) Cambridge University press.

REFERENCE:

1. Chambers Robert, Climate change and climate modeling, Cambridge University Press, 1989.

Additional References:

1. https://nptel.ac.in/courses/105/105/105105168/
2. https://nptel.ac.in/courses/105/101/105101084/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	1	3			2					3		2
CO2	3	2	1	2			2					3		2
CO3	3	2	1	2			2					3		2
CO4	3	2	1	2			2					3		2
CO5	3	3	1	3			3					3		2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEO06	Green Building Design	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Concrete Technology, Construction Materials				

Course Objectives

1. The course is intended to
2. Understand the requirements of green buildings
3. Evaluate the green building design process
4. Choose a sustainable landscaping and energy strategies
5. Choose a Suitable sustainable hydrologic landscaping and energy strategies
6. Design a green building commissioning and implementation

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Identify the requirements of green buildings	Apply
CO2	Explain the green building design process and assessment	Understand
CO3	Select a suitable sustainable landscaping and energy strategies for green building	Apply
CO4	Select a suitable sustainable hydrologic landscaping and energy strategies for green building	Apply
CO5	Illustrate green building commissioning and implementation	Understand

Course Contents:

UNIT I SUSTAINABLE CONSTRUCTION AND GREEN BUILDING REQUIREMENTS 9 Hours

Ethics and sustainability - Increased CO2 trade-Sustainable construction - Major environmental and resource concerns - Green building movement and obstacles - Green building requirements - Perceived

use of green building

UNIT II GREEN BUILDING PROCESS AND ASSESSMENT 9 Hours

Life Cycle Impacts of Materials and Product-Conventional versus green building delivery systems - Execution of green building process - Integrated design process - Ecological design -Merits and

demerits -Historical perspective - LEED building assessment standard - LEED certification process - International building assessment standards - Building rating system in India and its future - Case study of a green building

UNIT III SUSTAINABLE LANDSCAPING AND ENERGY **9 Hours**

Land and landscape approaches for green buildings -sustainable landscapes - Landscaping water efficiency Storm water management - Heat island mitigation - Building energy issues - Building energy design strategies - Building envelope - Active mechanical systems -Innovative energy optimization strategies - Smart buildings and energy management systems-Case study on smart buildings and energy management studies

UNIT IV BUILDING HYDROLOGIC SYSTEM AND MATERIAL LOOPS **9 Hours**

High performance building water supply strategy - High performance building wastewater strategy - Green building materials issues and priorities - LCA of building materials and products - Emerging construction materials and products - Construction and demolition waste management Design for deconstruction and disassembly - Closing material loops in practice-Case study on LCA of buildings

UNIT V GREEN BUILDING IMPLEMENTATION **9 Hours**

Site protection planning - Health and safety planning - Reducing the footprint of construction operations -Essentials of building commissioning - Costs and benefits of building commissioning- The economics of green buildings - Quantifying green building costs - Future directions in green buildings- Case study for high performance green buildings

Total: 45 Hours

Reference(s)

1. Charles. J. Kibert, Sustainable Construction: Green Building Design and Delivery, John Wiley & Sons, Inc., New Jersey, 2008

2. M. Bauer, P. Mosle and M. Schwarz, Green Building: Guidebook for Sustainable Architecture, Springer - Verlag Berlin Heidelberg, 2010

3. Jerry Yudelson, Marketing Green Building Services: Strategies for success, Elsevier, 2008

4. Jerry Yudelson, Marketing Green Buildings: Guide for Engineering, Construction and Architecture, The Fairmont Press Inc., 2006

5. Angela. M. Dean, Green by Design: Creating a Home for Sustainable Living, Gibbs Smith Publication, 2003

Additional References:

1. https://nptel.ac.in/courses/105/102/105102195/
2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ce40/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	1	3			2					3		2
CO2	3	2	1	2			2					3		2
CO3	3	2	1	2			2					3		2
CO4	3	2	1	2			2					3		2
CO5	3	3	1	3			3					3		2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEO07	SELECTION OF MATERIALS	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Construction Materials				

Course Objectives

The course is intended to

1. Get exposure of Engineering materials.
2. Gain knowledge on the properties of materials
3. Acquire knowledge on manufacturing processes of materials
4. Learn about the selection of materials and tests
5. Know about the various applications of materials.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Understand different types of availability materials	Apply
CO2	Identify the effective ways to select the required materials.	Understand
CO3	Implement the manufacturing processes of materials	Apply
CO4	Interpret the material selection charts and tests	Apply
CO5	Express the applications of selected materials.	Understand

Course Contents:

UNIT I ENGINEERING MATERIALS 9

Introduction – classification of engineering materials – selection of materials for engineering purposes –selection of materials and shape –classification metal and alloys, polymers, ceramics and glasses, composites, natural materials,-non metallic materials- smart materials - physical, metrical properties of metals

UNIT II MATERIAL PROPERTIES 9

Mechanical properties – fatigue strength – fracture Toughness - Thermal Properties - Magnetic Properties - Fabrication Properties –electrical , optical properties - Environmental Properties , Corrosion properties –shape and size - Material Cost and Availability– failure analysiS

UNIT III MANUFACTURING PROCESSING AND ECONOMIC ANALYSIS 9

Interaction of Materials Selection, Design, and Manufacturing Processes - Production Processes and Equipment for Metals - Metal Forming, Shaping, and Casting - Plastic Parts Processing - Composites Fabrication Processes - Advanced Ceramics Processing – surface treatment - Resource -The Price and Availability of Materials

UNITIV MATERIALS SELECTION CHARTS AND TESTING 9

Ashby material selection charts-Testing of Metallic Materials - Plastics Testing - Characterization and Identification of Plastics - Professional and Testing Organizations - Ceramics Testing - Nondestructive Inspection.

UNIT V APPLICATION AND USES 9

Selection of Materials for Biomedical Applications - Medical Products - Materials in Electronic Packaging - Advanced Materials in Sports Equipment - Materials Selection for Wear Resistance - Advanced Materials in Telecommunications - Using Composites - Manufacture and Assembly with Plastics, fiber and Diamond Films.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Ashby, M. F. Materials selection in mechanical design, 3rd edition. Elsevier, 2005.

2. Ashby, M. F. and Johnson, K. Materials and design – the art and science of material selection in product design. Elsevier, 2002.

REFERENCES

1. Charles, J. A., Crane, F. A. A. and Furness, J. A. G. Selection and use of engineering materials, 3rd edition. Butterworth-Heinemann, 1997

2. Handbook of Materials Selection. Edited by Myer Kutz2002 John Wiley & Sons, Inc., NewYork.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	1	3			2					3		2
CO2	3	2	1	2			2					3		2
CO3	3	2	1	2			2					3		2
CO4	3	2	1	2			2					3		2
CO5	3	3	1	3			3					3		2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

20CEO08	TESTING OF MATERIALS	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	Construction Materials				

Course Objectives

The course is intended to

1. Give an overview of materials and test aspects
2. Gain knowledge on mechanical testing of materials
3. Acquire knowledge on Non-destructive testing of materials
4. Learn about the material characterization testing.
5. Know about the thermal testing and chemical testing.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Implement a suitable testing technique to inspect the industrial component.	Apply
CO2	Interpret the various mechanical tests, advantages and limitations	Understand
CO3	Execute the non-destructive test on materials.	Apply
CO4	Illustrate the macroscopic and microscopic observations in material characterisation testing.	Apply
CO5	Recognize an appropriate thermal test and chemical test on materials.	Understand

Course Contents:

UNIT I NTRODUCTION TO MATERIALS TESTING **9**

Overview of materials, Classification of material testing, Purpose of testing, Selection of material, Development of testing, Testing organizations and its committee, Testing standards, Result Analysis, Advantages of testing.

UNIT II MECHANICAL TESTING **9**

Introduction to mechanical testing, Hardness test (Vickers, Brinell, Rockwell), Tensile test, Impact test (Izod, Charpy) - Principles, Techniques, Methods, Advantages and Limitations, Applications. Bend test, Shear test, Creep and Fatigue test - Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT III NON-DESTRUCTIVE TESTING **9**

Visual inspection, Liquid penetrant test, Magnetic particle test, Thermography test – Principles, Techniques, Advantages and Limitations, Applications. Radiographic test, Eddy current test, Ultrasonic test, Acoustic emission- Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT IV MATERIAL CHARACTERIZATION TESTING **9**

Macroscopic and Microscopic observations, Optical and Electron microscopy (SEM and TEM) - Principles, Types, Advantages and Limitations, Applications. Diffraction techniques, Spectroscopic Techniques, Electrical and Magnetic Techniques- Principles, Types, Advantages and Limitations, Applications.

UNIT V OTHER TESTING **9**

Thermal Testing: Differential scanning calorimetry, Differential thermal analysis. Thermomechanical and Dynamic mechanical analysis: Principles, Advantages, Applications. Chemical Testing: X-Ray Fluorescence, Elemental Analysis by Inductively Coupled PlasmaOptical Emission Spectroscopy and Plasma-Mass Spectrometry.

Total: 45 Periods

TEXTBOOKS:

1. Baldev Raj, T.Jayakumar, M.Thavasimuthu “Practical Non-Destructive Testing”, Narosa Publishing House, 2009.
2. 2. Cullity, B. D., “Elements of X-ray diffraction”, 3rd Edition, Addison-Wesley Company Inc., New York, 2000.
3. 3. P. Field Foster, “The Mechanical Testing of Metals and Alloys” 7th Edition, Cousens Press, 2007.

REFERENCES:

1. Metals Handbook: Mechanical testing, (Volume 8) ASM Handbook Committee, 9th Edition, American Society for Metals, 1978.
2. ASM Metals Handbook, “Non-Destructive Evaluation and Quality Control”, American Society of Metals, Metals Park, Ohio, USA.
3. Brandon D.G., “Modern Techniques in Metallography”, Von Nostrand Inc. NJ, USA, 1986

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	1	3			2					3		2
CO2	3	2	1	2			2					3		2
CO3	3	2	1	2			2					3		2
CO4	3	2	1	2			2					3		2
CO5	3	3	1	3			3					3		2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**Final Examination (60)**
	IAE 1 (5)	**IAE 2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

ONE CREDIT COURSES

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20CEA01	Drafting and Documentation of Construction Projects	L	T	P	C
		1	0	0	1
Nature of Course	Employability Enhancement Course				
Pre requisites	Basic knowledge in building drawing				

Course Objectives

The course is intended to

1. Gain knowledge on basic drawings, editing and viewing tools
2. Acquire knowledge on inquiry commands and altering objects
3. Be aware on creating multiline text
4. Understand the dimensioning and tool pallets
5. Draw additional objects

Course Outcomes

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

CO. No.	Course Outcome	Bloom' sLevel
CO1	Create basic drawings and manipulate objects	Apply
CO2	Organize drawing objects on layers	Understand
CO3	Create multiline text and hatch objects	Apply
CO4	Explain dimensioning and working with reusable content	Understand
CO5	Develop knowledge on drawing additional objects	Understand

Course Contents:

UNIT- I Introductions to AutoCAD **6**

Navigating the working environment -Working with files -Displaying objects- Creating basic drawings - inputting data -Creating basic objects -Using object snaps - Using polar tracking and polar snap - Using object snap tracking - Working with units- Using function keys manipulating objects - Selecting objects in the drawing - Changing an object's position - Creating new objects from existing objects - Changing the angle of an object's position - Creating a mirror image of existing objects - Creating object patterns - Changing an object's size

UNIT- II Drawing Organization and Inquiry Commands **6**

Using layers - Changing object properties - Matching object properties -Using the properties palette - Using line types -Using inquiry commands - Altering objects -Trimming and extending objects to defined boundaries - Creating parallel and offset geometry - Joining objects - Breaking an object into two objects

- Applying a radius corner to two objects - Creating an angled corner between two objects - Changing part of an object's shape - Using grips

UNIT- III Annotating Drawings **6**

Creating multiline text - Creating single line text - Using text styles - Editing text -Hatching objects - Editing hatch objects - Chapter exercise

UNIT- IV Dimensioning **6**

Content center library - Configuring content center libraries - Authoring tube & pipe parts - Publishing to content center - Create styles using published parts - Placing tube & pipe parts

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Working with Reusable Content - Using Blocks - Working with Design Center™ - Using Tool Palettes

UNIT- V Creating Additional Drawing Objects **6**

Working with polylines - Creating splines - Creating ellipses - Using tables

Total 30 Hours

Text Books

1. AutoCAD 2019 3D Modeling ; Munir Hamad, Mercury Learning and Information; 2019.
2. AutoCAD 2019 ; Zico Pramata Putra , Independently published 2019.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
Cos	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3				3							1	2	
CO2	3				3							1	2	
CO3	3				3							1	2	
CO4	3				3							1	2	
CO5	3				3							1	2	
	3	High				2	Medium					1	Low	

Bloom's Level	**Summative Assessment (Internal Mode)**	
	Assessment I (50 Marks)	**Assessment II (50 Marks)**
Remember	10	10
Understand	10	10
Apply	30	30
Analyze	0	0
Evaluate	0	0
Create	0	0

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20CEA02	3D Modeling Techniques of BIM	L	T	P	C
		1	0	0	1
Nature of Course	Employability Enhancement course				
Pre requisites	Knowledge in Autocad				

Course Objectives

The course is intended to

1. Revit Architecture is a robust architectural design and documentation software application created by Autodesk for architects and building professionals
2. The tools and features that make up Revit Architecture are specifically designed to support building information modeling (BIM) workflows.
3. Understand the painting with colors
4. Provide a real life design scheme to the model
5. Prepare a drawing and present the model

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Develop the knowledge on drawing tools and furniture modelling	Understand
CO2	Create a plan with Elevation views	Apply
CO3	Develop knowledge on painting with colours, textures and photo matching	Understand
CO4	Create sequencing animations of the projects	Apply
CO5	Create attractive drawing for project communication	Apply

Course Contents:

Unit I Building Information Modeling

Building Information Modeling for architectural, understanding Revit - element hierarchy - Revit Architecture basics - Revit Architecture user interface - The ribbon framework - Guidelines for using the interface - Using Common modification tools - Viewing the model - About Views - View Properties - Guidelines for Working with Views - About Controlling Object Visibility - View Templates - Using Filters - Guidelines for Controlling Object Visibility - About Elevation and Section Views - Guidelines for Working with Elevation and section views - About 3D Views - Perspective view - About Cameras - Creating and Modifying Camera Views - Axonometric view.

Unit II Starting a new project

Creating Project Templates - Guidelines for Creating Project Template Files - About Levels - Adding and Modifying Levels

- Guidelines for Adding and Modifying Levels
- About Grids
- Methods of Creating and Modifying Grid Lines
- Guidelines for Creating and Modifying Grids

Walls and Curtain walls

- Creating generic walls
- Sketching walls
- Hosting element in walls

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- Modifying walls
- Editing walls
- Creating curtain walls
- Adding curtain grids, mullions and panel
- Modifying curtain walls
- Editing curtain walls structure

Floors and Roofs

- About floor elements
- Process of adding a floor element
- Sketching floors
- Editing Floors
- About roofs
- Process of sketching roofs
- Roof modification and example
- About Ceiling elements
- Creating ceiling
- Editing ceiling

Unit III Stairs and Railings

- About stairs and railing
- Process for creating a staircase by component
- Process for creating a staircase by sketch
- Creating the generic railing

Adding Families

- Adding families
- Loading families
- Placing families
- Editing families in project

Unit IV Rooms and Color fill plans

Tagging spaces with room tags - Room tags - Room Boundaries - Room separation line - Generating color rooms plan

Unit V Creating Plan Annotation and Schedules

- About Temporary Dimensions - About Permanent Dimensions - About Spot Dimension Symbols - Guidelines for Adding Dimensions - Exercise: Add Dimensions and Spot Symbols - About Text - Setting Text Placement Parameters - About Legends - Guidelines for Creating Legends - About Schedules - Working with Schedules - Guidelines for Working with Schedules

Total: 30 Hours

Reference Books:

1. Sketch Up for Interior Design; Lydia Cline, Wiley publishers. 2014
2. Sketch Up for Dumies; Aidan chopra, 2017.

[Type text] [Type text]

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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)														
Cos	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	1				2							1	2	
CO2	2				3							1	2	
CO3	2				3							2	2	
CO4	2				3							2	2	
CO5	2				3							1	2	
	3	Hig h			2	Mediu m						1	Low	

Bloom's Level	**Summative Assessment (Internal Mode)**	
	Assessment I (50 Marks)	**Assessment II (50 Marks)**
Remember	10	10
Understand	10	10
Apply	30	30
Analyze	0	0
Evaluate	0	0
Create	0	0

[Type text] [Type text]

CHAIRMAN - BOARD OF STUDIES

20CEA03	3D Modelling of Buildings	L	T	P	C
		1	0	0	1
Nature of Course	Employability Enhancement course				
Pre requisites	Knowledge in Autocad				

Course Objectives

The course is intended to

1. Gain knowledge on basics of sketchup and modelling.
2. Understand drafting and modelling.
3. Understand the painting with colors
4. Provide a real life design scheme to the model
5. Prepare a drawing and present the model

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Develop the knowledge on drawing tools and furniture modelling	Understand
CO2	Create a plan with Elevation views	Apply
CO3	Develop knowledge on painting with colours,textures and photomatching	Understand
CO4	Create sequencing animations of the projects	Apply
CO5	Create attractive drawing for project communication	Apply

Course Contents:

UNIT- I SketchUp Basics **6**

Opening SketchUp - SketchUp Screen - Toolbars - Viewing Tools - Shortcut Keys - Drawing Tools - Modelling Furniture, Cabinetry and Accessories - Faces and Edges - Stickiness - Move Tool – Groups - Modeling exercises.

UNIT- II Drafting, Modeling, and Furnishing a Floor Plan **6**

Importing and Tracing a Raster file - From Plan to Model - Draft a Plan from a Paper Sketch - Interior vs Exterior Models - Create Plan with Elevation Views.

UNIT- III Painting with Colors, Textures and Photo-Matching **6**

Paint with Native SketchUp Materials - Paint with Textures - Put New Colors and Textures into the Model.

UNIT- IV Apply a Real Life Design Scheme to the Model **6**

Import a Texture - Import an Image - Photo-Match an Interior Space

UNIT- V Enhancing and Presenting the Model **6**

Annotating the Model - Dimension a floor Plan - Scenes - The Walk-Through Tools - Dynamic Components - Save vs. Export

Total: 30 Hours

Reference Books:

1. Sketch Up for Interior Design; Lydia Cline, Wiley publishers. 2014
2. Sketch Up for Dumies; Aidan chopra, 2017.

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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
Cos	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	1				2							1	2	
CO2	2				3							1	2	
CO3	2				3							2	2	
CO4	2				3							2	2	
CO5	2				3							1	2	
	3	High				2	Medium					1	Low	

Bloom's Level	**Summative Assessment (Internal Mode)**	
	Assessment I (50 Marks)	**Assessment II (50 Marks)**
Remember	10	10
Understand	10	10
Apply	30	30
Analyze	0	0
Evaluate	0	0
Create	0	0

20CEA04	Total Station Survey	L	T	P	C
		1	0	0	1
Nature of Course	Professional core				
Pre requisites	Advanced Surveying				

Course Objectives

The course is intended to

1. understand the working of Total Station equipment and solve the surveying problems.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Working principles of total station and accessories instruments.	Understand
CO2	Propagation of EMR through atmosphere and corrections for its effects.	Understand
CO3	The functioning various types total station and GPS equipments and their applications.	Understand
CO4	Various techniques available for surveying and mapping with total station and GPS.	Understand
CO5	Get the knowledge on various types of process in surveying by total station.	Understand

Course Contents:

UNIT I FUNDAMENTALS OF TOTAL STATION AND ELECTROMAGNETIC WAVES 6

Methods of Measuring Distance, Basic Principles of Total Station, Historical Development, Classifications, applications and comparison with conventional surveying. Classification - applications of Electromagnetic waves.

UNIT II ELECTRO-OPTICAL AND MICROWAVE SYSTEM 6

Electro-optical system: Measuring principle, Working principle, Sources of Error. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance – land survey applications

UNIT III SATELLITE SYSTEM 6

Basic concepts of GPS - Geodetic satellite - Doppler effect - Positioning concept - Different segments - space, control and user segments - satellite configuration – GPS signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment - GPS receivers.

UNIT IV GPS DATA PROCESSING 6

GPS observables - code and carrier phase observation - linear combination and derived

observables - concept of parameter estimation – downloading the data RINEX Format – Differential data processing –use of different softwares available in the market.

UNIT V HYDROGRAPHIC, MINE AND CADASTRAL SURVEYING **6**

Reconnaissance – Route surveys for highways, railways and waterways – Hydrographic– River surveys — Tunnel alignment and setting out - Cadastral survey.

Total: 30 Periods

TEXTBOOKS:

1. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1996

2. Satheesh Gopi, rasathishkumar, N.madhu, ¯ Advanced Surveying, Total Station GPS and Remote Sensing ¯ Pearson education, 2007 isbn: 978-81317 00679

REFERENCE:

1. R.Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.

2. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1993.

3. Guocheng Xu, GPS Theory, Algorithms and Applications, Springer - Verlag, Berlin, 2003.

4. Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 3rd Edition, 2004.

Additional References:

1. https://nptel.ac.in/courses/105/105/105105168/
2. https://nptel.ac.in/courses/105/101/105101084/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
Cos	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	1				2							1	2	
CO2	2				3							1	2	
CO3	2				3							2	2	
CO4	2				3							2	2	
CO5	2				3							1	2	
	3	High				2	Medium					1	Low	

Bloom's Level	**Summative Assessment (Internal Mode)**	
	Assessment I (50 Marks)	**Assessment II (50 Marks)**
Remember	10	10
Understand	10	10
Apply	30	30
Analyze	0	0
Evaluate	0	0
Create	0	0

20CEA05	Tekla	L	T	P	C
		1	0	0	1
Nature of Course	Professional core				
Pre requisites	Nil				

Course Objectives

1. To learn about the purpose of building information management.

Course Objectives

CO. No.	Course Outcome	Bloom's Level
CO 1	Understanding the purpose of Building Information Management (BIM) and how it is applied in the Autodesk Revit software.	Understand
CO 2	Navigating the Autodesk Revit workspace and interface.	Apply
CO 3	Working with the basic drawing and editing tools.	Knowledge
CO 4	Creating Levels and Grids as datum elements for the model.	Apply
CO 5	Creating a 3D building model with walls, curtain walls, windows, and doors. Adding floors, ceilings, and roofs to the building model.	Understand

Course Contents:

Introduction to Tekla Structures

Basic 3D Modeling

System Components

Interactive Modeling & Building Custom Components

Modeling Techniques » Structural Profiles and Materials » Numbering and reports » Principles of working with drawings » Creating General Arrangement Drawings » Creating Assembly Drawings » Creating Single Part Drawings » Creating Anchor Bolt Plans » Multi Drawings and multi numbering » Revision Control and Drawing Management » Modelling Stairs and handrails » Extracting Bill Of Material

TOTAL: 30 PERIODS

REFERENCES:

Exploring Autodesk Revit 2018 for Architecture- by Sham Tickoo

Additional References:

1. https://nptel.ac.in/courses/105/103/105103093/
2. https://nptel.ac.in/courses/105/104/105104161/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
Cos	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	1				2							1	2	
CO2	2				3							1	2	
CO3	2				3							2	2	
CO4	2				3							2	2	
CO5	2				3							1	2	
	3	High				2	Medium					1	Low	

Bloom's Level	**Summative Assessment (Internal Mode)**	
	Assessment I (50 Marks)	**Assessment II (50 Marks)**
Remember	10	10
Understand	10	10
Apply	30	30
Analyze	0	0
Evaluate	0	0
Create	0	0

20CEA06	VAASTHU	L	T	P	C
		1	0	0	1

Nature of Course	Professional core
Pre requisites	Construction Materials

Course Objectives

The course is intended to

To prepare plan and construct as per vasthu principles

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Prepare plan as per vasthu principles.	Apply
CO2	Plan for the direction of flow of water.	Create
CO3	Interpret the characteristics of main door.	Apply
CO4	Illustrate about the auspicious timings.	Apply
CO5	Explain vasthu related to apartments.	Understand

Course Contents:

UNIT -1 **6**

Preparation of building plan Modern House construction, Kitchen, Bed Room, Bath Room, Sit-outs/Verandah, Dining Room, Rest Room/Relaxation Room, Toilets, Garage, Compound wall , Construction of Staircases and its benefits, etc.

UNIT -2 **6**

Water Management Septic Tank, Sump, Overhead Tank, Swimming Pool, Direction of flow of water out of house from all sources in the house, Direction of Rain Water flow out of house and their effects, etc.

Walls Calculation related to foundation. Materials found while laying the foundation, Height, thickness of Walls, Parapets

UNIT -3 **6**

Main Door and other Doors and Windows Characteristics of Main Door, Procedure for its installation, Number of Doors and its results, Height/Width, their installation, Door

Hits/Dwarashoolas

Wood Friendly and Enemy woods, Male, Female and Neuter wood and its effects 6. Rules while preparing Building Plans Door Hits/Kuttu, Ground level, Neighboring buildings, Construction of Internal Chajjas, Main Door, Central Area/Brahmasthana, Pillars, Beams, Staircase to be considered while preparing building plan.

UNIT -4 **6**

Muhurtha Timings Rajayogas, Activities of Vaastu purusha during 12 months, Fixed/SthiraVaastu, Movable/Chara Vaastu and Daily/Nitya Vaastu, Procedures/Rituals for starting the Construction of House /Building.

Method of making Shanku, Procedures/Rituals for performing Bhoomi Pooja Installation of Shanku and its benefits, Bhoo Pooja, Garbhanyasa, Muhurtas, Qualifications of Architects and Masaons.

UNIT -5 **6**

Apartments Vaastu related to Apartment Buildings, Its benefic/malefic effects.

Total: 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
Cos	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	1				2							1	2	
CO2	2				3							1	2	
CO3	2				3							2	2	
CO4	2				3							2	2	
CO5	2				3							1	2	
	3	High				2	Medium					1	Low	

Bloom's Level	**Summative Assessment (Internal Mode)**	
	Assessment I (50 Marks)	**Assessment II (50 Marks)**
Remember	10	10
Understand	10	10
Apply	30	30
Analyze	0	0
Evaluate	0	0
Create	0	0

20CEA07	Pre-Engineered Building	L	T	P	C
		1	0	0	1
Nature of Course	Professional core				
Pre requisites	Construction Materials				

Course Objectives

The course is intended to

1. Tekla Structures is the most constructible structural software for BIM.
2. With it, you can create, combine, manage and share accurate multi-material 3D models full of construction information.
3. Tekla Structures for design, detailing and information management from conceptual planning to fabrication and construction on site.
4. With Tekla Structures you can create accurate, information-rich 3D models that contain all the structural data needed for building and maintaining the structure.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Learn PEB Building (Pre-Engineered Buildings)	Apply
CO2	Learn about building Connection Details	Apply
CO3	Learn to Analysis a Building	Apply
CO4	Learn to Set Working Area and Grid	Apply
CO5	Learn to Details and Joint Documentation	Apply

Course Contents:

Unit I Introduction **6**

Steel Framing - Grid systems & Create Simple Steel Column - Editing Column Length & Simply copying - Create Views - Create simple Beams

Unit II Concrete Framing **6**

Creating Piers & Pad footings - Create Strip Footings & Modify view Depth - Create Concrete Foundation – pile – Anchor - Slab

Unit III Analysis Models **6**

Creating Analysis & Design Models - Creating Loads & Export Analytical Model Secondary steel Framing - Creating Cutouts & Stairs - Crating stair base details – Handrails – Shear plates - Creating & adjusting all handrails in 2nd Floor

Unit IV Modeling **6**

Rebar Modeling: Rebar Modeling in Pad Footings - Rebar Modeling in Strip Footings & Create Connection - Rebar Modeling in Piers & Slabs

Steel Connections: Creating Base plates - Creating Beam to column connection & Using Auto Connection - Copying & updating property of components

Unit V General Arrangement Drawings **6**

Creating General Arrangement Drawing & adding notes in Drawing - Adjusting reinforcement

Locations & marks in Drawings - Creating Section cuts & Dimensions in drawing - Creating Floor plans & changes in drawings

Total: 30 Periods

TEXTBOOKS:

1. C CUBE TECHNOLOGIES, Pre-Engineered Building, 2020

REFERENCES:

1. C CUBE TECHNOLOGIES, Pre-Engineered Building, 2020

2. Mapping of Course Outcomes (COs) with Programme Outcomes (POs) ProgrammeSpecific Outcomes (PSOs)

Cos	Pos												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	1				2							1	2	
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	3	High				2	Medium					1	Low	

Bloom's Level	Summative Assessment (Internal Mode)	
	Assessment I (50 Marks)	**Assessment II (50 Marks)**
Remember	10	10
Understand	10	10
Apply	30	30
Analyze	0	0
Evaluate	0	0
Create	0	0